Centers for Disease Control
National Institute for Occupational Safety and Health
Advisory Board on Radiation and Worker Health
Savannah River Site (SRS) and SEC Issues Work Groups Joint Meeting
Tuesday, March 23, 2021

The Work Group convened via video teleconference, at 10:30 a.m. EDT, Bradley Clawson and Henry Anderson, Chairs, presiding.

Present:

Bradley Clawson, SRS Work Group Chair
Henry Anderson, SEC Issues Work Group Chair
Josie Beach, SEC Issues Member
James Lockey, SRS Member
Gen Roessler, SEC Issues Member
Phil Schofield, SRS Member
Paul Ziemer, SEC Issues Member

Also Present:

Rashaun Roberts, Designated Federal Official
Nancy Adams, NIOSH Contractor
Terrie Barrie
Bob Barton, SC&A
Ron Buchanan, SC&A
Grady Calhoun, DCAS
John Cardarelli, DCAS
Nancy Chalmers, ORAU Team
Josh Fester
Joe Fitzgerald, SC&A
Rose Gogliotti, SC&A
Richard Griffiths, SC&A
Roger Halsey, ORAU Team
Warren Johnson
Mike Mahathy, ORAU Team
Jenny Naylor, HHS
Chuck Nelson, DCAS
LaVon Rutherford, DCAS
Tim Taulbee, DCAS

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Proceedings

(10:30 a.m.)

Roll Call/Welcome

Dr. Roberts: I do have 10:30. So I want to wish everybody a good morning. This is the Advisory Board on Radiation and Worker Health. I'm Rashaun Roberts. I'm the DFO for the Advisory Board.

And this is a joint meeting of the Savannah River Site Work Group and the SEC Issues Work Group. I want to let you know, as per usual, that the agenda and all of the background materials and presentations for this meeting are on the NIOSH website if you look under the scheduled meetings, today's date. These materials were also distributed to the SRS and SEC Work Groups prior to today. So if you've taken a look at today's agenda, you'll see that the meeting is primarily focused on the Savannah River Site.

Before we officially move into that business, let's do roll call. And I would like all Working Group Members, NIOSH, SC&A, and others to address conflict of interest. However, to simplify things a little bit, I'll speak to conflict of interest with regard to Members of the Savannah River Site Work Group. In order for them to serve on the Work Group, they can't have any conflicts of interest.

So, with that, let's go ahead and move into roll call.

(Roll call.)

Dr. Roberts: Okay, excellent. Well, thank you, and welcome again to all of you. I do need to go over a couple of additional items before I give the floor to Brad Clawson, who's the Chairperson for SRS.

In order to keep things running smoothly and so that everybody can everybody can be clearly understood, everyone please mute your phone. If you're participating by phone, please mute it, unless, of

course, you're speaking. If you don't have a mute button, press *6 to mute, and *6 to take yourself off mute. If you're on Zoom, the mute button is at the bottom lower lefthand corner of your screen. Also, to make sure that you're muted, using that button to take yourself off mute, you'll have to press it again.

Also, in the interest of maintaining a productive meeting and to ensure that we also get a good transcription of this meeting, I ask everyone to please be patient with this process. And please do not interrupt people when they're presenting or speaking. Everyone, from the presenters to the petitioners and members of the public, should be given the opportunity at their designated times on the agenda to make whatever points they're going to make so that things can move forward. And I really would like to thank everyone in advance for observing this courtesy to others throughout this meeting.

So, once again, if you didn't hear earlier, the agenda, the presentations, and other materials that are relevant to today's meeting can be found on the NIOSH website so you can follow along. So, without further delay, I'll go ahead and turn the meeting over to Mr. Brad Clawson.

Chair Clawson: Thank you. Can everybody hear me, okay?

Dr. Roberts: You're a little low for me.

Chair Clawson: Well, I'll see what I can do to better that.

Dr. Roberts: That's better.

Chair Clawson: Anyway, let's just do a little bit of background because we have a motion that has been tabled to the Board for SRS. And we've come up that we need to evaluate and we've had SC&A evaluate part of the bootstrap, whatever that was process, and I believe it was 94 and 92.

Anyway, and so without further ado, according to my agenda, NIOSH is going to start out and give their discussion, and then SC&A will report on theirs. So, Tim, is it going to be you or it is going to be John.

Dr. Taulbee: It'll be John speaking.

Chair Clawson: Okay. John, I'll turn the time over to you then and let you go from there. All right.

Mr. Calhoun: This, this Grady. Can I say a few things real quick?

Chair Clawson: Sure.

Mr. Calhoun: I just want to make sure that, in the interest of time, we make sure that we got plenty of time at the end of this thing. And if the Work Group decides that they still want to go forward to add a Class, we to make sure that we understand what the basis is.

And then I will help to write that. Not necessarily that I will agree with it, but I will try to write whatever you guys decide on just to kind of streamline the process. I just want to make sure we've got time at the end for that. And that's really all I have to say.

Chair Clawson: I understand that, Grady, and I greatly appreciate that. That's very kind of you. We kind of did a straw man on it a little while ago. So that'll probably be one of the basis of where we'd start that at. But, yes, we'll try to get through this.

I really don't, after all the reading that I've done, I have not seen anything that has really changed. A lot more data, everything else out there, but not the substance or criteria that I feel that we need. But we'll take that in consideration and I'll turn it over to John.

Dr. Cardarelli: All right, thanks, Brad. Thanks, Grady. I'll share my screen here. Hopefully, everyone should just be able to see the presentation for "Bioassay for Subcontractor Construction Trade Workers at the Savannah River Site from 1972 to 1997." I believe that's showing appropriately here.

And this is basically RPRT-0094, which we talked about a little bit in the previous meetings back in November and December. It's a brief summary of that presentation that was written by Roger Halsey, one of our contractors with Oak Ridge Associated Universities.

And the overview, it will simply be defining what the purpose of that original RPRT-0094 was, our results, and a summary of the conclusions. So, really, the purpose of RPRT-0094 was to extend the period of evaluation of SRS subcontractor bioassay data completeness.

We were looking at 1989 to 1998, in one of the previous reports, and we extended that as early as 1972 that went up through 1997. So really, the purpose was to look at how complete the data would be for developing a co-exposure model and applying that for dose reconstruction purposes.

In this particular basic analysis, we only looked at the NOCTS, which is the claimant data for NIOSH. And we wanted to basically understand any trends associated with the radiological monitoring of the subcontractors in this particular subgroup of workers.

Now, what is our NOCTS data from the construction trade workers perspective? Right now, our co-exposure models are all construction trade workers combined together. That would be the DuPont, or the prime construction trade workers with these subcontractors.

And that's what we call all construction trade

workers. You're either exposed or you're not exposed. If you're not exposed, there's possible, it's likely you could have been monitored simply because you were in an area that potentially could have presented you to an external radiation where you put a dosimeter on.

So you would have been monitored. And if there was no exposure, you would be not exposed. And then, you could become a claimant., if you filed. Obviously, if you're not exposed and you remote monitored, you could still become a claimant. If we go -- I'm getting a feedback. Okay.

If we look at the exposed category of all construction trade workers, you either monitored or not monitor, similarly with the non-exposed. And obviously, if you're exposed and monitored, those are the type of information we would gain an understanding of how well the monitoring practices were at the site.

There may be circumstances where you were exposed and not monitored. And in that case, we would be using the co exposure model to help apply those reconstruction efforts to account for the non-monitored workers there.

All right, so what did we find in this basic data accountability review? This is one of the charts from RPRT-0094. The white part is the all other claimants, which is everyone in 1972 through 1997 that filed claims.

Then we show with the blue what percentage or what number, the number of SRS claimants that are actual subcontractor construction trade workers of that. And you can see it's a small proportion in the early 70s and it builds up somewhere in the mid-'80s, and begins to slightly decline.

And really what you can take away from that is simply that's just the way that the monitoring philosophies and practices were. they used

subcontractor trade workers at different periods of time and at different frequency.

So it's just to give you a big picture view of, that we do have data associated with subcontractor trade workers covering the entire time period that we're claimants.

Member Lockey: John, Jim Lockey. Can I ask a question about that slide? Just as -- just as --

Dr. Cardarelli: Yes.

Member Lockey: So what all other claimants are contractors, right? Prime contractors and subcontractors together?

Dr. Cardarelli: Yes. They could be, they could also be non-construction trade workers. These are all claims.

Member Lockey: It's all claimants from the facility, whether construction, subcontractor, or prime contractor, or anybody else?

Dr. Cardarelli: Correct.

Member Lockey: Okay.

Dr. Cardarelli: So in 1972, there was just under 2,000 claimant. And then, there was around 100, subcontractor construction trade workers in that particular population. It's very straightforward.

Now, if we wanted to just look at subcontractor monitoring within the claimant population, we had somewhere on the order of almost 6,100 total SRS claimants throughout this time period. Of that around 900, or 15 percent were subcontractor construction trade workers.

And most, if not all, of the job titles of the subcontractor construction trades are represented. So we are missing a particular occupations, which is a key factor in understanding whether or not, you know, do we need to evaluate occupations that were

not monitored.

And here, we're showing you that just about every occupation had some monitoring associated with or are in the claimant database. So we've looked at those who were externally monitored, because you would receive a dosimeter if you have any potential of going into a radiological area.

And then, we looked at those with internal monitoring, and we broke them up, basically, on tritium bioassay, non-tritium, which would be the plutonium, uranium, and fission products, actinides things of that nature.

And then, whether or not you had any hope on counting data because that's another way we can characterize your potential for internal exposure.

Member Lockey: And before you leave that slide, one other question. That 6,097 that represents contractors and subcontractors only, right?

Dr. Cardarelli: Which cell?

Member Lockey: At the top 6,097 total SCR claimants?

Dr. Cardarelli: Yes, this is the entire claimant database that was evaluated between '72 and '97.

Member Lockey: Is that? No. That wasn't my question.

Dr. Cardarelli: I'm sorry.

Member Lockey: Does it, is it represented just to contractors and subcontractors?

Dr. Cardarelli: Roger, can you give clarity to that? Or Tim?

Mr. Halsey: Yes, it is all contractors and subcontractors. Any worker who worked at Savannah River during those years and made a claim,

regardless of who they work for, or what their job was.

Member Lockey: Who's a contractor or subcontractor, correct?

Dr. Taulbee: It is, yes.

Member Lockey: Because it doesn't represent the whole population from the previous slide. It doesn't to that. So let's --

Mr. Halsey: I'm sorry, who would be a contractor? It represents everybody. The previous slide is individuals per year. So it's many people working multiple years.

Dr. Taulbee: Yes, if I can explain that a little more, Dr. Lockey. What you're seeing in this particular slide is that some people worked in every year. Okay, so they work '72 through 1982. And so they will be counted in each one of those bars. When you go to the next slide, John, this is, 6,097 is the total unique SRS claimants over that large span.

Member Lockey: Okay, okay. So that really represents the individual claimants over that span representing the whole population.

Dr. Taulbee: That is correct.

Member Lockey: Okay. Thank you.

Chair Clawson: Hello. This is Brad. Do we have one showing all the people that don't have data for too?

Dr. Taulbee: We don't have that depicted. But I mean, as far as the total number of workers on site that were externally monitored, that could be developed. But we don't have that readily available.

We only looked at -- the purpose of RPRT-0094 was to look at the claimant database. Those records do exist, but you'd have to go back and look at all of the population of monitored workers.

Chair Clawson: Well, the reason why I'm saying this is, you're showing we've got 6,097 individuals over this time period, and 886 of them are subcontractors. And so, that really looks good. But it also does not bring up to us how many people we don't have squat for.

And then, we come down here to the bottom. And I'd like to see, we just got tritium there. What about plutonium? What about cesium, strontium? What about any of the other ones? We do not -- all we see is tritium.

Dr. Taulbee: Well, we combine the, all of the others into the non-tritium bioassay. So we summed them together. And John will get to that in just while.

Chair Clawson: Okay, maybe -- okay, appreciate that. I'll turn it back over to you, John.

Dr. Cardarelli: No problem. I'm glad we're having that discussion here.

Member Lockey: Hey, Brad, Jim Lockey. It's okay. Because as we go these slides it's easier for me to ask questions when the slides up. If that's okay with you?

Chair Clawson: What's that? I couldn't hear you Lockey?

Member Lockey: Brad, it's easier for me to ask a question about a slide when it's on the screen rather than going back in time. If that's okay.

Chair Clawson: I understand that. And I agree with you fully. And we do have crayons for you to be able to help. Lockey, I'm joking.

Member Lockey: I understand. You have to understand Brad, I'm hard of hearing, and then, I remembered you from Idaho, and I thought maybe it has something to do with it. So I wasn't sure.

Chair Clawson: Yes. Okay, thanks. Go ahead, John. I'm sorry.

Dr. Cardarelli: No problem. So a lot of this, I think it's very good to ask these clarifying questions because it can get very confusing, especially when we start talking about percentages, and what those mean. And so I invite those type of clarifying questions here.

So the focus of the NOCTS data evaluation, we looked at the extra monitored subcontractor construction trade workers, obviously, because if you went in any radiation area, you had a radiation badge.

But that doesn't necessarily mean that all extra monitoring, required internal monitoring. There were many times people would have been in an environment where it, just internal monitoring was not a potential exposure, nor required by any of the defense in-depth monitoring criteria.

And what I mean by that is, there would have been no air monitoring, surface contamination monitoring, incident monitoring things of that nature, which would require or trigger a special bioassay or even require routine bioassays.

So the benefit of this analysis was we were looking at all areas. External radiation covers pretty much the entire site. Something like 35 areas represents data used in our dose reconstruction efforts. And we conducted a simplistic internal analysis.

This was just to basically gain an understanding of what data we have on existing claimants that were potentially internally exposed. So why did we do this simple approach? And what I mean by this simple is how and why we combined all of the actinides or what we call them non-trading exposed workers.

Simply because there are areas at the site where you could be potentially exposed, say to plutonium, but may never have been exposed to things like tritium

or fission products. So, and this would be subcontractors in reactor areas, where they would likely didn't need plutonium, but they needed tritium and vision products.

So another example would be subcontractors and plutonium areas that didn't need tritium or monitoring. So when you see something on the order of 20 percent or five percent, or even 60 percent of the workers were monitored, if you take the 60 percent, that doesn't imply that the other 40 percent should have been monitored, and we're not.

It just means that 60 percent of those who were likely exposed in that particular area were monitored. It doesn't mean we missed 40 percent. So I think that's an important clarifying comment when we look at these kind of statistics moving forward.

And likewise, subcontractors in tritium areas didn't need plutonium or fission product monitoring. So, you know, we've got to be careful when we start talking about these percentages.

Ask questions so we can clarify exactly what those mean. And so, we're asking ourselves this fundamental question. Are subcontractors sufficiently represented or bounded in the co-exposure modeling? If they are, then we can move forward with our co-exposure modeling as part of those reconstruction effort.

And I keep, want to emphasize right now the current co exposure model is all construction trade workers combined together. That would be the primes and the subs into one co exposure model. Later on -- go ahead.

Chair Clawson: John, I have a question. And while we're here, because it was a question at the -- it's been a question throughout this process. And after spending days on these papers, it remains a question for me. What about americium? Why do we have such

deficient data in americium? What's the explanation for that?

Dr. Taulbee: This is Tim, if I could interject an answer that for you, John.

Dr. Cardarelli: Please do.

Dr. Taulbee: Okay. Americium, during the production era, americium was really a byproduct in a sense of the plutonium. Plutonium and tritium were the two main products from Savannah River.

And so, when you're producing plutonium, fresh plutonium has very low americium content. So they were really controlling more for the plutonium than the tritium, or more for plutonium and tritium than they were for other radio nuclides.

If you saw plutonium, then, you might do for further follow up on americium. But the biggest trigger would be the plutonium in the HP line, and FB lines, JB lines, all of the plutonium processing lines in the canyon areas

Simultaneous, there was small amounts of research going on in separation of americium as part of the californium production processes. These were done in three areas at the site, as opposed to the major operations that were going on in the canyons.

So these were very small. They were in, 773A, was, contains two of the areas. F wing was the primary one. Where those areas were, americium would be separated from plutonium. So plutonium could not be an indicator then.

The other areas would be MPPF, the multipurpose processing facility, which was at the tail end of F Canyon. And in that particular operation, operated up until around 1980 - 1981, and then went into standby type of mode.

So this is why you don't see a lot of americium

monitoring. Because it was really isolated to three areas. And that's why you're seeing such a limited amount of americium data.

Member Lockey: So Tim, let me, so I understand what you just said. In 773A, in the two areas there, it would have been appropriate to monitor for americium as a separate radio nuclide in those two facilities, is that correct?

Dr. Taulbee: That is correct.

Member Lockey: You cannot use plutonium as a surrogate?

Dr. Taulbee: You could not in those areas where the separations were being conducted, that is correct.

Member Lockey: Okay. So in, where plutonium was. What about in the other areas? Would you use plutonium as a surrogate for americium?

Dr. Taulbee: Yes, you could, you certainly could because of the, it takes time for the americium to build in. And in our TBDs, Technical Basis Documents, we assume things like five-year age plutonium or 10-year age plutonium to get that americium component.

And so in those other areas, we can come up with claimant favorable assumptions. Because the plutonium that's being fresh and being made is the dominant one and it hasn't aged for five to ten years that the workers are physically working with. So the americium component is very low compared to five-year and 10-year aged americium. It grows in over time.

Member Lockey: It grows in over time. So you're using the plutonium as a surrogate, then, is that true?

Dr. Taulbee: That is correct. Yes, sir.

Member Lockey: Okay. Thank you.

Chair Clawson: Tim, I've got a question though. I thought that they brought some plutonium back after it had been out there in a lot of the processes and stuff like that. And I thought they did research on some of that. And I thought we were having americium, and so forth, coming out of it.

Dr. Taulbee: I don't believe so, Brad. I'm trying to remember of any, where they would bring, you know, pits back to do anything. I don't believe that that was routinely done. It maybe a one off or two off in 773A. But I don't, I don't recall that.

Chair Clawson: This is some of the hockey pucks that come out of Rocky flats that had been there for a while. And they were looking at, my understanding, if I read the material right, it was looking at a lot more of the decay process that they were getting into.

And there's some classified stuff with that. And I just, I thought I remember reading that in Savannah River, but it could have been one of Rocky flats too. But I was under the impression that they had an americium issue with that.

Dr. Taulbee: I don't think so.

Chair Clawson: But that being said, we, it's okay. We'll won't go there. I thought there was some research that was done on that at Savannah River.

Member Lockey: So Tim, one or question. In 773A, A and B, in those two sections. What was the workforce there? What was the, how was it populated? With what? How many workers? what was the populate with what? How many workers?

Dr. Taulbee: Oh, this is coming off the top of my head. It would, the total number of workers would be, I believe, in the 400 to 500 range, maybe, 600, 700. But I'd have to go back to the external

dosimetry records to try and give you an exact number of the number of workers in that area.

Member Lockey: And they weren't construction workers, they were other workers, I take it, right?

Dr. Taulbee: That's correct. It was primarily researchers, operations, people working inside of the laboratory.

Member Lockey: No americium data on those workers?

Dr. Taulbee: Yes, sir, we do.

Member Lockey: Okay, thank you.

Dr. Taulbee: I believe Bob Barton has his hand up.

Chair Clawson: Yes, Bob?

Mr. Barton: Thank you, Jim. Yes. Just a follow up on Dr. Lockey's question, which just mentioned that we'd be using plutonium as a surrogate or indicator. That's not currently how it's constructed, though.

I mean, you have an americium co-worker model. So we're not using a radio or plutonium bioassay, currently. Is that NIOSH's plan potentially moving forward?

Dr. Taulbee: Current dose reconstructions, if we've identified somebody is in, working in the F area or the canyon areas, and they don't have americium monitoring, we do assume a five-year age or a 10-year age.

Correct me, if I'm wrong, somebody from the ORAU Team. But that is what we assume, currently, for those workers, that they are -- for the americium component. Okay? If they've got plutonium monitoring in those areas in those areas.

Mr. Barton: So you wouldn't apply the exposure, then?

Dr. Taulbee: Not currently, no.

Mr. Barton: Okay.

Dr. Taulbee: I guess, just to clarify just a little bit, I mean, if we've got indication, they worked at MPPF with separated americium, or if they worked in 773A in the F wing, you know, from their caddy or from other indicators, then, yes, we would apply the co-exposure model. Okay? For those three areas where americium was separated, and plutonium is not a good indicator. Okay?

Mr. Barton: So the co-exposure model that has been developed, thus far, for americium, that's only going to be applied by evidence that they were in one of those three separations areas?

Dr. Taulbee: That's correct.

Mr. Barton: Okay.

Dr. Cardarelli: Okay. Thanks, Tim. In RPRT-0094, we have on the order of 886 subcontractors with their detailed work histories that are kind of color coded. This is just an example of -- if we go on the left you see the craft. We have three electricians, an insulator and a labor.

The second column is the internal monitoring evaluation. And that's really driven by the color coding. So green would indicate that they did have internal monitoring. That could be for plutonium, uranium, active tritium, you name it.

The red would mean that there is no information that they were monitored for internal exposures. And the yellow would simply be that they were employed sometime after 1997 and we may not have information on that.

So if we looked at 1984, the top electrician, the end, as you see in the legend, would be a non-tritium urine bioassay. Now, that could be plutonium, uranium,

fission products, or any of the actinides.

And that's just basically to give us an indication that some workers, this worker was monitored for some internal radio nuclide that was not tritium. But you can see in 1981, they were monitored for extra radiation and a tritium. And then, in '82, they were not, they had a non-tritium urine bioassay.

And as you go across, the ND, would be there's no data because they were not employed that year, or the NEI would be, simply is not employed. There's no external or internal monitoring there. I'm sorry, they were employed, but they had no external or internal monitoring.

So we looked at 880, 800 and I think 86 subcontractors. It's in the back of the report. And it was a quick visual way of indicating. If you see a lot of green, there was a lot of internal monitoring. If you see a lot of red, there was no internal monitoring, but there was potentially external.

And it's just a visual way for us to quickly gain a big picture of a very large group of subcontractor trades. So we think that was a useful tool and I wanted to present this here in this presentation. It was also described by Tim in the last presentation he gave.

Moving on, one of the key takeaway points here, is this is looking at the radiation work permits, which is an area of a lot of interest. And this one is associated with plutonium analyses only. And that's the purple bars from '72 through 1998.

And you'll notice that the purple bars are missing in the mid-1970s. And again, in the 1989 to 1990 period, largely because we either don't have any job plan data, we couldn't find it or doesn't exist. And there's no radiation work permit data.

However, if you look at the green bars, that's not this data. And we are showing that we can fill in these missing gaps using claimant data and the bioassay

data that they provide. So there's ways for us to fill this in.

And one key takeaway might be, if we had no radiation work permit across this entire period, we'd still have a tremendous amount of data to be used for co-exposure modeling, and dose reconstruction purposes. So it's a nice to have, but it's not required. Any comments or questions? Tim, I see your hand up. You're on mute.

Dr. Taulbee: Yes, sorry. I just wanted to emphasize that the 1980 to 1988 was not for the full site. That is just 773A. Okay? I just wanted to point that out to make sure everybody's clear of that.

The 1991 through 1998, purple bars are for the full site. Okay? Now, the NOCTS data is just globally in all. And Dr. Lockey and Brad, both of you went off mute. So I think you have questions.

Chair Clawson: Yes, I do. So in our co-exposure model, what does it require you guys to be able to provide for us to be able to say completeness. What are the requirements?

Dr. Taulbee: Okay. In the co-exposure implementation guide, it is do we have monitoring data that covers all of the potentially exposed job titles and the facilities that they could have worked in? Do we have evidence of that? And that's -- thank you, John, for going to that slide.

And this is where we looked at all of the workers that are currently claimants and do we see any missing crafts or trades? We don't. And that's what is shown right here. And so, that's, that's the key component here. Are we seeing that people are missing?

And if you recall the example I gave back in December, with the Nevada Test Site when they did, when we looked at that particular data, we found that only security guards and radiological technicians were monitored. And only a couple of crafts were

monitored. So there was missing people. Okay?

So that means that the data set was incomplete. We don't see that here when we look at the NOCTS data set. We're seeing all of the crafts being monitored here. And when we look at the areas that -- go back to that final slide there.

Dr. Cardarelli: Which one?

Dr. Taulbee: Actually, this one, and then, the next one will be fine. So you see all of the crafts off to the left. And we look at, what was there monitoring? Do they have internal? Do they have external monitoring? And we see that. That's the net appendix or our Attachment B of RPRT-0094.

And so, we're looking across the entire time, and we're seeing non-tritium bioassay, tritium bioassay. We're seeing external monitoring of this workforce. And we're also seeing gaps of employment here of times when they're not working. We know they're not working based upon their DOL history. And so there's no reason that there would be monitoring data there.

And so, we're seeing that. Now, if the whole thing or if everything was red here, where you see the external monitoring with no internal monitoring, that would be a significant issue that would speak to completeness. Okay? Does that make sense to you, Brad?

Chair Clawson: Okay. So that being said, I'm seeing electricians here, but I'm not seeing any other crafts. Did you just choose just the electricians and then labor?

Dr. Taulbee: No. That's just for the example here for the presentation. If you go to Attachment B of RPRT-0094, you'll see all 886 subcontractors. We've got them all listed there. Twenty six percent are more electricians, 22 percent are pipe fitters, 9 percent are laborers, etc. So you will see all of these crafts in that Attachment B of RPRT-0094

Chair Clawson: Okay. And then, if we go, John to the last slide there, you're telling -- right there. So there's no job plans or data from the '74 up to the '80. All we've got is 773A?

Dr. Taulbee:: Actually, from the '74 to 1980, we don't even have the data from, or '75 through 1979, we don't even have job plans for 773A. That we just had no information, whatsoever, if you recall from RPRT-0092.

So we couldn't do anything. We can't compare anything. But there is NOCTS data. There are some trades, subcontractor construction trades that are monitored. But if you look, there's very few actually monitored during that time period.

Chair Clawson: Somebody was talking. Go ahead.

Dr. Taulbee: What you'll see is that there's much, there's many, many less, that's a terrible English, sorry. There are less subcontractor construction trades in those years of '77, '78, and '79. Especially, compared to what we see in the 1980s and 1990s.

Member Lockey: Tim, Lockey.

Dr. Taulbee: Yes, sir.

Member Lockey: So, you know, throughout all these documents, the other question that always comes to my mind, and I think SC&A have raised it, or pointed it out in different ways. Is that, this period of time, particularly from '77 to '79, is problematic.

The data that I'm looking, here, is, this is non tritium data, correct?

Dr. Taulbee: That is correct.

Member Lockey: Okay. So do you feel that in that timeframe, in the '74, '75 up to '79 timeframe, you have adequate data there, in that timeframe do a co-exposure model?

Dr. Taulbee: We do because we've combined the co exposure model for all construction trades, and we have a lot of maintenance and E&I technician, people who were doing work that were DuPont construction in that time period that we feel we can bound the doses in that time period for those particular workers.

That's the basis as to why. If you separate out to where we can't combine the DuPont construction trades and the subcontractors, then no, I would agree with you that we do not have sufficient data here.

Chair Clawson: Hey, Tim, when you -- and no disrespect, but, you know, so many times I've heard we have sufficient data. What are we talking number wise? Because we've come to find out sometimes the sufficient data may be 20, 20 points or something like that, which, for a site like this, I don't feel as substantial.

Dr. Taulbee: Well, there's -- I'm having difficulty answering your question here Brad. Because there isn't a definitive number. Okay? As to what we use from that standpoint. We try to use more than 30 for the model.

But if you have a random sample that is truly random, then, you can do it on less. You can get the same results. So there isn't a definitive number from that standpoint. We've used the NOCTS data because it was the most convenient to use without having to go through a large amount of data coding.

We know there's more data available. If you looked at the slides that I presented back in December, where we're presenting the total number of plutonium bioassay, we know there's, there's more data than what we used in our co-exposure model that is available that could be coded and used from that standpoint.

And when we did the comparisons, what we found

when we added more data, the numbers didn't change significantly. So that's, that's why we feel I mean, good about those areas.

Chair Clawson: Well, let me throw something out that kind of bothers me because you can go into DOL and look at the occupational radiation dose for 1986 for Savannah River, and it says 18,936 people.

Dr. Taulbee: What do you? I'm sorry. What are you looking at?

Chair Clawson: DOL Occupation Exposure Report For 1986. And if you go down and look at it, individuals over there, Savannah River, you look and there's 18,936 people.

Dr. Taulbee: Okay.

Chair Clawson: So, you know, that's a fair amount of people too. And granted some, you know, that's just the ones that are being monitored. We don't have that.

Dr. Taulbee: John, if you could go up a few slides to your external monitoring one, that one. And what you'll see there in 1986, Brad, to give perspective here, is that we have, that's near the peak.

The actual peak is around 1990. But we have about 2,700 claimants in that time period. Okay? That's our claimant population. These are people who got cancer and filed a claim with us. Okay?

Chair Clawson: Right.

Dr. Taulbee: So that's where we feel this is the population that we're trying to estimate the doses from. And so, how many of those workers have monitoring data to estimate doses for those who did not have monitored? Okay?

Chair Clawson: Okay.

Dr. Cardarelli: So another key factor, though, I'll add

to the, from the Implementation Guide, is, it's just not the number of data that's available, it's, are we having those people most likely exposed being properly monitored?

Chair Clawson: Right.

Dr. Cardarelli: And, and that's a key factor in that. You can have 1,000. But if it's the wrong group of people, that would not be appropriate for conducting a co-exposure model. And we believe that the people most likely exposed through all of their monitoring practices were properly monitored and characterized, as you can see in the pie chart here.

So we don't feel like we're missing, folks. And we also feel like we're capturing those most likely exposed. And a subtlety, it's not critical, but it's important to understand that these are conservative numbers, especially, what you might see here.

Because we've excluded certain subcontractors who went on to become primary contractors. We wanted to keep the data set as pure as possible from -- so if you were a sub at one point and became a prime, you would not be included in this particular thing.

So it's a minor issue, but it just demonstrates that you know, that if we looked at in totality, the numbers would slightly increase here. So I thought I would add that clarification for what we consider to be completeness by the Implementation Guide. The number and those most likely exposed being properly monitored.

Chair Clawson: Okay.

Member Lockey: I have one more question. Go back to previous slide, would you? So let me, in 1978, what's that 5 percent or something? Ten percent, right? Had, you had NOCTS data on, right?

Dr. Taulbee: Yes.

Member Lockey: Okay. What's the denominator? What's the numbers there?

Dr. Taulbee: Okay. The denominator is the number of workers externally, number of subcontractors externally monitored. Okay, that's the denominator.

Member Lockey: And what is it?

Dr. Taulbee: Let me pull up the report, and I'll get you that number here.

Dr. Cardarelli: I think, Tim, on this one, this is the number of SRS claimants. And 1978 looks to be around, I don't know, 250.

Dr. Taulbee: I don't believe --

Mr. Halsey: If I can jump in. It's 254 in 1978. This is Roger Halsey.

Dr. Cardarelli: Yes.

Member Lockey: So, 254 claimants? And you have data on 10 percent of them? Is that right?

Dr. Taulbee: Yes.

Member Lockey: So go to, let's 1992. Give me that data.

Dr. Taulbee: Around 400.

Mr. Halsey: 434. And let's see, which internal monitoring? Oh, I'm sorry, 1992, you said?

Member Lockey: I'm sorry?

Mr. Halsey: 371. And with internal monitoring it would be 347.

Member Lockey: So it's 371. And you're --

Mr. Halsey: Wait a minute. I'm sorry. I'm giving you, I'm, I'm, I did all internal monitoring and I should have done with non-tritium bioassay and whole body

count.

Member Lockey: Yes.

Mr. Halsey: I apologize, here. Let me get to the right chart, apologize. Okay. It would be, 1992 is 348 with external monitoring. And then --

Dr. Cardarelli: NOCTS data is close to 100 percent. It's over 90 percent.

Dr. Taulbee: Yes, 330. Is that right? Yes, 330, whole body count or non-tritium bioassay for 1992, comes out to 95 percent.

Member Lockey: So I guess my question is, I think the data from 1981, particularly, is very rigorous. We're good. I see that. But somehow, when, in 1979, you have 10 percent out of 254. That, you think you can do co-worker reconstruction with that type of data, in that timeframe?

Dr. Taulbee: Again, it depends upon if the Work Group and the Board is okay or accepting of us combining all of the construction trades workers together.

Because we have a large number of maintenance and electronics instrumentation, control techniques, technicians, basically electricians that did a large fraction of the work that subcontractors did later in the 1980s and 90s, in that time period.

If we combine the two together, we have a lot more construction trades worker monitoring data. When you separate out the subcontractors from it, yes, I agree with you that we do not have, I mean, 10 percent monitoring would not be sufficient from that standpoint.

So, you know, if we're constrained where we can't combine those two, the DuPont construction and the subcontractor construction trades groups together, then yes, the subcontractors were not monitored to

the degree that we could develop a co-exposure model in the 1970s.

Member Lockey: During that timeframe. Okay. Yes, and I think having those percentages is very informative for me anyway. Because my look at the 1982, you know, 330 out of 348 is, you know, I would publish that any paper in the country. But I would have problems with 10 out of 254 as been represented during that timeframe.

Chair Clawson: But that being said, this is where we get into the difference between the primes and the subcontractors because the primes, we, you've heard the term turn and burn.

The subcontractors were coming in, they were being utilized burnout and sent off. It's especially during this time period. So now we've just taken NOCTS, which I don't think is representative of the subcontractors. And we've just kind of fluffed it up.

Dr. Taulbee: If I could clarify.

Chair Clawson: But let me, let me finish, Tim, on this one. The thing is, and it is proven that we were running them in there and running them out. It was a turn and burn experience for Savannah River.

That's what the construction trades were. And a lot of them going back and forth. I think we're just putting a bunch of fluff on myself, but. Because I think we're covering up what the real issue, what the real problem was. Go ahead, Tim.

Dr. Taulbee: Just one minor point of clarification here. RPRT-0094 is just subcontractors. So the data that you see in the Table 5-4 on page 17 is just the subcontractor construction trades.

And that, and where Dr. Lockey, you're talking in '77, '78, '79, where we have 5 percent monitoring and '77, '78 and 11 percent in 1979, those are just the subcontractors. When you get to the 1992, where

we're talking the 95 percent monitoring that Dr. Lockey was pointing out, those are again, just the subcontractors.

That particular table is not adding in the DuPont, CTWs. Okay? What makes us think that that five and 11 percent, in the 1970s is okay is because we've later added in the DuPont CTWs. Okay? I just don't want to get those two confused there. That table --

Member Lockey: Well, it's pretty easy to be confused, because as we go through this, we're from one side to the other side. And then, this year, we're using this part of it. And then, we're going to be able to use that. But --

Chair Clawson: And this table's just subcontractors I'm looking at, right?

Dr. Taulbee: That is correct, sir. Table 5-4.

Chair Clawson: But the, you know, the question is, remains, do we have enough data to say that subcontractors are similar to the prime contractors? Right? And when I look at this table, at least during that timeframe, it gives me heartaches. Okay?

Dr. Taulbee: I understand.

Chair Clawson: Okay.

Dr. Cardarelli: I think we'll have a little bit more detailed data and the follow up bootstrap analysis. But are we okay with this particular to move on?

Dr. Taulbee: Yes. I think we're ready for your conclusions.

Chair Clawson: Yes, I'm sorry. Yes, we are. Yes, I'm good.

Dr. Cardarelli: No problem. Okay. So again, this was an evaluation of kind of the overall data as presented in NOCTS. And in the 1990s, we observed the high percentage of subcontractors were monitored and

would be sufficiently represented in a co-exposure model.

And the '80s, slightly less but moderate percentage, and they were monitored and would still be sufficiently representative in a co-exposure model. In the 70s, Dr. Lockey, which you mentioned, initially, there was a moderate percentage of subcontractor trades that were monitored for internal exposure.

However, there's a market decrease, as you pointed out in the late 70s, followed by then the surge of monitoring in the 1980s. This pattern was observed in limited, also, radiation work permit evaluation, as we were just talking about the purple and the green bars chart.

So with this information, the overall trend that we have observed in these data is that the subcontractor construction trade workers who were monitored, were represented at least as well as other SRS workers.

The completeness of the data is more than adequate by our definition and the Implementation Guide for dose reconstruction purposes and for the basis of the SRS co-exposure model.

Now, remember that co-exposure model is a combined co exposure model between prime CTWs and sub CTWs. So that concludes this presentation. I just briefly wanted to for discussion remind folks that there are extra slides which kind of give a history of the site, some of the radiological control measures when they were implemented in time.

How we did some full body count. And there's some additional charts that were in RPRT-0094, which I did not go over here. But if we do get into those discussions, these may be proven to be helpful. So with that, I will turn it back over to you to Mr. Clawson. For further discussion,

Member Lockey: John, Jim Lockey. Go to your

conclusions slide. I have just one question. Who is other SR workers here? What's your definition?

Dr. Cardarelli: That would be the, in my, -- it's the DuPont prime construction trade workers.

Member Lockey: All right. So this is, other SR workers, here, is prime construction workers. Right?

Dr. Cardarelli: Yes.

Member Lockey: Okay.

Dr. Cardarelli: It could, frankly, it could also be for non-construction trade. It's, but the overall trends were similar.

Member Lockey: Okay. And I think slide 21, go to slide 21. Is this, is greater than 60 percent of construction trade workers had external monitoring data, right?

Dr. Cardarelli: Yes.

Member Lockey: Right. And so, if they did not have extra monitoring data, that would indicate either they should have been monitored, and they weren't, or there was no indication for them to be monitored?

Dr. Cardarelli: Yes. I would interpret that is, if you were not safe, it's 60 percent. That doesn't mean the 40 percent were not monitored. It means that they probably were not going into radiological area, which would require them to have external monitoring.

So they would not have been exposed, rather than be potentially exposed and not monitored. That's a clarification, I think needs to be understood with the way to look at this. We're not missing 40 percent.

Dr. Taulbee: If I could state that just a little different way. One of the problems with the subcontractors coming in is, they would be doing new construction, as well. So a lot of our metrics were based upon those who are externally monitored. It was required if

they're going into any radiological area that they would be wearing a film badge or a TLD.

And so, what you're seeing here is the people who did not get any external monitoring, likely, were working on new construction at the plant and not exposed to either external or internal.

Member Lockey: Okay. So what you had postulated to us, what you had put in previous slides to us, is that everybody, not everybody had to be monitored because they weren't job tasked with exposure.

And a certain percentage of people that needed to be monitored, didn't have, did not have not dosimetry because it was an indicated based on the monitoring data. Correct?

Dr. Taulbee: Can you say that last part one more time?

Member Lockey: I think what you've been saying to us in previous presentations was not all workers went a job tasks that needed to be monitored. In other words, they were doing something that monitoring was not required. Other --

Another segment of workers would be in a job tasks that needed to be monitored, but the monitoring data was such they did not have to have in total dosimetry performed. Correct?

Dr. Taulbee: That is correct. Yes, sir.

Member Lockey: Is that what your next slide is inferring in relationship to tritium?

Dr. Cardarelli: Yes, sir.

Dr. Taulbee: That's exactly right. Because in this particular case, this would be people who were externally monitored and monitored for tritium exposure. If they worked, in say, the plutonium areas, there was no potential for tritium exposure.

Okay?

The tritium exposures were limited to the five reactors, as well as, the tritium facilities. So if you worked in the, if a subcontractor worked in M Area where uranium was, they were not exposed to tritium. If they worked on the HB lines or JB lines, they were not exposed to tritium.

So there's a difference by radio nuclide as to where they worked. And if you go up, this goes back to I think, John, your slide 4 or 5 where we gave a broke -- down one, shoot up. I'm sorry. I'm looking for the one where you have the breakdown of who should be monitored and where. There, all right, up one, there.

And here's where we gave that breakdown. I mean, SRS is a very large site. There's 312 or 310 square miles. So if you worked in the reactor areas, you would need to be monitored, potentially need to be monitored for tritium and fission products. If you worked -- but not for plutonium.

If you worked in the plutonium areas, again, you would not need to be monitored for tritium. So that's why taking these percentages doesn't really, is not definitive. Okay?

Not everybody who worked on site was exposed to plutonium. Not every subcontractor is exposed to plutonium. It depended upon where they worked. Not everybody on site was exposed to tritium. It dependent on where they work.

Member Lockey: Thank you.

Dr. Taulbee: Okay.

Chair Clawson: Okay. But now we get back to what we got into with some CATI reports where you separate people out because they weren't monitors because they were doing new construction.

So they could do new construction from 8 o'clock in

the morning till 4 o'clock in the afternoon. After 4 o'clock, they can go to work at another place under different overtime and different contractor.

Dr. Taulbee: Yes, sir.

Chair Clawson: So this is where you get into all of the problems with saying, well, they didn't have monitoring because they didn't need it. But there was nothing stopping them on their over times. And it happened continuously to go do a hot job after that. So just want everybody to keep in mind that, too.

Dr. Taulbee: Absolutely, Brad. And that's part of why we did the global analysis that you see with the color codes of Attachment B. To look at it on an annual basis of how they might have moved around. And did they have any internal monitoring from that standpoint? That's why we took a larger level.

Court Reporter: This is the Court Reporter. I'm sorry to intrude. Phone participant with number ending 222, I'd ask you to mute your line.

Chair Clawson: I appreciate that. That's nice. Okay, anything else that you'd like to put out there, John, or Tim? Okay. Joe or Bob, I guess it's up to you now.

Mr. Fitzgerald: Okay. Thanks, Brad. This is Joe Fitzgerald. And just to recap from last time, the Workgroup SC&A did consider NIOSH's proposed weight of evidence approach as a means to resolve the question of bioassay data completeness and representing this for subcontractors that run off bioassays.

That was the sort of tasking we were given from the last meeting of actually the full Board. And the weighted evidence approach for those who are just getting back into this, is it combines the claimant bioassay data NOCTS, which we just heard, and logbook plutonium data.

All of which would complement the analysis in RPRT-

0092, which was the subject of the last Workgroup session, which evaluates data completeness, based on bioassays related to work permits. So again, our charge was to look at these other two aspects that were being brought to the table as of last December.

I just want to preface what we're going to go through in terms of the fact you'll hear a lot of information, analyses and conclusions, I think, regarding bioassay data for subcontractors, SRS. A lot of what we just went through.

But I think what we need to ask ourselves throughout all of this is whether that data, and it's considerable, Savannah River is a big site with a long history. Whether that data is relevant as a means to answer the question that was posed by the Advisory Board back in 2017, over four years ago.

Which is whether NIOSH can: 1) demonstrate whether the pronounced gaps in job-specific bioassay data in 1997 existed prior to that year, very basic question; and 2) whether that data is available, whether data is available that can represent what may be missing from that data set.

And that's pretty much what we're talking about today. But I want to remind the Work Group and whoever else is listening in that going back to the last Workgroup meeting, SC&A concluded from our review of RPRT-0092 that NIOSH is unable to demonstrate from its analysis, as presented in that report that the data gaps in 1997 did not exist in prior years.

And from our review, was unable to show that any such gaps could be bounded or represented by what data was discussed or analyzed in that record. So in a sense, today, we continue to address that, this latter question, the second question about what data is available.

And, again, we'll walk through what we have

identified as not so much issues with NOCTS. Because again, we're very familiar with NOCTS. NOCTS was one of the databases that NIOSH considered from the get-go as far as looking at subcontracted completeness, along with the Center of Protect Workers' Rights data as a starting point.

And decided not to pursue either one at that time. So we're familiar with this as an option. But we're going to kind of discuss why we think that's a problem in terms of application. Okay? That's the distinction.

And also, before we walk through all that, I wanted to provide in a slide or two a little bit more context by what we mean by job-specific, and routine bioassays as they were applied to Savannah River during the timeframe we're talking about.

And, you know, you have heard us before, and you'll probably continue to hear us constantly distinguishing question. The application of what's called routine bioassay data as a means to represent jobs specific bioassay data.

And again, for the reason that they were not collected did on the same basis. And were likely based on different radio nuclide source terms. So this first slide -- thank you, whoever did that.

Really, I think puts in contrast, in a very basic way. These are the words of Westinghouse Savannah River, from the 1990s in terms of their policies and procedures. And again, I think it's important to realize that there is a distinction.

That job-specific bioassay program was designed to collect bioassay samples from workers whose routine bioassay program does not include some or all of nuclides present at the worksite and who are not on a routine program.

And to go further, as Westinghouse defined it, it's very important realize that being on a routine sampling program does not automatically cover the

bioassay sampling requirements specified on the RWP or requested through the job plans.

And that routine sampling programs that may not be appropriate for work involving non-routine mixes or concentrations of reactive material.

Now, I think, again, it's important realize that the stimulus for doing a lot of this retrospective analysis of data in the 70s, 80s, and 90s was the very, was the finding that a preponderance, 79 percent at least in 1997, of job-specific bioassays were missing.

And the question of whether that circumstance preexisting 1997 and would, in fact, impair a representative co exposure model for those prior years. There is very, again, a very basic question posed by the Advisory Board back four years ago.

So I think, again, we have to kind of remind ourselves, though, that when we try to apply routine bioassay data to describe or to bound job-specific data, we have to be very careful because they're two different things. Next slide, please.

So the key question, the thesis, if you may, that we've been working against is that, again, the question is completeness of job-specific bioassay data, and whether there's any way to bound or represent what may be missing in that database for the years that we're talking about.

That transient short-term subcontractors, we did talk about that a bit. And have talked about it a lot in the past, are certainly affected by the job-specific bioassay program, but they're not the sole group affected.

Obviously, a number of different worker categories were under our RWPs and under job plans that would have been required to leave a job-specific bioassay.

And as we, I think, Brad mentioned, certainly, we continue to question the, the ability or the

justification for subsuming subcontractors that may have been exposed to non-routine mixes, non-routine source terms, and non-routine radiological exposure circumstances into the general CTW database.

So, again, and we've always returned to this basic question, did deficiencies exist in the completeness of this job-specific bioassay program before 1997 that would preclude formulation of a representative co-exposure model? Again, consistent with the co-exposure implementation guide?

And that is the question that continues to be before us. So again, I just wanted to set that preface. And I will, I guess, turn to Bob Barton. I think Bob is going to walk us through our actual review of RPRT-0094.

Mr. Barton: Thank you, Joe. Hopefully, everybody can hear me okay. And that's a really a very good summary of what we think are is the key issue.

Member Lockey: Wait a second. Joe, can you go back to the previous slide, please? I have a couple of questions here. The second, main question is, not so group. What do you mean by not so group? What groups are you talking about?

Mr. Fitzgerald: Well, RWPs, not to mention job plans during the DuPont era, were required when you had non-routine source terms or non-routine mixes of nuclides or particular work that was relatively unique and required an RWP or a job plan that would describe the actual, you know, work and how it would be done, and what specific protections might be required.

And that was not exclusively applied to subcontractors. Any worker, operator, whatever, who was involved in that kind of work, that would entail a job plan or RWP would be entailed to get a job-specific bioassay.

So we're saying that, you know, the circumstance in

1997, which was the trigger for a lot of scrutiny, was the finding that, you know, 79 percent of those job-specific bioassays were lacking for the year 1997.

And that's where the question arose, what about the prior years? How many workers would be, I mean, what was the data gap that may have existed in those prior years that would pose a problem?

Member Lockey: So I guess what I'm hearing you say is, the inference there is that, is what is applying -- what you are applying to subcontractors may have actually applied to prime contractors, as well as, all other workers at Savannah River. Is that correct?

Mr. Fitzgerald: Well, that's always been the case. I think subcontractors, by virtue of their work are most heavily affected, because, again, they were brought in to do specific work. And then, a lot of his work was transient, and particularly, you know, in some cases involve higher exposure. So that group was heavily influenced.

But I think we have always pointed out that it wasn't just by virtue of the fact that permits didn't not only, you know, only apply to subcontractors. That obviously, others would have been implicated in terms of job-specific bioassays.

Member Lockey: Okay. And one other question. There was in the 1997 review, there was 79 percent non-compliance, there was 21 percent compliance. Correct?

Mr. Fitzgerald: That was the finding, initial finding by Westinghouse, yes.

Member Lockey: In that 21 percent, where there was 21 percent compliance, is there any indication that the data generated in that 21 percent was any way different than the general overall data, monitoring data, or bio-exposure data? Was --

Mr. Fitzgerald: Well, I think it as has been made,

clear in the past, Westinghouse, went back and actually reviewed all these records and re-sampled all the workers that had missed, the 79 percent that had missed submitting bioassay samples.

And all of the workers showed no uptakes or intakes. So that was a means to validate that even though the bioassays weren't collected, there was no exposure situation, or exposure issue involved with those lack of missing bioassays. So the riding question wasn't so much that in 1997, whether those missing bioassays or bioassays in general involved exposures.

It was whether before then, if because of the proportion missing, whether before then that would posed an issue of the data completeness for that category of bioassays that would make it difficult, if not impossible, do a co exposure model.

And that was the premise behind the surveys and reviews that started in 2017. Is to actually get a handle on that particular question. You know, what does that gap pre-exist 1997? If so, to what extent?

And is there any way that one could mitigate against that missing data, if so. And that was where RPRT-0092 was coming from. Essentially to look at that particular question.

Member Lockey: I remember that. I remember you saying that before. And I and when they went back, the Westinghouse went back and looked, there was not divergence in the data, the data was, was reflective of what was going on at the time. All right, I appreciate that.

Member Ziemer: Joe, this is Paul Ziemer. Could I ask a follow up question here? For clarity, in your mind is the absence of a special work permit or job-specific bioassay permit in itself sufficient to assume that the data itself for bioassays is also absent? I mean, isn't it quite possible that even though we don't have the

work permit, the data is still there?

Mr. Fitzgerald: Yes, exactly. And that was a central question. And I think you're talking about what we've been calling linkage. A linkage between a permit or job plan and the actual bioassay that would come from that.

And that was something that both NIOSH and SC&A looked at quite in detail, because that's really important. The question is, they certainly performed. They certainly wrote up job plans and RWPs for the source terms that were unique or involved mixtures that were unique. That was certainly what was entailed.

But could you actually link the subsequent job-specific bioassay, to those permits or job plans? And if you couldn't, did it really matter? And certainly, our analysis says that, no, actually.

Certainly, during the DuPont era you couldn't link any job-specific bioassays to the actual job plans. They didn't have our RWPs at Savannah River until the '90s. But in the '70s and '80s, with the job plans, you know, there certainly would be job-specific bioassays.

But there wasn't any linkage in the sense that you could actually see the requirement laid out and actually find a job-specific bioassay that would be tied to that individual, that particular exposure.

And that was a basis for our concern that if you, in fact, were experiencing these gaps as late as 1997, how sure could you be that you actually were capturing this data from these job plan based exposures?

And even into the '90s, where you instituted an RWP program, which I might add is fairly late in the game to be actually doing RWPS.

But even where the RWPs were put in place in the

'90s, given the fact that you were missing as many as 79 percent by 1997, how sure are you that in fact, there was a program that would actually collect, require collection? And actually, you know, review exposures for those individuals under our RWPs before, 1990 to 1996.

And that was, you know, not to complicate it too much. It was just a very basic question of data completeness that we've asked for every single site. If there's evidence that you're missing a fairly substantial percentage of a particular data category, in this case, job-specific bioassay.

How sure are you for the time period in question that you have that data? And if there's some question about its completeness, is there any way that you could bound or represent what may be missing?

And as I just went through in that prior slide, the problem I see is that by its very definition, RWP, Radiological Work Permits are written up for jobs, and you know, this definition is Savannah River's, right from Westinghouse's procedures and policies.

RWPs and permits are written up specifically for those jobs whose source terms, the very nuclides in question are unique. The mixtures are not ones you would come across in routine work.

So our concern is, you know, applying a database based on the normal or routine work that may be taking place without distinguishing that from the non-routine work, may not be appropriate. That it may not represent that kind of work, because that kind of work is unique, by definition.

So that's kind of where we're at as far as you know that premise. Now RPRT-0092, if we're able to identify sufficient work permits and job plans and show that job-specific bioassays could be linked to those permits.

And you had a representative database, and it was a

database of those job-specific bioassays. Then we probably would be finished with this because you would be able to characterize the kind of exposures and the data that was derived from these job plans and RWPs.

But to date, we cannot do that. Okay? We have to turn to, you know, not this. We have to turn to routine data to try to figure out how that might describe that which we do not have, which is the very specific job-specific bioassay data that came from these permits.

So that's kind of, in a nutshell, you know, what this is all about. We have nothing against the analysis of NOCTS data. I mean, I think everyone's familiar with NOCTS. But I think the application in this particular case is what we're concerned about.

Member Lockey: So Joe --

Member Ziemer: Just as a follow up, and I appreciate that clarification. I think one of the, sort of follow-ups, I think we kind of did this would be if there's a systematic absence of that data that correlates with systematic missing work permits, it ought to show up in the claimant files eventually.

As the claimants who show where they work through their CATI interviews and that sort of thing. Is there a great amount of missing and bioassay data amongst the worker group, inspection Work Groups? And I think the NOCTS data doesn't show that, does it?

Mr. Fitzgerald: Let me just comment. And maybe, Tim will say something. But I think the real problem you have is in terms of the management history and the worker non-response to the actual program.

In other words, this was brought up in a number of independent reviews, both by DOE, the Tiger Team, and the Westinghouse self-assessments that, you know, there was a system, the job plan system

during the DuPont era, and the RWP system during the Westinghouse era.

But it wasn't enforced. That they didn't manage it in a way which would compel or require workers to respond and to, to submit bioassay samples. Of course, this led to an enforcement action eventually that forced the overhaul of it.

But I would question whether you would have a lot of workers that even realized that they had a system or an obligation on job-specific bioassays because again, there wasn't a management system that made it clear that they were required to submit.

And I would be surprised if very many of the workers would, in a CATI, or in a submission would acknowledge, or be even aware that they would have had a job-specific bioassay, or were obliged to submit a job-specific bioassay.

That system of account of accountable bioassays did not get put in place until the mid '90s and wasn't enforced until 1998. And that's pretty late in the game to have an enforceable radiological work permit system that required and enforced job-specific bioassays.

And I think that's been the undercurrent of why this has become quite a nettlesome issue. Because really, you know, that's something that you would expect to see in a mature radiological program, which is RWPs with required bioassays specified in a system that would ensure that those bioassays were submitted and analyzed. That did not happen until 1998.

Member Lockey: Joe, I have one other question. Joe, based on the on the existing RWPs where there is data that exists, when you went back and looked at that existing data, was there any indication that that data was not representative of the cohort in general?

Mr. Fitzgerald: I think we looked at the data from DuPont, the data from Westinghouse and the RWPs

were not implementing at Westinghouse until '93, '94. In other words, that did not become a working program until '93, '94.

And we were looking at whether or not you could look at the completeness of the job-specific bioassays at that point. But to answer your question, I think it's clear that there was a system where the RWPs actually stipulated what bioassay would be required.

And we could identify job-specific bioassays in the database. And certainly you had a lot more of those bioassays. So the answer your question, circumstances changed after they implemented RWPs in '94.

The question remains, though, whether the compliance was adequate or not simply because of that, finding in '97. So there's several years there where it's not clear whether even though they had a policy in place, whether in fact the workers were honoring it, and the management was enforcing it.

So that part of it, I think we reserve judgment in terms of, of whether you could, whether you could actually identify sufficient data points.

But we're pretty clear that during the DuPont era, where you had job plans that were not, did not have clear job-specific bioassays stipulated and you could not find or link job-specific bioassays to those job plans, which was you know, certainly RPRT-0092 attempted that.

I think we feel that there's a stronger basis for feeling like there is not a very good database to draw from and you could not make any conclusions on representativeness of that.

Member Lockey: Maybe I wasn't clear in my question. I guess, what I'm asking is where there are existing RWPs and there is data related to those RWPs, does that bioassay data look any different than the data in general? Have you looked at that?

Mr. Fitzgerald: Let me, you know, Ron, Ron Buchanan, are you, you're on the line, right? Ron actually -- okay, Bob?

Mr. Barton: Yes, I might be able to illuminate a little bit. Because I think what you're asking, Dr. Lockey is, when you had a bioassay that was linked to a job-specific requirement, was it decidedly different than what you're seeing in the rest of the population?

Member Lockey: That's correct.

Mr. Barton: One facet you really have to understand is, there's no way to identify what was a job-specific bioassay. Even in RPRT-0092 when we went through and with a very limited sampling or not even a sampling. NIOSH grabbed everything they could. It was only for A Area. And there were some years missing in there as well.

We basically looked and said, okay, well, they were on, this is our job plan. And now let's see, were they monitored, essentially at all, and we can't differentiate whether that was a routine bioassay that occurred, you know. It could be many years down the line, and still count as being covered for that RWP.

There's no labels for the job-specific bioassays and these are the routine bioassays. There's just simply no way to differentiate it. And again, when we went into RPRT-0092, to assess the completeness and representation there. Again, it was limited to area and there's a gap during in the late 70s, and larger gaps for things like americium in the separations areas.

We just simply do not have the way to have that connection, unambiguous connection between what the RWP was requiring for its job-specific bioassay and what the workers were actually sampled for. I mean, it's just simply, you can't look at a bioassay result and say, okay, this one's a routine one, and then, this one's a job-specific one.

So it's very difficult to actually make a meaningful comparison between these RWP or job plan mandated bioassay samples, and the preponderance of routine bioassay that that is available. And there's a lot of out there.

I guess, as we've been trying to sort of focus the discussion is, if you're, if you are actually missing jobs specific bioassay for these workers who were doing non-routine tasks and weren't on a routine bioassay program, then, you know, how can you make that connection to say that they are sufficiently represented in any subsequent co-exposure model?

Member Lockey: I'm having trouble understanding. If you do have RWPs, where it specifies that certain radio nuclides be monitored, some of which are going to be done routinely. And some which are specifically, are specified to be monitored. And that data is not retrievable is what you're saying.

Mr. Barton: I think that's accurate. I mean, there's just no way to differentiate whether it was a routine sample. Again, for some that plutonium it might have been, you know, five years down the road that they submitted a sample. And then in the RPRT-0092 analysis, we counted that as being covered, essentially. And then, we come up with those percentages.

And again, it's RPRT-0092, SC&A's view that really was to get to the root of, are these workers who were performing these non-routine duties under the job-specific bioassay program who weren't routinely monitored, are they sufficiently represented in any follow up co-exposure model?

And, again, we can't say with any specificity, whether it's a job-specific bioassay or routine. So we just, like I said if there's a bioassay sample for the correct nuclide, further on down the line within a reasonable timeframe?

Member Lockey: So you have no data to say one way or the other whether those specific bioassays, or RWPs, are different than the population in general? You don't know when they occurred?

Mr. Barton: Yes, that's correct. There's no way to differentiate or compare the two groups because they're just simply not labeled as such.

Mr. Buchanan: This Ron Buchanan. I'd like to point out that the RWPs and the job plans to not specify the particular nuclides in a consistent basis that needed to be monitored until about the 1994.

That even though there the RWPs were implemented by Westinghouse in 1990, they did not become specific to, in general, for what nuclides need to be monitored until several years after Westinghouse took over. So it wasn't an overnight thing.

And most of the former job plans and RWPs said internal monitoring, but it didn't often say what nuclides. And so, it's almost impossible to get a linkage between those incomplete RWPs, and job plans, and bioassays.

Member Lockey: Thank you, thank you.

Member Schofield: Yes, this is Phil, I've got a question. A lot of people, as Brad pointed out, they could work for one employer during the day. They'd go work swing shift for another employer.

And if they did give a sample, my understanding is this, from what you're saying from the data is that sample they may have worked in an area of plutonium or they may worked in the area for where they're doing work with americium, or mixed fission products.

And when they do give a sample, they aren't necessarily looking at the whole thing of one day's exposure. And we know hot jobs due to the very nature, the risk of getting contamination, the risk of

inhaling or ingesting something is much higher.

Mr. Fester: No, hang on one second. Okay? All right.

Mr. Barton: Time, you seem to have had your hand up for a while. Did you want to jump in?

Dr. Taulbee: I wanted to circle back if I could to Dr. Ziemer's original question about did he see any difference with the 21 percent and the subcontractors. One of the things I wanted to point out is, that was one of the, that was one of the driving reasons that we developed RPRT-0094 was to look at that.

That if, in fact, that 21 percent of these workers, only 21 percent of the subcontractors were monitored, we should see that in the claimant data and we do not. We see a much higher percentage of the subcontractors being monitored.

And part of that comes back to the difference between the routine bioassay and the job-specific bioassay. On in RWP, if a worker is going in and signing in on the RWP, they were to check their radiation qualification badge.

If they were on a routine program for that job-specific bioassay, then they did not have to submit a job-specific bioassay, they were covered under the routine program. If they checked their qualification badge, and it did not say the radio nuclide indicated on the RWP, then they would have to submit a job-specific bioassay.

So you've got workers on the same RWP exposed to the same radio nuclide mix that Joe was talking about. Some are routinely monitored. Some are in the job-specific monitoring. This particular finding the notice of violation was just for the job-specific.

And so, when you when the Savannah River broke this down and did their after action analysis -- and this is on slide 17 of the December presentation that

I gave, where it goes through all of those numbers and all the different boxes.

And you can see where the breakdown and where the issue came from on that. Ninety five percent of the workers signing in on these RWPs were on the routine bioassay program for the radio nuclide mix on that RWP.

Five percent needed to file these job-specific bioassays. And of those 5 percent, only 21 percent complied. I just think that's important to bring up. Thank you.

Member Ziemer: Well, that might suggest, then, that the routine when values would cover the data base or the data for that particular nuclides in terms of a co-worker model.

Dr. Taulbee: That is right, sir. And that's our position.

Mr. Fitzgerald: Yes. And our position I think would be that to apply the 1997 experience to all prior years would be a reach, would be a speculation because, again, the notion, the basis for the Board's inquiry and the RPRT-0092 and valuation was to provide any demonstration that the circumstances in 1997 were either different or similar for prior years.

And, you know, the permits or whatever weren't available necessarily for all that timeframe. And you can't, and we've gone through the RPRT-0092 in some detail. You can't substantiate whether or not that circumstance existed for all prior years. And particularly if you go back before the RWPs were implemented.

And I keep emphasizing that, that the radiological qualification badge, the RWPs were very specific prescriptive bioassay requirements, that were, those were all products of Westinghouse's revision of the radiological programming at Savannah River that took place in the early '90s, when they got the contract and after the Tiger Team.

And so, you know, those features that would give you some confidence that, you know, these bioassays were being taken, and that you could, in fact, you know, apply some of these, these trends for the prior years, I don't think can be done with confidence before that time period before RWPs became a feature at Savannah River.

So and that's, that's kind of where we were coming from. That we were reserving judgment for the RWP era, for the reasons that Tim has mentioned. That, you know, certainly, it was a working RWP program that had the bells and whistles that one would expect.

And there was a lot more data and the circumstances in '97, as far as the exposures seemed to us that one could apply that during that particular era.

But prior to an RWP program at Savannah River, given the experience with the non-compliance, we didn't see any demonstration that you could do that for those prior years and have confidence that job-specific bioassays would involve exposures that were the same as, or less than, those workers that were doing routine work.

Again, I would refer you back to the definitions that Westinghouse supplied. That, you know, again, these were required for non-routine source terms. Unless, there's more questions, maybe Bob you can start walking through the slides?

Mr. Barton: Sure thing, Joe. Thank you for that. So --

Dr. Roberts: Excuse me, Bob.

Mr. Barton: Yes?

Dr. Roberts: Can I just remind folks on the phone to stay on mute. I'm seeing multiple numbers popping up as people are speaking. So please check your phones and mute them. Thank you.

Mr. Barton: Thank you, Dr. Roberts. So we're really what we're discussing, and we're trying to keep it focused on again, this key question back from the previous slide about potential deficiencies in the job-specific bioassay program and how does that affect representation and completeness when you're trying to formulate a co-exposure model?

So really, the things that we've looked at since November and December, those most recent discussions, obviously, RPRT-0094, which was the subject of the previous NIOSH presentation.

Which is a compilation of essentially all the NOCTS data to look at percentages of workers who were both externally monitored, that's really the trigger point. If they weren't externally monitored, they didn't factor into any of the percentages and RPRT-0094.

And by the way, that's something that SC&A and NIOSH absolutely agree with. We had that in our report, as well, because there was a lot of non-radiological work that was going on in which it wouldn't require any sort of external dosimetry and if you don't have external dosimetry it's logical to make a leap that you wouldn't need internal monitoring.

What RPRT-0094 did is separate it into -- well, first of all, any internal monitoring was one metric that they used. But then, they also separated out tritium from that. So you had it monitored externally and also monitored for anything non tritium and that's RPRT-0094.

So that's, that was really the main focus of work that's gone on since November, December. We're actually tested -- look at '94, back in, prior to that in late October. RPRT-0094 actually came out in 2019, I believe.

And our initial read on that, was that, you know, since it has the actual unambiguous connection to these

job plans, you're basically just looking at the overall percentage of routinely monitored subcontract workers. So even back in 2019, our focus wasn't on '94. It wasn't on the overall number, the percentage the preponderance of data.

Our focus was really on '92, which was the proceeding report, which actually took what job plans and RWPs we had, and then, tried to trace what follow up, internal monitoring there was for that.

So RPRT-0094 is sort of a different animal entirely because it loses between the job-specific bioassay and the actual monitoring requirements from these are RWPs and job plans.

The second thing we looked at, which was also presented back in November, to the Work Group, and in December to the full Board was plutonium logbook data. Now this goes past just the claimants. This, all of the captured plutonium logbook data for subcontractors and we'll get into that a little bit later in this presentation.

And then also, later on, on the docket today is the stratification analysis, involving tritium and the bootstrapping methodology. And so, we combined that in into this presentation just for, I guess, simplicity and to try to streamline it.

So I'm not going to talk too much about the tritium right now to allow NIOSH to present their work in their findings. But that is really the third facet that's happened since our discussions last, in the winter.

The '94, what it what does it do? It provides estimates of the numbers and fractions of, again, the claimant population of subcontractors who were externally monitored, and who also had some form of internal monitoring, again, in this period from 1972 through 1997.

And again, the trigger point was you had to you had to be a subcontractor who was monitored externally.

And then, we would go in and to see what sorts of internal monitoring you had whether it's plutonium bioassay, tritium bioassays, whole body counts, chest counts, that sort of thing. And it was done by year.

So as I said, we were actually tasked to look at this back in last October, and it was sort of a focus review. Again, let's see, how does this report fit in with this entire discussion of whether a co-exposure model for SRS subcontractors, is it consistent with the implementation guidelines?

Which two of the four main facets are completeness, and representativeness? The other two are adequacy and stratification. Adequacy obviously refers to just can you trust that the data is actually reflecting the exposure that you're trying to reconstruct? That's not really, it's not part of this conversation at this time.

And the other one, stratification is, okay, if we've established completeness, and representativeness, in other words, we have a data set that we can be reasonably comfortable can be used to create a co-exposure model. Now, do we need to split it into different distributions based on job types or exposure scenarios?

And again, the other focused part of this review was to substantiate can you use a claimant data sample to reflect the full worker population at a site? And this is sort of an interesting issue that's sort of been hanging out there for a while now.

And this goes back to a report called TIB-75, which provides some examples of comparing just the claimant data set to a full sites data set to see if it's actually a representative sample.

But that was the other facet that we look into. And they looking back through some of the transcripts related to that discussion for TIB-75 about whether you can use NOCTS to represent an entire site, a lot

of those findings that are relevant here are still open.

And they were intended to be transferred to procedures and also the SRS Work Group for discussion. But they haven't yet to be fully adjudicated or accepted by the Board.

So again, our review, approach for RPRT-0094 and specifically is the primary question, does the analysis obviate our original concerns with the potential deficiencies in these jobs-specific, the permit driven job plan bioassay program?

And that's the entire discussion really, which we show, lay out nicely. And so, we presented our analysis of RPRT-0094 and basically was just to take another look at that claimant data and really build upon what NIOSH presented in RPRT-0094, to give it a little bit more granularity.

Instead of just saying, non-tritium bioassay as one, just one specific metric. We say, well, what happens if we try to separate it out into the actual different radio isotopes that were supposed to be monitored for?

So our primary concerns is that, again, as I sort of intonated earlier, that RPRT-0094 analysis homogenizes the internal monitoring data into really a single metric. One of them is just are you internally monitored?

But that doesn't really answer the question, are you internally monitored for what you're supposed to be monitored for? If you're supposed to be monitored for uranium, and you have a tritium bioassays, it doesn't really tell you much.

And as I said, RPRT-0094 doesn't, it does separate out tritium in some of its analysis and tables, but you really have tritium, internal monitoring, and then everything else is sort of grouped together, homogenized into one metric.

And we felt it would be appropriate to dig a little bit deeper into the data to see, okay, just because you have some form of internal monitoring doesn't mean that you're actually covered for everything you should have been monitored for.

We didn't find that it substantiates that you can use a NOCTS sample. It doesn't really go into that whether the NOCTS data set is actually representative of the full site population that's really not discussed.

So that's sort of a non-starter there. But more importantly, it doesn't address the issues of completeness and representation for this permit driven job-specific monitoring, which is really the name of the game here.

So here's just -- I don't want to go through finding my finding. But here's kind of a summary of our results. So what we have here is, we broke out into these five radio nuclide categories, you know, plutonium, fission products, uranium, neptunium, and americium.

And we also split it into what we're calling the DuPont era, through 1990, even though Westinghouse, I believe, took over in late 1989. But based on some of the analysis that was done in RPRT-0092, really the two eras we're talking about is '72 to '90, and then, '91 and up.

As you can see in columns two, this is the range of the percent of externally monitored subcontractors who also had internal monitoring for each of these radio nuclide categories.

So for example, plutonium in that DuPont era, if you were externally monitored, in a given year, the range of percentages or subcontractors in the claimant population would go from three to 34 percent of the externally monitored subcontractors also had plutonium monitoring.

And you can see these can be compared to what was presented in RPRT-0094 based on these table footnotes here. So as you can see, again, it's non tritium monitoring. It's just the one homogenized category presented in RPRT-0094.

And so for the DuPont era, for example, RPRT-0094 shows that in any given year was five to 87 percent. And what we're saying is when you break it out into these different categories, it can be significantly different for some, not so different for others.

Notably, again, the plutonium up through 1990 was basically about a third of the subcontractor claimant population that was monitored externally, also had tritium monitoring.

This is, so this will give it by year. And this is kind of a busy chart. But I mean, this is the overall results of our review here. Again, we were just talking about plutonium.

So that's the blue circles, you can see there and as I said, just like in the NIOSH presentation, that there's that gap in the late 70s that we both saw. And as you can see, notably for plutonium, again, you're less than a third for most years until you get to about 1991. And then it jumps up above 50 percent. And then you have the -- it increases substantially.

Another notable thing that you can see here is that right around 1987 is a big jump for uranium and neptunium. And this is really the advent of what was called the FASTSCAN whole body counter, which we're not exactly sure if they were necessarily looking for enriched uranium or neptunium.

But the counter did have the capability to measure those radio nuclides. So we counted that as applicable internal monitoring.

And as you can see, fission product starts out pretty high up there. You got 60 a little bit above 70 percent. And then, it drops down into the later 70s,

and then, rises again. And obviously, as you get into that Westinghouse era it seems to be a lot stricter bioassay coverage.

As you see a lot of, there's just sort of a hump there in the 1990s. And it was it was definitely observable in the claimant data set that oftentimes they, the bioassay stamp will be on the same date. And it would be for fission products. Something like strontium-90, you know, uranium and all on the same day. That's why you see those sort of mapped together there in the 1990s.

So, in summary, for our conclusions for RPRT-0094 -- and I'll just read this into the record for completeness, here. SC&A does not find that the analysis of claimant's subcontractor data in RPRT-0094 adequately addresses the original concerns of permit driven job-specific bioassay monitoring.

It is estimated position that the original concerns related to the job-specific bioassay program can only be adequately addressed to a direct connection between radiological work permit, RWP monitoring requirements, and available internal monitoring for those workers as was analyzed in RPRT-0092.

Now moving on, this was the second thing we looked at beyond RPRT-0094, which was presented by NIOSH again back in the November Joint SRS SEC Issues Workgroup and also to the full Board. Joe, I don't know if you want to step in here. I know you took a pretty close look at the plutonium logbook bioassay.

Mr. Fitzgerald: Well, just very briefly, yes. Basically, I went through pretty much the entire logbook database. And it does, in fact, cover a lot of Savannah River Sites between the years in question.

And I looked at the type of bioassays. There was certainly column provided that gave the type of bioassay that was involved. And I could not find a

distinction between the job-specific bioassays and routine --

Certainly my review showed that it was the preponderance was routine, or specials, or terminations. You know, pretty much what you would expect. And, again, because you can't distinguish the job-specifics, I think what you're applying is a considerable amount of routine plutonium bioassay samples that would have covered both CTWs and subcontractors as well.

But, again, it's not clear how that's going to answer the question that we're trying to answer, which is, can you use that as representative of those that would have been on job-specific bioassays?

There's no way to answer that from this database that's provided there. That's pretty much the bottom line on that. There was a considerable amount of data. I'll concede that.

Mr. Barton: Thanks, Joe. And this is a slide about tritium. But since NIOSH hasn't presented their material yet, we'll just skip over that one. And but basically, our conclusions on this new material that hadn't been really discussed, or broached, or reviewed since our last meetings in November and December, is that RPRT-0094, I mean, it we don't disagree with the analysis.

And it does show as Joe just mentioned, there is a preponderance of data, routine monitoring data. There's a lot of it. However, it doesn't really meet the intent of the Implementation Guide.

That's IG-6, in which you have to establish that the data set you have, it doesn't matter how big it is, it matters, whether you actually have representative data of all of the workers who should have been monitored.

And if you don't, where are the missing workers? Where would that be? In this case, it's we feel the

job-specific permit driven bioassay, which was meant to cover the non-routine types of exposures.

And again, just to reiterate what Joe said, looking at the plutonium logbook data, again, there's a lot. And it's primarily routine. But does that address the question of whether there's a group of workers out there that's missing from your co-exposure model?

And are they actually bounded by what you do have? And I guess, our real, main issue here is that if it's very difficult to know. How do you know what you don't have? And I think that's the uncertainty that's sort of underlying this entire SEC discussion.

If there's a missing group of people, and that group of people are those who should have been covered by this job-specific monitoring Program, which had issues as late as 1997.

And, you know, our survey of whether that was a problem earlier, really didn't answer the question, which that was intended to be in RPRT-0092. We simply don't have the job plans to be able to look at to see if those people were covered.

And the ones we do, again, there's some missing years, it's only for one area. And even then, for things like the separated americium, we certainly found that there seemed to be issues with workers submitting these necessary bioassays to be able to say, with any degree of confidence that any subsequent co-exposure model is going to cover those exposures.

The last bullet here, again, is about tritium. So I'm going to skip that one until we get to the actual tritium discussion. Which is that, again, as I said, we believe that the only adequate analysis to be able to solve this problem was contained in RPRT-0092.

Which was severely limited by the job plans we had to be able to look at, and the years, and in some cases, specifically, americium that was separated. The numbers weren't all that impressive in our mind.

And obviously, that is a judgment call.

And just to reiterate, what our conclusion was from RPRT-0092. Without the validation of subcontractor data completeness, that the RPRT-0092 evaluation was to provide, there's been no substantiation that there are sufficient job-specific bioassay measurements available to ensure that the co-worker data in TA-1, which is the co-exposure model, are either bounding or representative of the exposure potential subcontractors performing permit driven work across the SRS site.

And that was our RPRT-0092 conclusion, which we feel is really the was the litmus test for this entire discussion.

Mr. Fitzgerald: And, Bob, this is Joe. Just going back to the exchange that I think Paul and Tim had a little while ago. And this gets to, perhaps, a root issue that the SEC Work Group may have to ponder. Because, you know, we have the IG-0060, the co-exposure implementation guide, that was developed. And actually Savannah River was a bit of test case, first time in practice.

But this question of, you know, NOCTS being applied, and what you can -- and I'll use the word infer, because I think that was used at our last Work Group meeting back in 2020. I think Tim was saying that, you know, RPRT-0094, the NOCTS-based approach, provides a way to infer completeness.

What we have struggled with, and I think what makes that difficult, is: is that good enough based on what the intent was on IG-006, you know? Certainly, looking at NOCTS, looking at the routine database, you know, because there's so much data, one can infer or deduce or assume that that data ought to represent, you know, what may be missing. In this case, maybe very specifically the job-specific bioassay.

But does that meet the criterion which is in the implementation guide, where, you know, completeness must be determined from sufficient measurements for workers with comparable activities and source terms, relationships to the radiation environment?

We think it falls short. I think the idea of inferring completeness or deducing completeness based on other data, even if you have a lot of it, brings into question how that's being applied. And that I think goes to, certainly, a question the SEC Work Group would have to contemplate, you know, in terms of interpreting what those words mean, because, really, it says something very specific that doesn't -- certainly, deducing or inferring or assuming doesn't meet that test.

And I think that's been the struggle we've had with, you know, with NIOSH certainly proposing these different avenues of applying what data we do have, which is a considerable amount of routine data, considerable amount of NOCTS data. But can it be used? Is it relevant to what the co-exposure model requires? And that part we do not agree with at this point. But, certainly, the SEC Work Group specifically, that would be a charge that they would have to address, because, right now, we don't think the inference of completeness that would come from NOCTS is sufficient.

Dr. Taulbee: Dr. Lockey, you're on mute.

Member Lockey: It's a good place to be sometimes. Bob, can you go back to Slide 8 for me? I just have a -- for my own clarification. What was the overall site worker production you were talking about there? What was that population? Was that just construction workers or is that everybody?

Mr. Barton: RPRT-0094 specifically looks at the subcontractors that are available in NOCTS. 886 total claimants were identified (audio interference)

contractors. So, that's what RPRT-0094 looks at. And that's what we looked at, as well.

Member Lockey: Well, this is the construction workers, correct?

Mr. Barton: Subcontractor construction workers.

Member Lockey: Subcontractors. Okay. And your bullet number 3 says it does not address the completeness and representation of permit-driven. I understand your statement there. Does the available data indicate that it's not representative?

Mr. Barton: Well, I'm not sure how you'd know.

Member Lockey: You have exposure data. You have bioassay data.

Mr. Barton: Yes.

Member Lockey: Is there any data available that says it's not representative when you divide into subcontractor group versus contractors?

Mr. Barton: Well, I think the original question was, you know, if there's a gap in --

Member Lockey: I understand there's gaps.

Mr. Barton: Yeah. I'm not sure how you prove a negative.

Chair Clawson: Bob, let me help you there with this one. Hey, Jim, tell me how much data we're missing.

Member Lockey: I understand that. But I have to -- I'm asking the question, Bob. You have existing data, okay? There is a fairly large data point, okay? And what I'm asking you, is there any data in that large data file that we have that indicates that this data is not representative? Did you look at that?

Mr. Barton: I'm not sure how I'd be able to tell if it's not representative if it's missing.

Member Lockey: Well, there is data that's not missing. So, you use the data that's not missing. And you want to know if the data that's not missing is similar to the other data. Is it similar to the prime contractor data, or is it different? That's what I'm asking.

Mr. Barton: Well, once again --

Member Lockey: I know there's data missing. But there's ways to handle that. And I guess what I'm asking is, did you go back and look at the data that you actually have to see if there's any difference in the distributions and in the confidence intervals?

Mr. Barton: I think what we'd be looking at is the comparison between primarily, or overwhelmingly, routine bioassays. And I believe NIOSH will be addressing that, at least for tritium, in the upcoming presentation. So, is there a difference between the routine bioassay data? NIOSH will address that. And --

Member Lockey: I wasn't asking about -- I'm asking you, did your group --

Mr. Fitzgerald: Let me try to answer that, at least from a different standpoint. You're saying, did we compare or look at, if A is the NOCTS or routine database, and B is what's available and job-specific, and compare them, I would say there's no way to do that because B is missing.

The whole dilemma has been the inability to compare anything because we're missing the essential data, the distribution of that data, or any distinguishing of that data to compare it with any of the other databases that NIOSH has come up with, whether it's NOCTS, the routine, the plutonium log books, you know, incident database. I mean, there's a whole bunch of data, but it is all from the routine database. And it forces one -- and I've said this before -- it forces one to not compare and establish that, in fact,

they're comparable or uncomparable. It forces you to infer or deduce that it would appear that you have enough data covering enough sites that it would presumably bound or represent that which is missing, without knowing what is missing.

So, you don't have a means to actually compare A to B. You're looking at A and judging whether, by virtue of the amount of data and what kind of data you have, that, in fact, it would in fact represent what's missing.

But, again, that isn't what IG-006 calls for, in our interpretation, our reading of the guide. And I think that falls short of actually establishing that comparison. You can't compare if you're missing what you're comparing with. And that's what the problem is here.

Member Ziemer: This is Ziemer. Let me ask for clarification. Even if it wasn't missing, it's not clear to me that you could compare them, based on what Tim said, that a larger number of the people who were working under a special permit already had routine data, or routine bioassay for that site. And, therefore, it doesn't show up as available to make the comparison. So, even if none of the information was missing, could you even make the comparison?

Mr. Fitzgerald: Yeah, and, Paul, the dilemma is that there's no way to know that in the earlier years because there was no management system that would generate those records and give you confidence that you, in fact, had that information. There's just no way of knowing because the data wasn't collected that way.

Member Ziemer: Yeah, I agree.

Mr. Fitzgerald: Well, I think --

Member Ziemer: And I think it's still true maybe in the later years, too.

Mr. Fitzgerald: Well, it's unclear, because, certainly, the RWP program, once it was implemented in '94 and put in place and you started, you know, getting prescriptive bioassays performed, I think that gives you a much different situation than before that point.

And we acknowledge that in our conclusions on 92, where we made it clear that once we get into that era there certainly is more likelihood that you could do what you're talking about, which is be able to show that the exposures of people that were both on routine and non-routine, you know, they were similar or representative. I think you can -- and that hasn't been done, per se, but I think that can be done. There's an avenue of doing that.

Before you had RWPs and management systems that would require the bioassays and actually prescribe those bioassays, we believe that, you know, that's not possible. And certainly before 1990 in the DuPont era, we don't see any evidence of it. So, it is timeframe-based.

I think what you're saying with RWPs I think is true. I think there is an avenue that you can actually demonstrate that, but only after the RWPs were put in place and implemented and you actually had the data. And that's mid-'90s.

Member Lockey: So, Joe, my understanding is you can't, for people that were part of a job plan or RWP and they were monitored as far as a routine monitoring program, you can't identify those samples, right? You can't differentiate?

Mr. Fitzgerald: We don't know. We don't know what overlap there was in terms of those that were routinely monitored and those that had job-specifics.

I think you can know that later in the '90s when you, you know, had better -- well, you actually had documented RWPs that prescribed your bioassays. Then you can make that distinction. In '97, as Tim

pointed out, very much so you can make that distinction. But not before the site adopted an RWP program. Before that time, there just wasn't a tight program, which was actually a major finding of the Tiger Team in 1990, that a lot of these bioassays were not being collected and there was a problem of management enforcing it. So, you know, you had that going back certainly to that timeframe and before.

Member Lockey: So, if they were being collected as routine they may not -- you can't identify them as part of that specific job plan or -- or say job plan, is what you're saying?

Mr. Fitzgerald: Yeah. There just wasn't any way you could identify that. And the management program just wasn't set up and established and managed that way, so you don't have a paper trail, you don't have an expectation.

Member Lockey: Got you. Okay. I understand. That's helpful.

Member Ziemer: One additional follow-up, because I'm trying to understand sort of the practical side of this when it comes to dose reconstruction. If you go back to the early period where there's a RWP that simply said you had to have bioassay. It didn't specify what it was. And you had workers who simply didn't leave the samples, so they weren't bioassayed.

When it comes to a claim -- and let's say it's a worker who has no bioassay, but you can identify him as having been in that facility, then you are assigning a coworker -- yeah, let me use the correct wording here, the old coworker word -- based on those for whom we do have the routine bioassays for that facility. Is that correct, Tim?

Dr. Taulbee: That is correct, sir. And to just elaborate a little bit upon that. With the implementation guide, the two criteria for completeness that we were

looking at is, are the jobs covered, all of the individual job types covered, in each of the years over the time period of the co-exposure model? The other component is, are all of the facilities covered that would have that potential exposure?

Those are the two criteria. There really isn't any job-specific or any RWP, any of that other type of criteria that is in the implementation guide. There are sites that do not have any RWPs in the 1970s and '80s for which we will be developing a co-exposure model on and we can't go through and do this direct comparison that SC&A is indicating that is required.

That was never our intent in the implementation guide. It was to look at, are all the jobs covered and are all of the facilities covered? That's what we are calling from a completeness standpoint. Now, so, I wanted to make that particular point here. And we believe that we've met that with this particular -- for this site.

The other component here is, you know, when you're looking at something the RPRT-0092 that doesn't go back further in time at all of the facilities, it does go back for 773A, for A Area, into the 1980s. There's good comparisons there. Other areas there's not. This was part of why we looked at RPRT-0094, was do we see any big changes in the total monitoring of the workforce during these different eras?

And as Dr. Lockey pointed out, in the 1970s, we clearly see that there is less monitoring. The 1980s, we see an increase in monitoring. And then the 1990s, more the modern era, where there's a lot of monitoring amongst the subcontractor construction trades workforce.

So, that was part of the reason that we looked at all of the areas. The bioassay log books is that component that gives us some assurance of the plutonium. I mean, were subcontractors monitored in the major plutonium areas? And that was something

that John presented back in November, and I indicated in December, where we looked at the two main areas where most of the subcontractor monitoring comes from are the two main plutonium facilities, F and H area.

So, it's looking at everything in concert, is what gives us the picture that we're looking at as to why we feel that the co-exposure model is complete and representative. Thank you.

Mr. Fitzgerald: And, Paul, if I can respond to that same question. First, SC&A is not requiring or implying NIOSH needs to actually compare things like permits or RWPs and what not, consistent with what was done in 92, in order to come to a conclusion on this.

That was NIOSH's proposed way of settling the question of subcontractor data completeness for RWPs and job plans. So, that was, as we point out in our report, a carefully designed approach to answer that question consistent with the co-exposure model criteria.

The second thing is we're not, I think, interpreting something different than what the implementation guide provides. I read it once. I'll read it again. I mean, it basically says that the completeness is a going-in proposition, is one of the first things that one ought to look at in terms of the hierarchy. And it should be determined from sufficient measurements for monitored workers with comparable activities and relationships to the radiation environment.

And I wanted to point out that, you know, this job-specific versus routine is not an esoteric thing. Actually, job-specific bioassays are distinct and are for non-routine source terms, non-routine exposures. And that's the reason the RWPs and job plans were written up, and why these job-specific bioassays were required.

So there's a definite reason for that. And, yes, as I was saying before, again, RPRT-0094 provides a considerable amount of data, claimant data. But that was data we had when we started this whole process. And we didn't pursue that avenue because, one, you always have the question of whether it's representative of the actual working population or not. But, more importantly, in this case, it can't easily be compared with the non-routine data that's missing. You can infer, you can deduce that you don't see anything, but you can't establish that, in fact, you have enough measurements that you can compare A to B or compare routine to non-routine.

I think you're, again, forced to assume that because of the amount of data and the facilities covered and what not, that it encompasses it. But there's no way to show that.

And, again, we keep going back to it, but if the question is, do we see some anomaly, see something, an outlier in the NOCTS database which would suggest that this data is missing? How would you know? Because you don't even -- you can't even characterize the bioassay data results from this whole category of job-specific bioassays because you can't distinguish it and there's a good chance that most of it's missing. You just don't know. That's the problem. There's a lack of information.

Member Ziemer: Yeah, I'm not disputing that at all, Joe. I appreciate your clarification.

One thing I would like to point out is that a job-specific bioassay sampling is not specifically related to unusual jobs or special hot jobs where you're burning people out. It's specific for workers who are not already on a routine for the area where they're being sent.

So I don't think we should assume that a job-specific bioassay implies that it's an unusually hot job. It implies that we need to specify for workers who are

not already on a routine for that location that they have to get a bioassay. And I think there's a big difference in the two. So, the issue of saying, well this is for people --

(Simultaneous speaking.)

Member Ziemer: It may cover jobs that are unusually high or hot, but not necessarily.

Mr. Fitzgerald: Yeah. And that's exactly why I put up that one slide. Because, you know, rather than interpreting how the contractor may have implemented the bioassays in that vein, this particular slide, I mean, this is the policy, this is the approach taken by Westinghouse between job-specific bioassays and routine bioassays.

And I agree, Paul. There's nothing here that says it's only for hot work. It just says that the source terms, the material that's being handled, if you're going to do a job, if it's not routine, if it involves non-routine mixes or concentrations, then that would require a job-specific bioassay and, by inference, an RWP.

So, yeah. And that's the issue, that --

(Simultaneous speaking.)

Mr. Fitzgerald: Because it's going to be different.

Member Ziemer: It doesn't mean that it's different or non-routine. It means that workers who are not already on a routine for that area need to have that added bioassay. They're not already collecting for it. It's bioassay samples --

Mr. Fitzgerald: Yes. And I think the --

Member Ziemer: It doesn't say the work is non-routine or unusual mixes.

Mr. Fitzgerald: Yeah, the second bullet, right. And that's what the first bullet says. The second bullet says, you know, just keep in mind that they are also

reserved for situations where you have the non-routine source terms.

Member Ziemer: Exactly. But not necessarily only that. That was the point. Yeah. Thanks, Joe.

Chair Clawson: Yeah. This is Brad, too. And I go back to what I got into with this in the earlier years, is when we were doing bioassay we only had certain bits and pieces that we were being bioassayed for. But our area had many other isotopes of concern. And this is where the special went into, because we were not there. And part of our problem that we got into was that we didn't have guidances to send us into these special work permits, or whatever, because when they told us we were monitored, we were being monitored for everything.

So when they'd come to find out that we were in these areas and made these dives, we weren't being monitored for those. And this is just a personal thing from me of why this is kind of a problem at Savannah River here.

I want to make something else clear, too, is I want everybody to realize what I have put up there for an SEC is from '72 to '90. And there's a reason for that. It's because trying to compare what Westinghouse did and DuPont did is night and day. It is totally different. I do not believe that DuPont intentionally, or anything else, did anything wrong. But their monitoring program was totally different. And they didn't implement a lot of the DOE guidelines that they were supposed to.

And even into 1997, Westinghouse, taking over for them, was still having a problem implementing the guidelines that they were supposed to. So I want everybody to realize when, because we're always talking '97, '90 this, '90 that. I purposely set the SEC because trying to wrestle with all of this is very hard. And this is why I separated it to these years, is because this is the only way that I felt that we could

get a good overall feeling of what was going on.

We're going to deal with the '90-on at another time. But we keep calling in '97 because of what happened there, and a lot of the Tiger Team reports and everything else like that. But I want people to realize that this SEC that I pushed for was from '72 to '90. And for good reason.

Okay. That being said, is there any more questions? Any other Board Members have any questions for Bob or NIOSH?

(No response.)

Chair Clawson: Okay. That being said, do we want to go on, Tim or John, and --

Dr. Taulbee: We can. But could we take a short comfort break?

Chair Clawson: No.

(Laughter.)

Chair Clawson: Yes, we can. Let's take a 15-minute break, if that's okay, Rashaun. Let's see, what have we got? We've got, oh my goodness. How about if we come back at 1:20 p.m. Does that give everybody enough time?

Okay. Sounds good. Thanks.

(Whereupon, the above-entitled matter went off the record at 1:04 p.m. and resumed at 1:23 p.m.)

Bootstrap analysis of SRS Bioassay Data

Chair Clawson: So, with that being said, I'll turn the time back over to John, and we'll go over the implementation of the bootstrap analysis.

Dr. Cardarelli: All right. Thank you, Mr. Clawson. This should not take too long of a presentation. It's actually a summary of two pieces of work that we

distributed. One was the statistical analysis done by Dr. Nancy Chalmers, who's a principle scientist for statistics with the ORAU Team. And, of course, then the summary, which is this particular presentation of that work and its implications on trying to understand how the uncertainty analyses around our co-exposure models can be applied, and what does that really mean.

So, briefly, I'll give a background, and I'll ask some questions or some comments that have been made in previous Work Group discussions. I'll describe briefly what the bootstrap analysis is. And then we'll talk about the observations and implications and some basic conclusions.

This is a common assumption that we've been talking for the last several Work Group meetings, and that is subcontractor construction trade workers were hired for more hazardous work than DuPont construction trade workers, and therefore had greater potential for internal exposures.

We present this as a statement, but it's really quite an assumption. And we are very curious, by understanding the uncertainty analyses in the co-exposure models, if this assumption is paid out by the particular data.

So, what are the questions that we were looking at as a result of this? First, do the subcontractor construction trade workers exhibit higher internal exposures than DuPont construction trade workers? And that's really -- that's the first question.

The second one goes to whether or not subcontractor trade workers, should they have their own co-exposure model?

And the third one is the current situation, which is: are the current co-exposure models, which is a combination of DuPont with sub construction trade workers together, is that model acceptable for dose

reconstruction purposes?

So, these were kind of what was in our mind when we started pulling this together. Again, a similar type of graphic here. And I'm going to walk down the dark arrow path. And we have all construction trade workers. Our target population is really made up of those who have been exposed, because we have data on them.

The study population that I'm talking about are only those who are in our target population, but have been monitored. And you can be not exposed and still be monitored. We talked about that in the last presentation.

And then the sample study, or the study sample in this particular slide, happens to be the NOCTS data from the claimant, which is basically any exposure data from the claimants. And we apply our models to it to construct an exposure estimate or dose estimate or an intake to those in the target population who are not monitored.

So, that's kind of how the use of the co-exposure models are applied to provide dose estimates to people who are exposed but not monitored.

So, this particular slide breaks down roughly the number of samples that were used in this particular analysis. And we used the tritium exposure data because, number one, it was already available in the NOCTS data and the conversion to dose was very simple. Given the timeframe that we had to conduct this work under, this is something that we could demonstrate the bootstrap method, understand the uncertainties, pull some implications from it, and yet demonstrate what we have here.

Again, if you take a look at the first line, subcontractor construction trade workers, there's over 12,000 tritium samples among 237 individual subcontractor trades workers. Among DuPont

construction trade workers, there is around 20,000 samples, resulting from 185 unique workers. Now, if you combine those two columns you'll have what we call the combined CTW, which is the current co-exposure model. And that's how we get our 32,477 tritium samples, made up of 421.

There's an asterisk there because some workers fell between subcontractors at DuPont. But the numbers add up if you account for the small number of workers that might shift between the two different groups.

And, of course, non-construction trade workers is 110,000 tritium samples among 728. And, again, this is from NOCTS data, so this is claimants only.

And, of course, if you were to combine it all together we have over 140,000 tritium samples from 1,000 unique workers, 1,079. So that's kind of like the global picture of the dataset that we were working under for this particular analysis.

Dr. Taulbee: Dr. Lockey, you're muted.

Dr. Cardarelli: Dr. Lockey, you're on mute.

Member Lockey: John, go back. So, the 110,000 -- no, next slide. You used the 110,000 non-construction trade workers in the analysis, right?

Dr. Cardarelli: Well, what you're going to be seeing is not the data associated with the non-construction trade workers. But I think in Dr. Chalmers' report she does include some of that information. But in this presentation we will not be focusing on the non-construction trades.

Member Lockey: I didn't think you included it in your presentation, but I think Dr. Chalmers did.

Dr. Cardarelli: Yes.

Member Lockey: Okay. I just wanted to make that

clear. Okay.

Dr. Cardarelli: Okay. Yeah, I will be only focused on the subcontractor construction trade, or the construction trade workers in this particular presentation.

One of the first steps in doing this bootstrap analysis is really a graphical display of the data. In the two different axes that we see here on the left, the doses in millirem, and it's really a logarithmic scale. And on the bottom is the standard normal quantiles. And that's what is called a Q-Q plot. And if the data itself fits the model very nicely, this is one way to graphically represent that.

And the data here on the far left lower corner is the lowest exposure. We have 66 particular construction trade workers in the year 1986. And we rank them by order. And then the upper right hand corner is the highest exposed individual for that particular year.

And then we can generate a geometric mean and the geometric standard deviation from this data. The geometric mean is derived directly from the 50th percentile. And as you can see here, it's the zero quantile, standard normal quantile. And then we extrapolated over to get the geometric mean of about 6.5 millirem, the line you see here.

To get the geometric standard deviation I added this normal curve kind of subtly in the back to understand where the 84th percentile, or the .84 quantile, comes from. And that's, frankly, one standard deviation among the standard normal quantile. And if you add up all of the percentages, this is 84 percent of all the data. And then we extrapolate this over to the Y, or the dose. And you'll see that if you take the 84th percentile, divide it by the 50th percentile, that is defined as the geometric standard deviation.

And in this particular example, 1986, the geometric standard deviation was 3.17. And all of this is based

upon the 66 individual workers who had some tritium results in that year.

And so, what is bootstrapping? Really, all it is is sampling with replacement. And for the example that we just saw, the year's 1986. We had 66 construction trade workers. The geometric mean was about 6.5 millirem, with a GSD of 3.17. And what we've effectively done with the sampling with replacement is we take the 66 people, and we put them all back in the pile, and we randomly select 66 different values. But instead of pulling it out, we replace the person back in.

So, in essence, we have 40 some-odd people. Well, we have 66 different people. In the most extreme case, it is possible -- not likely, but it is possible with replacement that you pick the same person 66 times to derive that. Highly unlikely.

And we do this up to 10,000 times. And as you see here, these were the actual results, from the first run, the average was 7.8 millirem with a GSD of 2.72, all the way down to the 10,000th time we tried this, where we got 5.2 millirem with a GSD of 3.19.

So we do this to come up with a better understanding of the uncertainty around that particular model. Again, the true data is 6.5, or the sample data that we would derive it from, of 6.5 millirem, with 3.17 as the GSD. But what are the uncertainties around that? And that's the benefit of the bootstrap.

We look at that population 10,000 times and we estimate these statistical parameters that have unknown properties. And in this case, we're after the 95th confidence interval around that data.

So, this is the next slide, shows the original data with a line drawn through it, which is the model of that data. You can see it has a very good fit visually. And then now we've added the light blue lines, or the dashed lines, which represent the 95th confidence

interval of the model.

So, in effect, there are 10,000 of these linear lines that all fall, 95 percent of them fall within those blue boundaries. That's how you would look at those 10,000 separate looks of this data. So it gives us a good indication of how widespread the uncertainties might be.

Now, what I've done in this particular slide is first show you the mean, which was 6.5 millirem. But now we've created, instead of those 95th percent confidence intervals, we color-coded that in. And now we call it a confidence band. It's just an easier way of interpreting the spread.

Now, this was based on 1986 with 66 construction trade workers. If we were to redo this entire analysis and only look at subcontractor construction trade workers, we're no longer looking at 66, we're looking at 39 construction trade workers. And the dose itself for those 39 is slightly lower than that of the original 66. But the uncertainty band, which appears to be pink or a little bit of red in this particular picture, has substantial overlap. So, one could argue, is there really a technical difference between these two?

And then, if we were to take this a little further, and look at just the DuPont, now we're no longer looking at 66, we're not looking at 39, we're looking at 66 minus 39, which is he remaining 27 construction trade workers that were DuPont workers. We could look at just their exposure potential for tritium, in this example. And we have their uncertainty co-exposure confidence band that also substantially overlaps the original one. So this is a quick way of us visualizing how well the spread of the particular data is around tritium.

Now, this is another product that was generated. And let me take a little time here. On the lefthand side this is a density plot with bootstrap uncertainties. So, on the left, if we did this 10,000 times, this is zero to

500 times. That's more of a histogram, as you see across the top. The bottom, or the X axis, is actually the dose.

So, even though the DuPont construction trade worker, the light blue on the far right, that's around 6-point, maybe even 7-point-something millirem, it looks lower than the other two, but the dose is higher. It's lower because it has a wider spread of distribution, largely due to the fact that it's a much smaller population, so you have a greater uncertainty associated with that.

And just like the construction trade worker, this was the 6.5 millirem that you see here. And it's got a very tight distribution around that uncertainty, from the density quad. And that's largely driven because that has the highest number of construction trade workers.

And then, finally, the subcontractor construction trade workers is more of the red or the pink version that you see here. And that has the lowest exposure, close to 6 millirem, even though -- and its uncertainty is fairly tight, a little bit tighter than that of the DuPont.

So, these are two different products that come together to give us an observation around the uncertainty associated with the bootstrap techniques for us to understand the dynamics in these co-exposure models.

So, what are we taking away from it? First question? Did I hear questions?

(No response.)

Dr. Cardarelli: Okay. The first one was representativeness. What we talked about earlier is what we are seeing in these particular data for tritium results on using NOCTS.

Obviously, during the 1970s the DuPont construction

trade workers dominated the particular number of available data points to be analyzed. And then in the 1980s the subcontractor construction trades dominated the number of available data points. That's something we've already been aware of.

The second implication is the stratification leads to increased uncertainty, which is one of the primary reasons we're asking input from the Working Group of whether or not we should further stratify.

What you see in this particular product is you have the geometric mean in dose in millirem on the X axis. And on the Y axis you have the geometric standard deviation. Now, these two parameters are linked to each other. So it creates the ellipse around the central data point, because if you change the mean you're going to modify the geometric standard deviation. And this is a way for understanding both of those uncertainty in this graphic interface here.

So, just to remember, this was construction trade workers. There's 66 of them in 1986. The average was around 6.5 millirem, with a GSD of around 3.l.

If we were to just now look only at subcontractor construction trade workers, this is those 39 construction trade workers, what you'll notice is, first of all, the dose is slightly smaller. It's around 6 millirem. And the uncertainty around that number gets to be a little bit larger. And that's largely driven by the fact that it's got less numbers. So it's going to show greater uncertainty.

And then, if we only look at DuPont workers, which are 27 in this particular year, you could see that the uncertainty around that dose estimate, which comes to around 7.5 millirem, the uncertainty is much greater. And, again, that's driven because the numbers are smaller. So, is it worth it to break the co-exposure into two separate stratified groups, DuPont, or prime versus subs? That's one of the questions we'll be asking input from the Working

Group on.

So, I just put both of these products together for 1986. We've already seen them both. And these are two graphical tools that we can use to kind of look at each individual year if we needed to. And they're all provided in Dr. Chalmers' report, of how we might want to consider is there particular years that we are concerned about? Or, overall, what is the uncertainty with these various models? So, those are useful tools.

The third implication is, what we've observed is that the sub construction trade workers were generally lower exposed to tritium than DuPont construction trade workers. And you can see that in the red triangles, which were routinely lower in the overall dose. If you take a look at 1986 we're around 6.5. Very tight grouping here, which is one of the reasons we showed that.

But if you go back into the '70s the subcontractor construction trade workers, even with the 95 percent confidence intervals around that dose estimate, are generally lower than that of the DuPont. And certainly when we have the combined, which is the green, you can see that there's substantial overlap for most of the years, such that the all, or the current co-exposure model seems to be representative of both of those cohorts.

But there are years in which they're substantially different, like 1978 year, where the construction trade workers are very much smaller in dose relative to that of the DuPont construction trade workers, even after taking into account the 95th confidence intervals.

The other implication, and I think this is rather obvious, is there's a constant downward trend in tritium dose. This probably is the result of improved radiological controls and decreased exposure potentials over time. It could also be due to a change in the operations, tritium production rates, and things

of that nature. But we can certainly see there's a reduction over time.

What's interesting about this is that the fifth implication is, if the dose itself is less than 100 millirem and I put the red bar across the bottom here, that wouldn't even qualify legally that dosimetry be even performed for tritium because that does not trigger the ten percent requirement or the requirement for monitoring workers. If you can show that their exposure potential is less than 100 millirem it wouldn't be necessary. It doesn't matter.

But they were monitored, and we do have this information. So, what you see here is most of the subcontractor construction trade workers over the course of '72 to 1990, almost all fell below that monitoring criteria, except for 1972. But even that, with the uncertainty bar, fell below that. So that's an interesting observation from this data.

So, our last implication is, can we -- oh, Dr. Lockey, you're on mute.

Member Lockey: Yes, John, one question. That's based on the 95 percent confidence, right?

Dr. Cardarelli: Yes. You can see the 95th per confidence intervals, which are the thin lines going above and below each of the geometric mean. Tim, you had a comment?

Member Lockey: But the implication for monitoring, it's not the mean, it's the 95 percent confidence. Is that correct?

Dr. Cardarelli: Yes. Tim.

Dr. Taulbee: Right. This is the 95th percentile that we're plotting here, Dr. Lockey.

Member Lockey: Right.

Dr. Taulbee: And the 95th percentile confidence

interval about that 95th percentile.

Dr. Cardarelli: Yes. Yes.

Member Lockey: I understand. But --

Dr. Taulbee: Okay.

Member Lockey: The implications for monitoring at 100 millirems is based on the mean or the 95 percentile presumed?

Dr. Taulbee: It's actually based upon the potential for the individuals in that area. But it's also combining all of their exposures, external, internal, et cetera, under the modern standard. So, it's a little bit of a misnomer to try and just pin it down to 95th or to 50th percentile from that standpoint.

Member Lockey: Right.

Dr. Taulbee: So, I guess the point that we probably should have better emphasized here is that these doses are low. And that when you get out into the 1980s type of time period it would be questionable as to whether you would even need to monitor these particular workers. But the site did, from this standpoint.

Dr. Cardarelli: And this is tritium.

Member Lockey: You don't take -- you're not taking into consideration other radionuclides here, correct?

Dr. Taulbee: No. No. This is just the tritium.

Dr. Cardarelli: This is, yeah, just to demonstrate how we gained an understanding of the uncertainty around our models. And, again, tritium was selected because the conversion to dose was very simple and the amount of data that was available allowed us to do this very quickly.

So, now, are the results that we're seeing for tritium, are they really applicable? Can we generalize them to

all of the other radionuclides, like plutonium, fission products, things of that nature? We believe you can, for a variety of reasons, and the fact the site itself was monitored, the defense in depth approach for protection.

And I'm showing the results from one of our previous studies that Tim presented in December, using plutonium Type S exposures between '73 and 1987.

And what we see here for the DuPont construction trade workers on the 50th percentile, or the mean, the intake of 15.71 dpm per day was estimated. In the subcontractor trade workers it was about half of that, 6.97.

So, the DuPont construction trade workers themselves, in essence, had a higher exposure potential than the subs, which is something that we also see, that same trend in the tritium. We saw it in 1979 and 1987, same exact situation.

But when you go to the 95th percentile there's a small shift. Where in the early '70s the DuPont construction trade workers, which by the way dominated the number of construction trade workers at the site, were more highly exposed than the subs. But in the 1979 and 1987 period, when the sub construction trade workers tended the dominate the population they were slightly higher.

And I wanted to point one thing out. Dr. Ziemer mentioned in one of the previous meetings that, is there truly a difference between 279 dpm per day versus 326.1 dpm per day between the DuPont and the sub construction trade workers respectively?

The answer is, well, probably not, from understanding the statistical uncertainties. The difference here is we don't know what the statistical uncertainty is around each of these particular numbers. But we're demonstrating through the bootstrap technique that that can be done. It just

would be very challenging to do.

And that's part of our conclusions here, is we believe data used to generate these models, we believe they meet the completeness definition as described in the implementation guide. But the assumption that the subs were hired for more hazardous work than DuPont, and therefore had a greater potential for tritium external exposure is not supported by this particular data set.

And then the subcontractors experienced lower tritium doses than DuPont construction trade workers at the 50th and 95th percentiles. And I mentioned which we slides we talked about on those.

The other conclusion is we've seen significant overlap in the uncertainty, which implies there's no practical difference between subs and DuPont's, which would go to our desire to maintain the current co-exposure model, which is combining them.

If we do keep the current model what we can say, at least for tritium, is that they would produce bounding or representative dose estimates for subcontractor construction trade workers.

If we were to conduct this type of analysis for plutonium or other internal radionuclides it would be very time consuming and difficult due to the complexity of the procedure to estimate intake or dose.

And what we mean by that is you could do the multiplication approach for all the sensor data associated with that, which we didn't have for tritium. We'd have to do a time-weighted one-person one-statistic, and then run it through the Integrated Modules for Bioassay, or the IMBA program, to estimate the intake modeling.

And then on top of that you have to do that 10,000 roughly times for all of the other bootstrapping techniques. And that could be done fairly quickly once

you get through this point. But, nonetheless, to do it for hundreds of individuals to get that level of understanding would take months and months to accomplish.

So, the concluding slide here is, do the subcontractor construction trade workers exhibit higher internal exposures than DuPont? That was our first question. The bootstrap analysis done here does not support that particular hypothesis.

Should the construction trade workers have their own co-exposure model? We really bring that question to the Work Group.

And then, are the current co-exposure models based upon this and some of the plutonium work that we've presented, are they acceptable for dose reconstruction purposes without going to further stratification?

So, with that, I'm happy to answer some questions.

Member Roessler: I have a question, John.

Dr. Cardarelli: Yes.

Member Roessler: Yes. It's Gen. I don't know how to make the hand go up there. And I'm sure we're going to have a lot of discussion on this and the conclusions. This bootstrap uncertainty analysis procedure, is that now a generally accepted way to do this sort of thing?

Dr. Cardarelli: I would argue that it's a pretty standard statistical approach to understanding various statistical parameters where you have a difficult time getting it.

Member Roessler: Okay. Thank you.

Member Beach: Can I have a follow-up question on that? This is Josie. I had the same question Gen did. Is there some examples of where the bootstrap

method has been used, right off the top of your head?

Member Lockey: This is Jim Lockey. We've used it a number of times. And we have large occupational databases that goes across various job tasks and job positions where we have a substantial number of data and we have to ask the question, do we stratify or we don't stratify? How representative the data is.

And what the bootstrap analysis allows us to do is that you retrieve a sample, and then you put that sample back in and you randomly resample. And you do that time after time, up to thousands of time. And by doing that you really strengthen the database that allows you to look at the geometric mean and geometric standard deviation relationship, the quartiles. It sort of gives you an idea of how strong or not strong your data is.

In this example, we pulled the subcontractors apart from the contractors. And we found that when we pulled them apart the uncertainty increases, with the stipulation that they sort of have the same bell distribution. Then that means they pretty much belong together. They fit together well.

If we would pull them apart and the two groups' uncertainties decrease, that means they most likely need to be separated. But the idea is, this sample-resample in a random fashion allows you to generate large numbers using the original database in a random format.

So, for example, if you had some outliers, you have a possibility of sampling those outliers five times in a row and putting them into your calculations to see how that influences the overall model.

It's helpful for us in looking at these types of large data, because in very few databases do we have all data. It's very unusual. And in some of our studies we have a substantial number of data but we still do it to make sure that we are not misrepresenting

something. So, the answer, Josie, yes, it is used.

Member Beach: Thanks, Jim.

Member Ziemer: This is Paul. Could I ask John or maybe Tim, when we talk about bringing in subcontractors for more hazardous work, for internal dose, do they actually calculate a working time limit for a job based on internal dose?

Dr. Taulbee: It depends upon the area and the time period. We have seen where they were doing some tracking of the DAC-hours when they were doing some refurbishing on one of the B lines in the late 1980s, I believe, from that standpoint.

In general, though, the bringing workers in for more hazardous work is really more tied to the external dose where they were directly measuring what the external dose was, and they didn't want to burn people out.

Member Ziemer: But that's exactly my point. When I worked at Oak Ridge, we did a lot of what we called burning people out, and we stood there with stopwatches in our health physics group and timed them, and they would get a -- well, we actually worked in terms of daily dose limits, and that might occur in 90 seconds or something like that.

Dr. Taulbee: Right, and --

Member Ziemer: And those were clearly burning people out. On internal, typically, you don't want them to get any exposure.

Dr. Taulbee: Exactly.

Member Ziemer: You're working with zero. Now you could calculate, perhaps, if something went wrong, there might be then some concentration.

But I have never actually seen anybody have a limited work time for internal if they were properly

masked or had the external meeting protection.

So that's what I was really concerned about, the idea that we were burning people out. Internal would be much more likely that their exposures would be similar to the regular workers -- or workers.

Dr. Taulbee: That is correct, sir. The one exception to that is tritium from that standpoint, from the internal standpoint. There are some times where you will use stay times because of saturation of the bubble suit or so forth.

Member Ziemer: Right.

Dr. Taulbee: So that's one of the benefits of using this tritium analysis here. But really, our main --

Member Ziemer: Right. But the tritium is -- the doses are so low to start with. So, I mean, those 5 millirems, I don't even worry about the error bar in that. You don't even worry about the 5 to start with. But that's my personal view.

Dr. Taulbee: Dr. Anderson has his hand up.

Chair Anderson: Yeah, I would just say that bootstrap can be helpful, like per Jim's research projects where you have these large databases.

What it does in this instance, it's really trying to increase your numbers, which then reduces -- since you're sampling out of the same timeframe you're now just adding a whole lot of additional people in but you're not really adding any samples.

So it somewhat skews your statistics to look more significant when in fact, you don't -- in this instance here, you only have the 66 or 27 people you're really working with and that -- again, we're talking here about people who are drawn out of a group that have filed for compensation.

We really don't know how representative that group

is of the overall group that's been exposed unless we were to look at the other measurements.

So it's a interesting statistical technique, but I'm not sure that it proves that it's representative, and you got to -- the group where you start has to be representative. But we don't know that.

Dr. Taulbee: Well, I would say, Dr. Anderson, that from a representativeness standpoint, these are all claimants.

So these are all people who got cancer, and from the standpoint of -- from a dose-cancer relationship, this would not be diluted by people with low exposures who did not get cancer.

These are people who are all claimants. Every single one of them that we used in the analysis here are claimants and so we're using a group of monitored workers and developing this and stratifying to apply to a group of unmonitored workers.

Chair Anderson: But you don't know what the unmonitored workers -- what the distribution of cancers is in that group. And you don't -- I mean, the other thing, you look at the cancers -- so they're all cancer. But a lot of them are going to be prostates and other -- I mean, are they all eligible and got their number of days in and all that?

So, you know, who actually hears and gets to file is not a random sort of event, I don't think. So how representative is it of all the workers at Savannah River Site who may have been exposed? There's a lot of people who may have had high exposures who don't file a claim.

Dr. Taulbee: That is true. But if you're -- I mean, this population, if anything, because of the cancer preselection component should be higher than those amongst the general SRS population.

So that's where we feel this is representative, and

then we further, you know, stratified to do this comparison to figure out more of how much uncertainty is there within this group.

Member Lockey: So these cases are all cancers compared to everybody else, correct?

Dr. Taulbee: These are all claimants who have filed -- who have filed claims. They all have cancer to be in the NOCTS data set.

Member Lockey: Right. Okay. And so this would be, if anything, if they have cancer, you would suspect their exposure levels to be higher?

Dr. Taulbee: That is correct, sir.

Chair Clawson: But not officially. There's a lot of people that have come down -- have not had cancer and have way higher doses. It's just part of the thing of the human bodies.

Member Lockey: But if you're -- if you're saying that increasing dose is related to cancer in general, we would say that this would be about bias population.

If we're looking for increasing radiation dose, you would pick a cancer cohort to say that's probably where we're going to see the increased radiation dose.

Chair Clawson: You could. One of the things that's interesting to me about this -- and I've told you guys this a long time -- this program is like a great big computer. You put garbage in, you're going to get garbage out.

This is also something else I want to remind people. This is a comp program. This is not go out and evaluate if we've monitored or got to there.

This is also why we have an SEC put in place, too, because if we don't have the data, sufficient data, this is why it's there. I think -- I think it's all really

interesting stuff. Don't get me wrong. I think some of these analyses and stuff like that have really been quite educational to me.

But I just keep coming back to that -- what this program was all set up for, what we are supposed to be doing with it.

Member Lockey: What I see with this data is that it is -- in this data set, looking at tritium, that this is pretty solid data.

I mean, if you resampled this 10,000 times, we're looking to try to make it diverge and you can't do it. It is solid data. I mean, at least for tritium. Now, whether tritium is representative of other radionuclides, et cetera, I guess we would have to discuss.

And I wasn't looking for this, but that the subcontractors had a substantial lower dose in comparison to the DuPont was a revelation to me and I didn't understand that.

I thought from what we'd been thinking that the subcontractors in relationship -- or this relationship to tritium the subcontractors had a lower dose.

Whether that applies to the other radionuclides or not, I guess, raises the discussion that in some cases it's somewhat applicable to the plutonium and other cases not.

And then the third point I got from this is that after 1980, at least for tritium, if you're just looking at tritium, the biological plausibility of an adverse outcome at that dose is -- will be very difficult to measure.

Chair Anderson: I mean, one of the other things about the bootstrap, what that does is it helps you control for outliers. So the more your data is distributed in a normal curve, the more likely are you able to randomly select and have it be representative

that way, and that's partially why the more times you go through it, if it isn't a bell-shaped curve, you're going to be sampling more lower people than you are on the higher end.

If it's normally distributed then, basically, you ought to be able to almost reproduce it. So it helps you understand, one, I mean, you're using a geometric mean partially because this tends to be a one-sided tail on your exposure estimates.

So it's a helpful technique to understand visually how your data is distributed. But I'm not sure it really helps with being representative.

Member Lockey: I would agree with Dr. Anderson, is that if we pulled the two parts apart, subcontractors out of the whole group, and the subcontractors had a lot more outliers, we would see that, that that group then also in their comp zones with resampling would become tighter, which would have indicated that that group really is different than the contractor group.

Chair Anderson: I mean, the other thing to look at here is when we talk about outliers, these exposure that are in this particular example with tritium already are pretty low. So you're bordering on the non-detect side of things.

Member Lockey: I don't think censored data was put in this, was it?

Dr. Taulbee: No. One of the nice things about tritium is that we really can measure extremely low doses. So --

Member Lockey: Well, I don't think censored data is appropriate here, right?

Dr. Taulbee: That's correct. There isn't any in this case.

Chair Anderson: In this case. Oh, okay.

Dr. Taulbee: There will be with plutonium or --

Chair Anderson: Yeah.

Dr. Taulbee: -- and mixed fission products and others. In fact, censored data would be a significant issue.

Chair Anderson: Yeah.

Member Lockey: So you've got to explain again to me why you think this may be representative of the other radionuclides.

Dr. Cardarelli: Well, that's our implication six, and we have looked at the plutonium Type S, largely because it has a long retention period in the body where tritium doesn't. It's very -- it clears very quickly.

That analysis here that Tim kind of presented back in December kind of showed that at the 50th percentile the DuPont CTW's exposure, at least in the '70s, was about twice that of the subs and then they were about the same, roughly, in 1979 and 1987.

That's the same type of trend we saw for tritium. So you know, that -- there's an extrapolation there. But we don't have the uncertainty numbers around that. And then, of course, on the 95th percentile, if you take a look at the right hand side you get to see a little flip flop.

But the numbers themselves, I would argue, probably have enough uncertainty around them that there's probably no strong statistical difference. But I cannot say that with the data that we present here. I'm just showing you what the point estimates are.

Dr. Taulbee: The point that I would add just a little bit to that is the 50th percentile of the data is more driven by what I would call routine low-level exposures, if you will, from that standpoint.

The upper 95th percentile is going to be driven by

your incidents that occurred, and because the DuPont CTW 95th percentile and the subcontractor 95th percentiles are quite similar from that standpoint, this is why we feel that this would be applicable to other radionuclides.

The upper tail of your distributions are going to be driven by the incidents, especially for the other radio -- or for mixed fission products, for plutonium, etc.

So that's why we feel that this is applicable from that standpoint. It's not just the tritium analysis, but when you couple that with the limited plutonium analysis that we presented back in December and showed these intake numbers being quite similar, this is why we feel we can generalize it. Does that help?

Member Lockey: One other question. The tritium analysis -- this data mainly comes from work in and around a nuclear reactor?

Dr. Taulbee: The reactors as well as the tritium facilities. They did take -- there were tritium targets that were irradiated in the reactors, and then they were separated in the tritium facilities to extract the tritium.

But actually the majority of the exposures come from around the reactors. Once they got it into the tritium facilities it was mostly a glove box type of operation. But those are the two areas.

Member Lockey: What was the other radionuclides around the tritium facilities?

Dr. Taulbee: None, just the tritium.

Member Lockey: Just the tritium?

Dr. Taulbee: Yes.

Member Lockey: Okay.

Chair Clawson: So John, I just need you to clarify to

me. So what you're telling me is that you feel the bootstrap analysis addresses the completeness concern that we have?

Dr. Cardarelli: Certainly. I think we addressed that in the last presentation and our argument, by looking at the Implementation Guide 006 for completeness, it's not just the number of measurements -- which some people constantly refer to -- it's also whether or not we have a fair and equal distribution of occupations that are represented that were most highly exposed.

So we're looking at the number of measurements, those occupations, and are those occupations that we do have data on, were they the most likely exposed in the group, and we believe the answer to that is yes.

Chair Clawson: Okay. Well, that being said, does anybody else have anything they want to discuss on this before we go on to SC&A?

Dr. Cardarelli: Well, the last two bullets, is there -- it would be great if we could get some feel from the Work Group on either one of those two bullets.

Dr. Taulbee: Why don't we wait until after SC&A's presentation, John?

Dr. Cardarelli: Okay. That's fair.

Mr. Barton: Okay, well I guess that's my cue and, really, there's sort of two main facets to this.

There is how does this bootstrap analysis relate to the SEC discussion -- which is a the entire discussion today -- and the second part sort of in a more of a global sense is can this type of tool, this bootstrapping tool be used, essentially, across the program to determine when stratification is necessary.

So those are really two different -- two different, I

guess, lines of discussion and really, on the first one and how this relates to the actual SEC discussion that we have been having about representativeness and completeness, and just because of the timing of when this work came out SC&A, obviously, didn't have time to do a full complete review of the tool itself in a -- in a programmatic sense. But we do have some initial thoughts on it and so we can discuss that a little bit, too.

But let me just -- let me throw up SC&A's presentation one more time. Again, we only had, really, one slide on this -- the tritium bootstrapping analysis in the context of the SEC discussion.

One thing we note is that tritium -- NIOSH and SC&A specifically agreed when we were setting up the sampling plan for RPRT-0092 -- which, again, is the direct comparison between RWP monitoring requirements and subsequent follow-up monitoring -- we left that out as not being able to answer the question, basically because it's such a low dose potential, as was shown in the presentation, and it's just the reactor areas.

So, I mean, even when we were developing the sampling plan to answer the question about this issue of completeness of job-specific bioassays and the representativeness for those workers in any subsequent co-exposure model, we both agreed to leave tritium out.

Now given that, we completely understand why it was used, just from the ease of converting from these bioassay samples to an annual dose, and it's a lot easier exercise, as John enumerated, than trying to do something with plutonium where you -- now you want to start modeling intakes over a certain -- you know, a certain exposure period.

Now what we see in this SEC context is that this bootstrap analysis really establishes whether you need to stratify. But before you even get to that step,

let's -- let's remember the four major tenets of the implementation guide -- adequacy, are you measuring what you should be measuring, completeness, and representation, which are really tied at the hip, whether your data set is really reflective and can be used for your worker population -- and then after you establish that both of those, now you talk about whether you need to separate it out into different co-worker models.

I don't think you can work -- it's our opinion anyway at SC&A that you can't work backwards from stratification to prove that two groups of workers are the same or not the same if there are questions regarding your completeness and representation in your data set, and I guess SC&A's opinion on this is pretty simple.

Then it doesn't address completeness and representation of the subcontractors who are doing these permit-driven -- again, transient workers, you're not generally going to be on a routine program and we're supposed to be monitored via job-specific permit-driven monitoring.

And I'd also point out that even though we didn't consider tritium in the RPRT-0092, which was really meant to answer the question of whether we have a relatively complete or sufficiently complete data set, there were problems with the tritium, job-specific bioassay as well, as shown in documentation even into the '90s because there was no form that was established until, I believe, about 1996 and so -- and they say, you know, there are Price-Anderson violations for issues with the job-specific monitoring program.

So again, we go back to this may be beneficial in establishing whether you need to pull out different groups for the purposes of creating different co-exposure models.

But before you do that, you really have to establish

and answer the questions about completeness and representation.

So I think those are our thoughts on the bootstrapping in relation specifically to the Savannah River SEC question we have been discussing today.

Now the other side of the coin is whether this is an appropriate analysis to do in a programmatic sense for all the sites once we have established that co-exposure models are feasible and appropriate; is this an appropriate tool to analyze whether you need to pull out different worker populations?

And I think that's a larger question that probably needs a deeper dive. But I really want to focus everyone's attention to the fact that we're talking about whether the two groups should be stratified when I'm not sure that the question of completeness and representation has necessarily been answered as yet and reflective of the discussion that occurred prior to this presentation on tritium bootstrapping analysis.

So again, in our conclusions, and this is the third bullet specific to the bootstrap analysis again, we don't feel that it establishes that the subcontractors who are supposed to be on these job-specific bioassays permit driven are appropriately represented in the co-exposure model.

And so any comparison may be missing a significant portion of the exposed population. We simply don't know. We don't have the information, and I think that is really the main takeaway from an SEC context.

So as far as we see it, the tritium bootstrapping tool is useful, and we haven't done our full review on it yet about how it's -- how it's applicable to broader situations, other sites, other radionuclides and the sort.

But I think the question of whether it changes our position on the SEC matter, we don't see that does,

because if there's a lack of completeness or deficiencies in completeness and representation via the job-specific monitoring program, then any subsequent comparisons sort of lose their, I guess, relevancy, in our view.

And I'll stop here for now. I know we have -- you know, Richard Griffith is on the phone, who is our statistician. He's done some preliminary work on it, and so he might have some questions about that second facet about using this tool in general across the program.

But I'll stop here for now and I guess field any questions for what is a pretty, I feel, is a simplistic view on how this affects the SEC discussion.

Member Lockey: Bob, let me ask you a question about the tritium analysis. I was just looking at how rigorous the data was and how uncertain the data, and apparently there's not much uncertainty of the data when you pull it apart.

So it looks like the subcontractors' and contractors' relation to tritium can be treated as one. But I was surprised that the tritium data indicated that the subcontractors have substantially lower tritium exposure than the contractors, and that's not what I would have thought I would have found based on our previous discussions.

So what's your thoughts about that?

Mr. Barton: Well, I guess the entire concept of differences in exposure potential really is not necessarily borne out of the quantitative analysis, which, again, if you don't have a relatively complete and representative data set you're not going to be able to make any quantitative determinations or quantitative determinations are going to be difficult to address the data that you don't have, that you don't know how those workers would have shaken out in these different distributions.

But it really was borne out of qualitative statements made by the claimants themselves.

Member Lockey: No, I understand that. But I think -- would you not expect that if the subcontractors who were being put in the job tests where -- that were more dangerous or dirty, would you not expect that the tritium results would have reflected that?

Mr. Barton: Assuming that the tritium results were collected in the first place. Again, that's the question.

Member Lockey: Or do you -- would you assume that any of the tritium results -- there were tritium results that were collected, okay, and none of those tend to show that.

So that means that the ones that were missed or the ones that were dirty or high, and the ones that were collected were the ones that were low. That seems not plausible to me.

Chair Clawson: Well, let's take -- this is Brad. Let's take a look at it like this.

If 90 percent or maybe, let's say, 65 percent of the construction trade people are out building buildings and we're using the other 25, 30 percent in doing hot jobs, but you've got all of your DuPont construction people working continuously in these facilities, what would you expect to see then, James?

The DuPont people were going to be higher because we have got a much smaller group in these points that are going to --

Member Lockey: If the -- if the DuPont people were doing the more dangerous jobs, they would be higher. I guess what I'm asking, Brad, is in the database -- in the database for the subcontractors, I would expect at least some of that data to reflect tritium concentrations that are more reflective of the DuPont results, and I don't see that and I don't understand that.

Chair Clawson: Well, have you ever thought that maybe the information coming in is flawed? Because I'll tell you, I'll be honest with you and I was surprised but I --

Member Lockey: But even that, Brad, what we're saying is the information that is flawed is all the information that's high.

That's the flawed information, or screening out the high information. And that would be a very -- if that's the case, then I would understand it.

But on a random basis, I would expect to see some of the tritium data in the subcontractors to be reflective and similar to what the DuPont data was, unless there's an active movement to just exclude any monitoring in a potential where there's high tritium for the subcontractors.

Chair Anderson: Well, and here's a question that -- another would be, if you're in an area where you're being tested for plutonium, would you also be tested for tritium?

I mean, is it a suite, or if you're in a hot area you're going to be -- being tested for your most concern and is tritium always looked for where it could be that those who are in the tritium facility where that's the only radioactive element they'd be exposed to and they may have lower levels in those areas.

It could be that your hot jobs are not being tested for tritium because they're being monitored for other elements. Is that -- I just don't know the programs that well.

Dr. Taulbee: No, that is not -- that's not the case. They would do the monitoring based upon the radionuclides that were of interest in that area.

In particular, the vast majority of the tritium bioassay that we have is from the reactor areas where the tritium exposures occurred, as well as the tritium

facilities. That's where all of the data is. It's where 99 percent of the data is coming from.

So it's not that if they're working in a plutonium area then, you know, we're going to sample them for tritium. That's not the case.

That's not how Savannah River set up their programming, and if you look at the bioassay control procedures detailing who is monitored and where, then you find that it is done by area and by the radionuclide of interest in those areas.

Chair Anderson: You only have one radionuclide of interest?

Dr. Taulbee: In the reactor areas, no. You've got both tritium and fission products. In the plutonium areas it's predominantly plutonium from that standpoint.

In the A Area, you do have more of a mix because they were doing more research in that area where you'd see plutonium mixed fission products.

You actually don't see tritium there because in the A Area they didn't work with tritium in high levels. They worked with it as protium or deuterium. They didn't need to do the research with tritium directly. We learned that from interviews.

Chair Anderson: Okay.

Member Ziemer: Well, this is Ziemer. One other possibility is that many of the subcontractors might have not worked the full year as a regular employee. But we sort of end up -- if you normalize this to exposure per day of work, it might look very different.

Jim, maybe you can clarify. A subcontractor, do they typically -- are they there the year round like a regular worker or are they just brought in for special jobs?

Dr. Taulbee: They are brought in for special jobs, but some of them are there for year round. It depends upon the work that was going on.

One thing that we have learned with at least tritium monitoring and discussions with workers is that tritium monitoring when they were doing the jobs was done daily, and they would get together the following morning and the foreman would go through the list of bioassay results of -- and some people were excluded from the workplace at that time due to a higher bioassay than the set point.

So they were monitoring tritium really on a more daily basis, depending upon the specific job.

And one thing I would like to point out is that in John -- one of John's slides there, if you look at the co-exposure model that we currently have, in the 1970s the DuPont CTWs far outnumber the subcontractor CTWs with regards to their representativeness in the co-exposure model.

But the inverse is true in the 1980s. There are more subcontractor construction trades workers in those 1980s, and yes, thank you, John, for showing this slide right here.

So this speaks to the representativeness that people have been bringing up, and Bob, you brought up. In our current co-exposure model, post-1981 on a individual basis, and remember, we're using individuals here, it's -- with tritium we can calculate dose.

We don't have to do TWOPOS from that standpoint. We can calculate an individual's dose. And so there are more subcontractors represented in that combined construction trades model -- trades worker model than DuPont construction trades workers in those latter years.

And you can see the number of workers that are represented there, and this is amongst the claimant

population that you see here.

Member Lockey: Does that mean that the DuPont workers had the -- had the more dirty job tests during the latter part?

Dr. Taulbee: No, it's more of the shift of relying more on subcontractors and less on their in-house people that shifted from the 1970s into the 1980s.

And so that's why we see more of the subcontractors coming in in the population for this -- for this co-exposure model. Does that make sense?

Member Lockey: It makes sense. I think -- I was just trying to find something.

Dr. Taulbee: Okay. And if you -- scroll a couple slides down, John.

And what you'll see is when this happens that we have got more -- there. When we have got more of the subcontractor construction trades workers, it's also coinciding with more control of the work along those lines.

And so this data in the late 1980s is exceedingly low from that standpoint, and you got to keep in mind that the subcontractor construction trades workers are the dominant in that particular -- in that time period. They're post-1980. And we're seeing that, you know, the two groups there's really no practical difference between them.

Member Lockey: But in general, the DuPont workers had the higher exposures?

Dr. Taulbee: In general. Yes, sir.

Member Lockey: Okay.

Dr. Taulbee: And one of the reasons that we included tritium here, and I know Bob spoke to this as -- you know, it was excluded from RPRT-0092 because we didn't feel that this was a SEC issue.

The tritium was well monitored and that there really was no question that we could estimate doses for subcontractor construction trades workers or DuPont -- for anybody at the site.

Tritium was an easy bioassay analysis to do. They did a lot of it, as you see, you know, just in this time period. Within the NOCTS population, we have 140,000 bioassay and 32,000 of just construction trades workers.

So they did a lot of this bioassay, and one of the reasons we did this was the initial straw man of a potential Class Definition that we saw shortly before the Board meeting in December included all radio -- all internal radionuclides, and that's what causes us a great deal of concern here because we know we have got tremendous amounts of tritium monitoring. And in addition to that, these doses are very low for this population.

And I tried to bring that out in my December presentation but apparently didn't get my point --

Chair Clawson: So what you're saying is if I stipulate the tritium not -- that they're able to do tritium but nothing else then you'll be happy with it?

Dr. Taulbee: That is not correct, sir.

(Laughter.)

Chair Clawson: Oh, no? Well, that's such a small dose we shouldn't worry about it, you know. You know, I guess of my problem that I'm going back to is that we have for years now been going over this construction trades versus the other trades.

All the different revolutions that we have done on all this that have kind of fallen to the wayside we could organize them by As and Bs and then different badges and everything else like that.

And I'm -- this is my personal opinion, but I really

have a hard time feeling that we have got a good grasp on this, because Dr. Lockey brought up something. He says, boy, this is sure interesting that the DuPont people are higher than the others.

You know what? There's 10 or 12 different reasons probably why that is. But the one that really struck me that got me interested is because in the late 1990s, because that's when it came to Idaho, was that you weren't on a bioassay program or monitored internally if your department could say that you were under 100 millirem. But we still made dyes. We still made everything.

And then all of a sudden we come down here and see all those construction trades were just sitting right below 100 millirem. That's the one that interested me. That's the one that I find really, really interesting.

But that being said, somebody wanted to interject something. I'm sorry. I --

Mr. Fitzgerald: Yeah, Brad -- yeah, let me interject on this discussion about, you know, DuPont higher, lower, you know, where did the subs fit in, the fact that you had so many more subs showing up in the late '90s relative to tritium records doses.

I think we can't divorce this from what was actually happening operationally at the site. You know, there's a reason for the uptick of subcontractors in the late '90s.

You were shutting down production, tritium production, at Savannah River. The K Reactor went down. This was post-Chernobyl, and you had pretty much all production cut off, and you had an influx of subcontractors to work on restart of the production reactor because, again, the tritium source was cut from the nuclear weapons program.

So this was a extremely, as you can imagine, high priority influx of thousands of subcontractors to

Savannah River to work on that. But you don't have production anymore. Basically, you have access requirements for the subs to, you know, work at K Reactor. Anywhere in the K Reactor fence line you'd have to be bioassayed for tritium, even though you're being exposed to residual levels that existed in and around.

I mean, tritium contamination was pretty prevalent around the reactors, but you didn't have production sources that were, you know, high sources. You just had these contamination levels that anybody who worked anywhere near a K Reactor had to be sampled.

So you have two trends. You have a lot more subcontractors coming on site, thousands in the late '80s into the early '90s, and you had certainly a lot of tritium bioassays.

But they're, you know, predominantly going to be lower level just simply because you're dealing with the residual levels of tritium that existed in the environment and around the reactor.

So this just goes back to, I think, what Brad mentioned and what Bob mentioned earlier. You got to be careful about trying to draw these conclusions about comparisons and what the tritium exposure levels may suggest because, you know, again, the operational sources of exposure behind that, the source terms, may be much different over time and much different between classes of workers.

So I would just make that comment on tritium in particular because that was a big deal in the late '80s, into the early '90s, because of the cut off of production -- tritium production at Savannah River, probably the biggest thing that happened in that timeframe.

Member Ziemer: This is Ziemer again. Joe's quite right. The K Reactor shut down and never did restart

even though they spent a lot of time and effort getting it back to operational conditions.

It never was allowed to restart. That was -- I guess, Joe, I know it was going -- the effort to get it restarted ended about '92 and they declared it ready to restart but it never was allowed to. So late '80s, early '90s.

Mr. Fitzgerald: Yeah, it turned out that, of course, the end of the Cold War made it unnecessary.

(Laughter.)

Mr. Fitzgerald: But between about '88 and '90 -- I think it was '92, there was a fierce amount of effort to get that restarted, and that's why I'm saying when you look at these bar graphs, just a tremendous uptake on subcontractors, a tremendous uptake on bioassays. None of it surprises me. It's skewed everything at Savannah River for at least three or four years.

But again, I wouldn't expect the actual doses to be that high because there wasn't any production. It was just simply whatever, you know, may have been leaking or existing in the environment.

That was pretty much it. And with the half-life, you know, you just wouldn't have a whole lot to worry about.

Chair Clawson: Well, that being said, is there anybody else that wants to ask any questions? And I appreciate that because, you know, this is something that's really been interesting to me is if you don't have a lot of the real history of what was going on at the time, a lot of this stuff can really look -- to me look skewed. They really do.

And you know, I found a lot of this very interesting, but I think we need to take a look at where we're going to go with this. But we have got decisions as a Board.

We have got a table motion right now until we could get through this information of being able to go forward, and I want to make sure that everybody that I've got, you know, can weigh in and express their feelings on this because this is going to come down to the Board and making these decisions on this.

Well, I guess what I would look at, and I'm looking mainly at the Savannah River Work Group, but Paul, it's also your group because this is kind of the test run, as they said earlier, of what we're looking at on this for the co-exposure model.

And so I just -- I guess what I'm looking for is people's inputs on this. Phil, do you have anything that you want to say or concerns or issues?

(No response.)

Member Lockey: Hey, Brad?

Chair Clawson: Yeah.

Member Lockey: This is Jim Lockey. I agree with you. I think this really is a co-exposure modeling issue that, Paul, your group's going to have to write -- provide some guidance or at least some input on this because it would be helpful.

Chair Clawson: Well, also, too, I agree with you, Jim. But also, too, we have got two different valuations of what the co-exposure model is saying, too. We have got two different opinions on that, too.

Member Lockey: That's right, and we have two groups that are well qualified that have come to completely two different opinions, which I find troublesome.

It's sort of like the CDC in conflict with the National Academy of Allergy and Immunology in relationship to COVID.

Chair Clawson: Well, I think we see a lot of different

opinions on that, to tell you the truth.

To tell you the truth, Jim, see it. I don't see anything new with this. We both have our sides that we're looking at at it. The thing is that we have got to look at what I always want to make sure that we represent, and that's the claimants.

Both of us are here to be able to do a job and the number-one thing with me, period, is the claimants.

I'm not -- I'm not out here doing this for the fun and games and stuff like this. I'm trying to be able to represent the claimants the best that I can, and this program should be doing the same, too. And I'm not saying that it isn't but it is -- it is important.

Member Lockey: So the question is, is the process typically defensible, which NIE says it is? Is it claimant favorable, which NIE says it is?

And SC&A is saying the process is not scientifically defensible, and I'm not sure what they're saying about claimant favorable. But they're saying it's not scientifically dependable.

Chair Clawson: No. And you know what? This comes down to the Board. This is the Board -- the Board has got to be the ones that adjudicate this. This comes down to us as a Board, bottom line.

Member Lockey: Yeah, so it's --

Chair Clawson: And basically, it comes down to what SC&A says or NIOSH. It comes -- it comes down to us.

Member Lockey: I agree, but what I'm saying, Brad, is you have two well-qualified scientific groups that come to different opinions, right, and that -- and that is not helpful. Okay.

Chair Clawson: No. No. No, it's not. But are you really surprised? Because to tell you the truth, I sit in a lot

of scientific discussions, and everybody has their own opinion on it.

But the problem that I have, and maybe this is what you're having, too, is that these are -- you know, people are involved. It's not a theory or a thought, but people's compensation is at stake here.

Member Lockey: If we go to the compensation issue, is it based on the current model? Is the current dose reconstruction claimant-favorable? The answer is yes. You know, we're dealing with 95 and 99 percent comp intervals.

In some of the dose reconstructions I've seen skin cancers to compensate for one rem exposure. So it is a claimable process even when NIOSH is going through, and I'm in agreement with that and we push that. It's a very claimant-favorable process based on the current available data.

So the question is, is -- you know, if I look at NIOSH's data and I look in SC&A's data, you know, I can -- I can see positions that are taken that really are skewed and presented in a one-sided fashion, and that bothers me because it almost is like the two groups are taking advocacy positions, and that's not what our Board needs, and that's why we're in the position we're in.

Chair Clawson: Well, the other thing, though, is -- and I know that you wanted to punt off to Paul's group, but this really comes down to the Savannah River Work Group, and scientifically, under the program and stuff like this, it can all be put out to us. But ultimately it comes to us as a Work Group to put out a decision. Once we have put out a decision, if the powers to be say that, you know, they don't agree with it or whatever, they -- that makes it so we can do it.

Member Lockey: I agree with that. No, I wasn't trying to leave it on Paul's group. Eventually his group is

going to have to address the issue. It may not be in relationship to Savannah River, but --

Member Ziemer: Yeah, this is Paul. Let me insert a couple of comments here, and that is to start with -- my clock is chiming now. Can you hear me against the chime?

Chair Clawson: Yeah.

Member Ziemer: Okay. So the SEC Work Group is mainly functioning to assure that as we approach SEC petitions for a variety of sites which have very different situations that we are addressing the issues of, for example, data adequacy and all of those related issues that we have been talking about.

It's not -- there's not a simple answer that our SEC Work Group can say well this -- this group has met the data adequacy thing so they're okay and this group hasn't.

I think originally Jim Melius asked us to sit in on this sort of to help monitor the complexity of the Savannah River and to lend our comments where necessary.

I don't know that we have been asked to make a separate decision on the adequacy per se. Although we could do that, then we haven't met the goal to consider whether inference is an important part or inference is part of the discussion, as Joe Fitzgerald was talking about earlier today.

I think we have tried to be here to help address some of these issues insofar as we can then expand the Work Group as they consider it a very complex issue.

But ultimately Brad is right that the recommendation to the full Board is a recommendation from the Savannah River Site. The full Board may ask what does the SEC issues Work Group think about this, and for example, right now I would say the -- or the Savannah River Site has looked at these specific

issues that we look at with respect to SEC.

They've struggled with it. They've listened to the arguments of NIOSH. They've listened to the arguments of SC&A. They've considered it fully, and they've made their decision.

But I would like -- I'm glad to hear from the other SEC Work Group Members if they think that we should go further and make the official decisions on the adequacy ourselves of this data and so on. But I just --

Chair Clawson: And I appreciate what you've said there, Paul. But I want to be clear on something, Lockey. If you think about this back four years we have been one-sided on this for four years.

And then all of a sudden NIOSH comes out with 0092, and they walked away from it and went to 94, and now the bootstrap theory, everything else like that.

We have been at the same position of this and none of these -- none of these have changed the issue. And the bottom line is, too, is that NIOSH and SC&A are reading 006 differently.

I think that's -- you know, that's -- the guidance says what it says, but NIOSH is interpreting the criteria. That is where I'm having my problem right now and that, number one, I don't want to -- I don't want NIOSH to think that I'm belittling them in any way or anything else like that.

But I don't read it that way, and I think this is what our biggest issue is, is the interpretation. And we -- because you said that we're kind of changing the -- we haven't changed our stance for four years. It's just been one more thing after another thing after another thing.

Well, if this one won't work, we could try this, and if that won't work we can try this. And I get in trouble for always saying that, you know, time is an issue.

Time really doesn't matter. You're 100 percent right on that.

But to me, I think we're going on 14 years now. At some point, we got to be able to bring this, you know, to an end. But the guidance says what it says, period, to me, and I think --

Chair Anderson: I would just add to that in here as well as what Paul said. I think what I've seen, and that's why at one point for the metals and control group, we want to look at other sites that we have made decisions on.

And I think what's happened here is as we get into some of these sites with difficulty of having enough data, we have really moved to the now co-exposure model -- it used to be co-worker -- and have kind of loosened up the interpret -- at least I would do, as we're kind of on the edge of when is what used to be the fallback of last resort when you don't have adequate data to look at.

Is there adequate data if you develop a co-exposure model, and then we got into what goes -- how much do you need to have a reliable co-exposure model to replace actual exposure of individuals or the Work Group that you're looking at.

So we're really starting to stray out to the edges and I think that's where it really gets to be somewhat -- or not somewhat but definitely subjective on, well do you think it's sufficient and then we get into the reliability in the -- is it adequately protective of bounding.

Well, bounding also has to be reasonable. So, you know, when we talk about some of these other like the wording of the skin cancer things and you look at what was that dose, then you almost get to the point, well, maybe that has strayed over into the -- being unrealistic.

So I think we're sort of at a point where, and listening

to NIOSH's presentation on this data and then some of the other data that they're looking at, is this seems to be the direction now is to move towards these subgroups like the construction workers that are being filed as supplemental petitions to look at relying on more and more as kind of the primary, a co-exposure model.

And I think that becomes where we really have to decide what initially was a fall back to, you know, last chance is we'll take a look at those. Now it becomes the lead to look at -- use co-exposure models combining all of the various groups, looking to other sites to see if we can use those data because their work is similar to what's done at these. So I think we have to be cautious to kind of not overreach on the use of co-exposure models.

Chair Clawson: Well, and Henry, I appreciate that and I think that's really good. But, you know, that being said, completeness and representation is first.

Chair Anderson: Yes, I would agree.

Chair Clawson: And the other thing, too, is is if you remember, right, how long we worked on this co-exposure model or co-worker data, whatever it was, it took a long time and it finally got put out there.

And I don't like to see the goal posts once we have then agreed to something because I did not agree with this co-exposure model, and you know that as well as I do. I did not vote for it. I do not like it and I think it's got a lot of holes.

But that is what's been given to me as a Work Group Chair to be able to work with and that's what I'm going to work with, and that's the rules of the game there.

But I also don't want those goal posts because you can't meet this criteria, let's move the goal posts five feet and then we can shoot it on through. That I -- that I do not agree with and that's a little bit to be

put there.

Member Beach: This is Josie. It sounds like you and Henry are agreeing with each other, and I wanted to make one correction.

Chair Anderson: I'm just too wordy.

Member Beach: Well, Henry's the Chair of that Work Group, the SEC Work Group. We keep saying it's Paul's but -- Paul is a Member but Henry's actually the Chair. Just a correction.

Chair Clawson: Thank you, Josie. It's just because Paul is such a pillar of the community.

Chair Anderson: And Henry relies upon Paul. You know, I don't have the work experience at the facilities.

Chair Clawson: Let's be honest. We rely on everybody here and that's what it comes down to, you know, and each one of us has our area of expertise or that we think is a expertise in some place.

But I think that we need to be able to address this and this, myself, lies with the SRS Work Group. And I guess, you know -- I guess my question to the SRS Work Group is at the next Board meeting do we want to untable this and discuss it as a full Board, because that's where it goes.

It's already came from the Work Group. We have done all of our due diligence on all the information that's put out there and everything else like that.

So that being said, as we move forward, and I'm speaking just to the SRS Work Group, I'd like to know your feelings of opening it up to the Board because I think that we have done everything. I haven't seen anything that's changed anything, really. But I'm open to discussion. So Jim?

Member Lockey: Well, Brad, I concurred with you that I don't think we're going to gather any more data that's going to be helpful for us.

We have to deal with the data we have, and this has been a useful process for me. I spent a lot of time at their -- our last few meetings to get a better understanding and clarity as well as insight into this and, you know, I feel -- my position is I feel NIOSH has presented significant enough data that they can do a very good dose reconstruction.

But I wanted it to go to the Board because I think we have to have the Board make a decision and finalize this because I don't think it's worth pursuing any further than that.

But if I had this as a database, I would be glad to use this data in a dose reconstruction to look at mortality, and I don't think there would be very few holes in that study.

This is the database I'd love to have. You know, we have an abundance of data in the modern period. Exposures were decreasing. A lot of the exposures were at least under 100 millirems.

We really run -- I know we're not supposed to talk about biological plausibility but we run into a biological plausibility issue in this modern day and age. Do these low type of exposures really present a risk at all, and is that risk measurable?

They're most likely not but that is reality. That is reality. This is not the 1940s and 1950s and 1960s and early 1970s. It's really not.

And I think dose reconstruction can be done based on the data that's available in a very claimant-friendly manner, particularly when we put in place the 95 and 99 percent competence intervals. I mean, that is all encompassing of this data.

And I have not seen SC&A present anything

otherwise that says it's not. They say there's holes in the data and there are certain percentages that aren't monitored. But they actually did not present objective data that says that's the case.

Chair Anderson: Okay. Thank you.

Member Ziemer: Brad, could I make another comment even though I'm not the Chairman of the SEC?

(Laughter.)

Chair Clawson: Sure. Sure.

Member Ziemer: If the Board does choose to proceed with this, it's got to be very clear in the letter that NIOSH doesn't agree with the recommendation.

It's got to be clear that SC&A does support the recommendation, and keep in mind that neither NIOSH nor SC&A nor the Board decides whether it's an SEC.

We make a recommendation which can be ignored. It's Congress that makes the ultimate decision based on the recommendation of the Secretary of HHS.

So we're not making the ultimate decision on this, and I think it's quite fair to have opposing views -- it's almost like the Supreme Court, I suppose -- but to have opposing views.

Science is very much that way where -- and particularly in complex things. This is not -- Savannah River Site is just a great example of the complexity of what we have been asked to do, which I suppose the Congress originally thought it was fairly straightforward to look at the -- look at this, A, B, C, and they didn't -- they didn't make it easy for us because they required some very specific things, which NIOSH has done a great job of carrying out and which are -- the Board's contractor has done a great job of reviewing.

So, you know, we have, in essence, been asked to have our science looked at critically, and we have both views in this case, and that's fine.

We had this before, at least in one case I remember, Bethlehem Steel. The Board was very split on that and NIOSH and SC&A were split on that. And, ultimately, the Secretary had to make the decision.

So we need to keep that in mind. Don't feel badly if you're defending a particular view. I think that's healthy and it's good. We don't have to agree on everything.

Chair Clawson: And I appreciate that, Paul, because I believe totally that this is why the Board is set up the way it is, to look at these different views, and the more different views that we have the better product that we're going to get out.

And I'm glad you brought up Bethlehem Steel because I was trying to remember which one. It's not -- it doesn't matter. You know, this is the Board's decision to be able to make. The Work Group is just making a recommendation. And Rocky Flats. On both of them we had split decisions on them. It was a totally different thing. But we've got to kind of move forward on this. We have spent enough due diligence on this and everything else like that.

So, Phil, if you're still on, what is your feelings about moving this forward to the Board?

Member Roessler: Brad, could I make a comment first?

Chair Clawson: Sure, Gen.

Member Roessler: Okay. I don't know if this little hand here shows up. But, anyway, this is a troubling decision. And I'm on the SEC group, not the SRS. But I think one of the things that as Board Members we need to think about is, what is our responsibility? And you mentioned as a Board Member of feeling

responsible to the claimants.

And, actually, our responsibility is broader than that. And it seems to me that maybe we need to kind of look at the whole picture and get someone to remind us of what that responsibility is. And I'll just end that statement there.

The other comment I'd make on this particular discussion today, and I think the SRS group may want to vote, when we get to the Board vote I will definitely vote for -- I guess when we talk about sides, NIOSH's approach, I'm totally convinced it can do dose reconstruction. I have not been convinced by SC&A that completeness and representativeness has not been addressed. I think we're using some different words here, but I feel that if there were a vote I would say yes, I think NIOSH could do a dose reconstruction. So, you wanted some opinions and I thought I would just give you those now.

Chair Clawson: And I appreciate that, Gen. I really do. You know, it's neither the position of NIOSH or, you know, the petitioners or NIOSH. You know, we do -- and I agree with you 100 percent. I always keep thinking about the petitioners and so forth because they're the ones that are passing away and dying from a lot of this stuff. And so that's where it's at. But, you know what? We have got a responsibility to the American people, too, and I understand that.

But, back to that, Phil, I want to give you an opportunity. Are you still on, Phil? Mute.

(No response.)

Chair Clawson: I guess not. So I'm going to -- I'm going to ask if Richard or -- if anybody else is out there.

Member Lockey: Brad?

Chair Clawson: Yeah.

Member Lockey: We need to bring it to the Board. I don't think it -- we're going to do that today, right?

Chair Clawson: Yeah, we're going to bring it to the Board. I don't think -- I haven't seen anything else that's going in there or anything else like that.

And so, Rashaun, you know, this is coming to the end of the Board meeting here, so I'd like to take in from the Board that we move for the upcoming Board meeting, that we bring Savannah River on to the agenda and --

Member Ziemer: Brad, I think Rashaun's trying to speak but it's not coming through.

Chair Clawson: Hello?

Dr. Roberts: Hi, Brad. Can you hear me?

Chair Clawson: Yes.

Dr. Roberts: Okay, great. I actually had a question for you. I'm not sure that the group has the quorum if Phil -- I haven't heard anything from Phil. He was on earlier, but I don't know that he's here.

Member Lockey: How many do you need, Rashaun?

Dr. Roberts: Three. And Richardson was not on at all today, I don't believe. The other thing I just wanted to point out is that there is an item on the agenda to allow the petitioner or the public to speak, and so I would like to honor that and give them the opportunity because, you know, they were cut off in December.

So I just want to bring your attention back to the agenda and note there's also correspondence as well.

Chair Clawson: Okay. I'll let you take care of that.

Dr. Roberts: Okay. Is it okay if we have the -- with you, Brad, if the -- if I open it up to petitioners or public at the --

Chair Clawson: Yes. Yes. I'll turn the meeting over to you now and then at the very end we'll go from there.

Dr. Roberts: Yes. Let's try to come back around. And I don't know if, Nancy, if you can hear me or if you could try to contact Phil. I'm not sure --

Member Beach: Hey, Rashaun, this is Josie.

Dr. Roberts: Yes?

Member Beach: Oh, bad feedback. Hang on a just a sec, Phil. Phil's on the line. But I think he's having a hard time getting through. But he's there. I just called him.

Dr. Roberts: Okay. Well, he will need to somehow weigh in to this and it may very well be the case that he's connected. But if we can't hear him, then that's problematic.

Chair Anderson: Could he use the chat? Tell him to use the chat.

Member Lockey: Josie, tell him -- tell him to call in by phone. Tell him to call in by phone.

Dr. Roberts: Okay. Well, while she's trying to talk with him, is it okay if we go ahead and have -- although he's -- I wonder -- Josie --

Chair Clawson: Rashaun, we can't hear you.

Dr. Roberts: Josie, do you know -- can you hear me now?

Member Beach: Yeah. Rashaun, he said he's been listening the whole time and he's trying to call in. So I told -- I told him to get off the phone with me and try to do that.

Dr. Roberts: Okay, because technically --

Member Beach: There's some interference, though.

Dr. Roberts: Okay. Because, technically, if we don't have the quorum the meeting really needs to stop.

Chair Clawson: Right. He's here and I'm glad that he made that announcement there. But I would appreciate if you're not talking or whatever that you mute your phone because we're getting a lot of feedback.

And I'll turn it over to you, Rashaun.

Petitioner Comments

Dr. Roberts: Okay. Well, assuming that he's here and he's listening, I'm thinking that we can go ahead and have the petitioners, invite them to speak at this point.

So are there any petitioners that would like to make statements or comments or would like to talk at this time?

Mr. Johnson: Yes, ma'am. This is Warren Johnson, one of the petitioners. Given the late time of the day and past experience, I'll be very brief. I have to say I am once again -- well, even more concerned.

We're now 20 years into this process. For the last several years I've been listening to these meetings. It's my understanding that NIOSH was pushing that they could actually prove the data completeness through the RWPs. Then November 17th of last year, Mr. Cardarelli conceded that critical data is missing.

Is bootstrapping a newly created technique for dose reconstructions? If not, why wasn't it used a decade ago? The obvious answer is that it's not appropriate when claimant favorability is the applicable standard.

It's also concerning to me that NIOSH routinely references worker interviews when it supports its position, but then goes on to disregard them when it points out deficiencies in monitoring, even when this is -- these deficiencies are backed up by enforcement

actions from Department of Energy, the Tiger Team report and the 1997 enforcement action.

I feel like bootstrapping is the appropriate term here. As I understand it, that term refers to trying to lift one's self up by their bootstraps, something that simply cannot be done.

Feasibly reconstructing a dose in a claimant-favorable manner is something that cannot be done here. NIOSH has been trying for 20 years and they just came up with this idea of bootstrapping for a reason.

In regards to the job-specific bioassays, it's well documented that job-specific bioassays are for people who have been on a routine from other areas and now have new radionuclides of concern. The purpose of routine was never to assign a dose.

It was simply to check on the system. And so now to try and pull in this additional data and use it for something that was never intended just so we have enough data points to try and satisfy these statistics is never going to get to claimant favorable.

As to the reference to the 40 percent that wasn't monitored, Mr. Cardarelli's answer was that that probably means they didn't need it.

In this context, it's not appropriate to speculate that they didn't need monitors as there's no evidence to support that. That is yet another anti-claimant favorable assumption.

The fact that we needed 92 to prove -- 092 to prove data completeness and then rejected that because there wasn't enough data just doesn't get us there.

And so in order to get enough data, NIOSH has redefined the monitors to include effectively monitored, which essentially this is a guess that has turned into a co-worker model to get to a co-worker model.

And now adding bootstrap analysis to that guess, as I understand it, we're basically going to average guesses until we get an exact measure. There's no way to get sufficiently accurate to ensure claimant favorability here, and as such, the SEC is appropriate.

With that, I'll yield the rest of my time and I hope that you all have the opportunity to bring this to vote.

Dr. Roberts: Okay, thank you. Thank you so much. I'm going to ask if there are any other petitioners or members of the public that would like to speak at this time.

Ms. Barrie: This is Terrie Barrie.

Dr. Roberts: Hi. Welcome.

Ms. Barrie: Hi. Thank you. I wasn't really prepared for comments. I just have a few, and I appreciate Mr. -- Warren's comments that he just made and I totally agree with his analysis, and the SEC does need to be brought to the full Board and passed.

I have an issue with using the NOCTS database, and I want to give you an example to -- so you would understand it easier.

Let's assume that only the NOCTS database was used for Rocky Flats dose reconstruction. There was a gentleman who was a strong advocate for the Rocky Flats workers who had a very high body burden and exposures over the years at Rocky Flats and he was never ever sick. He never ever made a claim.

So his exposures would not have been used to do the co-worker model or whatever you're calling it now. So I just have a -- that is -- to me that -- you're missing a whole lot of information if you're only using the records from people who have filed claims.

And the last thing that I want to briefly mention is Mr. Calhoun had offered assistance to the Work Group to draft the language for the Class Definition if

they decide to go forward with presenting it, and I have a problem with that.

First, it's the Work Group's responsibility, and the Board's, to define the Class. It's in -- you can find it under 83.15(e) of the final rule.

And NIOSH opposes granting the SEC status. So I think -- there's kind of a -- I'm having an echo here.

Dr. Roberts: Hello. If the person with the phone number ending in 229, could please mute?

Ms. Barrie: Okay, thank you. So there's like -- to me, there's some kind of conflict of interest with NIOSH working on -- with the Work Group to define the Class.

The Work Group, in December, had a very simple Class description and, basically, it was all subcontractor employees employed at Savannah River Site who were employed between October 1st, 1972, and December 31st, 1990. I think that's all that's needed, but I could be wrong.

So I kind of urge the Work Group to decline this invitation, and you have enough experience to do it yourself. So, thank you for allowing me to comment.

Dr. Roberts: Okay. Thank you, Terrie. Are there others that have come --

Member Schofield: Rashaun, can you hear me?

Dr. Roberts: Yes. Who is this, please?

Member Schofield: This is Philip. This is Phil.

Dr. Roberts: Hi, Phil. Okay. Great. Yeah, if you could mute for now, and I'm hearing an echo as well.

Member Schofield: Okay.

Dr. Roberts: Okay. So, glad that you're back. Okay. Any other petitioners or members of the public that

would like the floor at this time?

Mr. Fester: Yes, this is Josh Fester, also attorney for petitioner. I'll keep it brief.

As Warren noted a lot of our concerns here, but piggybacking off of what Terrie said, NOCTS data is just absolutely inadequate sample to base this co-worker model off of.

It's only -- to my understanding, that could -- correct me if I'm wrong, this is only folks that have filed for cancers under the Act and, you know, this -- Warren and my small plaintiffs firm in Hardeeville, we have hundreds of claimants, many of whom never have cancer but have very large amounts of dose.

And I know that's anecdotal, but I think you're missing -- by using NOCTS, you know, as the -- as the sample, I think you're missing a lot. One, for example, I know of -- one of my clients is on the top 10 list for assimilations of plutonium in the history of the Savannah River Site. Never gotten cancer.

So I think you're missing a lot of data by relying on NOCTS and it's just simply -- relying on NOCTS is just simply inadequate. But I will certainly yield, you know, to the Board, and I hope you all can get to a vote this afternoon.

Dr. Roberts: Sorry. It went off mute. Thank you so much. Are there any other comments from the public or the petitioners?

(No response.)

Dr. Roberts: Okay. Well, hearing none, there is another item that concerns a letter that was sent to DCAS and because it was requested that DCAS forward that to the Chair of the SRS Work Group, Brad, and I wanted to see, first of all, if those folks may actually be here.

There was a request that the letter be read at --

actually, it was the February teleconference which we actually -- that's where we -- we didn't bring up SRS at particular teleconference.

We decided to delay discussion until today. But let me reach out and see if Ms. Deborah Dunlap or Mr. Robert Dunlap are on the line and would like to speak about the letter directly.

(No response.)

Board Correspondence

Dr. Roberts: Hearing none. Okay. So, Brad, I just wanted to ask you, do you prefer to read the comments? These are lengthy comments, and I can certainly read through but I wanted to check with you first.

Chair Clawson: No. If you'd go ahead and read with it. I'm pretty sure of it.

Dr. Roberts: Okay. Very good. And bear with me because these are lengthy comments. So it may take a moment to get through them.

So it says, I would appreciate Mr. Bradley Clawson, the Chairman of the Savannah River Site Advisory Board, receive a copy of this letter. We appreciate the opportunity to provide information concerning the date extension of Petition 103, Savannah River Site.

As we communicated with you in previous emails, the Class will more than likely be awarded to construction workers at SRS. The SEM does not include supervision or management for the same hazards as their employees. This is not an accurate assumption. First-line managers as a whole are exposed to the same hazards as their employees.

Some of their offices are located in the contaminated areas and they constantly are out monitoring their employees and looking for hazards in the field.

The following is a summation of why it is of our opinion more thought should be given to operations, RadCon, maintenance, E&I, and laboratory workers as well as the supervision providing job performance oversight to all Work Groups mentioned above.

I, Deborah Dunlap, have attended several community information meetings in North Augusta, South Carolina. During these meetings, I'm amazed at the lack of knowledge the employees have concerning their radiological and contamination exposure at the site.

As you will see in the paragraphs below, as a RadCon inspector I felt inadequately trained and lack of knowledge provided to perform my duties.

It is disturbing that in the community outreach meetings there are career RadCon personnel stating they don't know what they were exposed to. It is reprehensible that construction, operations, mechanics, lab technicians, and E&I personnel depended on these grossly undertrained RadCon personnel to protect them from radiation and contamination hazards.

This is the same department that was responsible for maintaining but, ultimately, losing or destroying pertinent exposure records.

One, very little training during the '80s and '90s was provided to employees before being sent out into the workplace. During this timeframe, the site was hiring a large number of employees due to attrition of employees retiring and expected new missions.

Most of the training was basic industrial practices with no radiological or chemical training. The majority of training was taught by co-workers in the facilities assigned.

This on-the-job training was task specific with no explanation of the associated hazards or knowledge of facility conditions past and present.

With this being said, the majority of this class of workers did not have any radiological knowledge at all. We were employees hired off the street, glad to have a job with great benefits.

We were often told we were the cream of the crop. Safety was emphasized. We were taught about seatbelts, holding hand rails, driving vehicles, and not leaning back in chairs.

This was great information but not adequate for us to understand and protect ourselves from radiological and chemical hazards. The personnel that were retiring were also people hired with no radiological or chemical background.

Most of these employees worked off the 'good old boy' system, did not ask questions, trusted what they were being asked to do was safe, and did whatever it took to get the job done with little or no regard to radiological or chemical hazards they were being exposed to.

Putting our nation first, this class of personnel had no understanding of what an impact being exposed to these hazards had to their health. They performed their jobs with little knowledge of the whole process, which is the turnover we received as well in the '80s and '90s.

Two, I, Deborah Dunlap, was employed as a clerk in 1982. In less than a year of employment, I took an aptitude test to determine if I could be trained for a position as a lab technician or RadCon inspector. Before going into the lab, I was offered a job as a RadCon inspector.

I accepted the position with no knowledge of what the job requirements were. I did have six months training period which consisted of touring the operation facilities including the canyons and reactor areas.

During the training, I was trained on the instruments

used for surveying, which included instruments for surveying for contamination and radiation.

Training was provided for wearing protective clothing including respirators, plastic suits, how to dress out with coveralls, hand/foot protection, and plastic suits.

All of this was taught by a RadCon senior supervisor. Rad worker training and testing was taught before entering the facilities.

Yes, we were trained but with no real understanding of the job duties or hazards. We were always told at the site that we were safe with the best safety record.

I was assigned to L reactor as an inspector. The inspectors were mostly older men, very complacent with their job duties, and did not appreciate the fact that females were taking the jobs that were typically a man's job.

They did not want to share knowledge with new inspectors. L reactor was being refurbished to restart during my time at the reactor. I worked alongside construction, maintenance, E&I, and operations. We were all exposed to the same hazards.

A RadCon inspector assigned to the reactors covered other reactors that were still operating at that time during their outage and over time.

We also covered D Area and N Area for overtime as well. No additional dosimeters were provided or acknowledged for working in different facilities.

I had several incidents while working in the RadCon position. I worked one eight-hour day and eight hours OT to cover a spill that happened on the railroad tracks.

I was not told what the spill was. My job was to survey the soil at the contamination until no more contamination was detected.

To be honest, I had no clue what I was doing and expressed that concern to my supervisor. He did not take my concerns seriously.

I covered a job one night for a line break. The operations supervisor gave briefing at the -- at job site. The operators were in plastic suits. The other participants were in lab coats, standing behind the roped off area to be worked in.

Per procedure, a standby person has to be suited up in case something unexpected happens. He can go into the roped off area.

I asked the supervisor in charge who the standby person was. He indicated he was the standby person. I told him he needed to suit up. He called my manager and had me pulled off the job and have someone that would cover the job with him not having to suit up.

The next night the senior supervisor apologized to me and told me he looked up procedure and I was absolutely right. It is sad that this practice was acceptable and this was the normal way the facilities were run.

Later, the same operations supervisor stuck his hands in some material that he needed added protection. When the RadCon personnel -- person told him he could not do that there was a confrontation.

I covered a fire in D Area one night, again, right there with construction workers. Again, no special dosimeter. Again, not really knowing what I was doing.

I was sent to a reactor to help and gain a good learning experience of working in a shutdown facility. The RadCon supervisor thought it would be a good learning experience to cover a job with a fellow RadCon inspector to measure radiation rates while pulling fuel rods.

I was told to watch the inspector for a while, then I would cover the job. This job consisted of standing on a bridge to monitor for radiation in a plastic suit while the operators did their task.

My fellow co-worker braced himself on the bridge while they moved the bridge to different locations. No hand rails on bridge, just braced feet close to the little ridge on the sides.

When it was my turn, I did exactly as he did. The supervisor was in an area above the reactor called the Fish Bowl. They could observe the job being done. When he saw what I was doing, he panicked and had me pulled off the job.

As I stated earlier, this is how we were trained. This activity is an example of how operations were ran in all areas. I asked to return to clerical.

I felt the job was not for me and, to be honest, for most women. Lots of climbing on scaffolding, put on jobs not trained for, too many rules not being followed, not enough questions if what has been done for years is correct. And while it is not recognized by NIOSH and the Advisory Board, we did a lot of work with construction with same radiological concerns.

I later transferred from clerical to become a lab technician in F Area, 772F, around 1992. I was knowledgeable of the instruments from being a RadCon inspector, which was good -- which was a good thing.

With this job there were several concerns. I was assigned to co-workers to help train me on the different methods performed in the lab and lab practices of coming in and out of hoods and glove box.

We were told that the procedures were written so that any person coming off the street could run the radioactive samples. This was not true for me and, I would suspect, for others.

I had to learn how to perform the method to understand the procedure. At that time, we had many procedures to run the method. You were supposed to have the procedure open to the proper step while performing the method. So many procedures helped with that.

Later, they did away with many procedures. It was impractical to expect a technician run a method by following a five-page procedure while working in containment. Buffing floors was a common practice in contamination areas with no additional monitoring of any kind and no additional protective clothing.

You have to realize that the lab floor had several years of contamination being stirred up by the buffer. Later, this practice was discontinued. The drain system was not working in the lab, radio benches, hoods, and glove boxes.

We would take two-liter bottles out of containment when full and stored them in glove boxes. Once the glove boxes were full of bottles, we were tasked to gather all of the waste bottles, bag each bottle, and dump the liquid waste in the area that samples were entered into the cell.

With this being said, there are bottles from all the labs with different radiological materials and chemicals all being poured down the drain one after another, often with fumes caused by the incompatible chemicals mixing together.

We wore coveralls, plastic apron, and face shields for protection. No additional RadCon coverage was provided for this job. The same method was used for dumping unused samples.

Sample dumping was done when sample bins were full. Cell waste is waste from cells that were used to run samples that are too high in radiation to be run in a regular glove box or hood. Once the cells are full of waste, a team of technicians are tasked with

removing the waste.

We wore two pair of coveralls, respirator, and lead apron and pencil dosimeter. The LTD and pencil monitors were worn under lead apron. We did not wear finger rings until later years.

No head nor extremity monitoring was performed except for those finger rings in later years. The thought by NIOSH that a dose can determine by co-workers' dose is not accurate.

We were all in the same area performing different tasks with different exposure rates. As a lab tech, when we got a heavy rain the basement would flood. It was the technicians' responsibility to mop the water up. No additional protective clothing or monitoring were required.

The dirty protective clothing worn from all crafts were stored in the basement for the laundry to pick up -- was stored in the basement as well as the clean laundry. The worn laundry would often get wet and had to be moved around to clean the water up. Construction did perform a lot of work in the basement.

The area was roped off but personnel could walk around the work area without being monitored. When the elevator was broken, we had to take dirty laundry down the stairs and bring up clean laundry.

This task was performed in street clothes. At times, technicians would put on clean coveralls and discover contamination on coveralls. Plain coveralls were from all areas -- were from all areas were not sorted by area. It was cleaned and bagged up for delivery to the facilities.

In the later years, laundry was contracted out to facilities off site. In the early years, SRS had a laundry facility, which was a known -- which was known as a very hazardous area to work.

The respirators were also decontaminated for reuse, again, not always properly decontaminated. The ceiling tiles in the lab would leak from condensation from the tile above.

No solution was ever made for the leaks. Buckets were put -- placed around the lab to catch the drip. One of my fellow co-workers had one fall on her head while running a sample.

TRU waste barrels were stored in an area that was normally transfers for technicians to go to the individual labs. The TRU waste barrels were not removed in a timely manner.

Number three, I, Robert Dunlap, was employed by DuPont at SRS in 1984. My training to be an operator consisted of respirator use, forklift operation, and CPR. I have previously been employed in commercial nuclear reprocessing as done in F and H Areas.

After the rigorous training I received in the commercial world, I was shocked at what passed for training at SRS. I would like to address the issues related to my time in 221-SA-line.

This facility concentrated uranyl nitrate-depleted uranium. Heated it to drive off all the liquid, the vacuumed and drummed -- the uranium powder, sometimes called yellow cake. Half-face respirators were used only when handling the powder but the entire building was always covered in yellow dust.

Even the control room and offices were covered. Given these circumstances, I was constantly inhaling and probably ingesting this uranium powder. Bioassay samples were a monthly schedule, which I believe to be insufficient.

The concept was to fill the bottle as the month progressed. Because there is such a disgusting odor to open a bioassay bottle, once you started it the top practice was to fill in in one shift. This does not provide the level of monitoring necessary to track a

slow constant intake of uranium dust.

Based on my personal experience, NIOSH does not recognize this when performing dose reconstruction. The irony there is that in the last five years uranium miners have been added to the people eligible to participate in the compensation program.

Uranium miners' exposure is identical to that of those who worked in 221-FA-line. And, yet, NIOSH refused to consider this as a factor in my dose reconstruction.

So how can uranium miners be added while 221-FA-line workers are being discredited? It's because NIOSH contends that the DuPont area program was adequate.

As I listened to the recent Advisory Board meeting on December 9th, 2020, it was clear that Mr. Bradley Clawson adamantly believed same way, but the NIOSH representative constantly pushed back.

It appears to me that NIOSH's involvement in approving this petition to extend the inclusion date is a conflict of interest. If the inclusion date is moved out, NIOSH would receive less work and, subsequently, less funding.

Thank you for your effort in pursuing extending the SEC inclusion period in Class determination. Also, we appreciate your consideration of our information and hope that it provides some insight into the work and monitoring formerly practiced at SRS during the DuPont era and early Westinghouse operation of SRS.

Obviously, the early '90s Tiger Team uncovered these same issues, which validates the proposed extension of the SEC inclusion date and expansion of the class of workers. Debra Dunlap and Robert Dunlap, who have signed that.

So, that's the letter.

Chair Clawson: Thank you, Rashaun.

Dr. Roberts: Sure.

Work Group Discussion

Chair Clawson: That being said, Phil, I need -- if -- Rashaun, is it okay if I take back the meeting for a minute now that we have got Phil?

Dr. Roberts: Sure. Absolutely.

Chair Clawson: Okay. That being said, Phil, I've -- you've been listening to everything. What is your feeling about moving the SEC to the full Board?

Member Schofield: Hey, Brad?

Chair Clawson: Yes.

Member Schofield: Can you hear me again?

Chair Clawson: Yeah.

Member Schofield: Okay. My feeling is let's go forth, put it before the whole Board. I have great concern because, you know, a lot of these subcontractors worked for -- well, one of the guys even said he had worked for six different subcontractors out at Savannah River.

So where they were a lot of these guys didn't know. All they knew is they were assigned. You know, someone take them over to this area and drop them off and you do what you're told over there.

They're not going to know for a CATI report which buildings they were in necessarily, what they did on one day or one week or even one month.

So I'm all in favor of putting them before the whole Board.

Chair Clawson: Okay, thank you, Phil. I appreciate that. That being said, we have all voted that we're

going to move it ahead to the full Board.

Rashaun, I'd like to have plenty of time to be able to discuss that. But I'm going to ask a very big question and this is a view --

Dr. Roberts: Actually --

Chair Clawson: What?

Dr. Roberts: Brad, can I just ask a question --

Chair Clawson: Sure.

Dr. Roberts: -- for what you're bringing to the Board? So let's see. So are we bringing the same thing that was brought before? Is that --

Chair Clawson: Yeah. We are untabling the SRS SEC and bringing it to the full Board because there's too much information that they kind of run out of time. And --

Dr. Roberts: Okay. And is there agreement among the Work Group for the description of the proposed Class that you are untabling?

Chair Clawson: We don't have to come up with that description until the Board votes one way or the other because if the Board votes now then there's no reason for a description.

Member Beach: Can you ask that 229 to mute so we can hear, Brad? Because I can't hardly hear him.

Dr. Roberts: Okay, but let me mute then. And, Brad, if you would --

Chair Clawson: Yes, it's already been proposed to the Board. What the Board takes from that, what they decide one way or the other, then the description would come out on that. If they vote that this is adequate data, then we don't need a Class for it.

But if they decide that there is insufficient data, then

we'll make the Class then. Is that what you needed to know, Rashaun?

Dr. Roberts: So you want to ask the Board -- the question to the Board is that whether or not people believe that there's sufficient data for dose to be -- so you want to just bring that for discussion?

Chair Clawson: We're going to bring this to the Board for a vote and so there's going to be a small presentation. And we can discuss it and revise it if the Board feels, you know, strongly about it.

But it's already put before the Board. We're just untabling it. I would like to have a small presentation, and Tim and Joe or Bob or John, I guess, I'm going to be honest with you. I don't want to see more than four or five slides.

Just to give a background of where we're at, because the last time when we dumped 71 slides onto the Board where they hadn't seen hardly anything, it's information overload.

And so we're just untabling this and proceeding forward. But there'll probably be some questions there. I'd like to be able to make sure that we have got the information that the rest of the Board Members want to ask and go from there.

So we'll move this to the Board meeting. That being said, as Lockey and Gen mentioned of why they felt that there was sufficient data, I want to mention why I feel there is not.

I feel it is inadequate for many areas. Number one, we're looking at 773-A. We're looking at one area. Three hundred areas in the Savannah River Site. We have got partial information.

I do not feel good about where it's at. It seems like the last four years there has been more information, more information to try to make the last information that didn't work.

And if you look at the whole process, we have gone through all of this and we're back to where we were at when we started four years ago.

Now, if this data would have been all that good and all that wonderful right then, I would have felt like that we should have done it clear back then.

But that's my opinion, and all of us have opinions and it is -- there is no problem with us voting this and going ahead without NIOSH's concurrence. That's their position on it.

Because this is just a recommendation, as Paul said, from us as a Board to HHS, and they're going to be the ones that ultimately say yes or no.

So I just wanted to go on record of saying that and just go from there.

Dr. Roberts: Okay.

Member Lockey: This is Jim Lockey. I agree that, and with the Board. I think it should be reflected that I think there is adequate data.

Brad thinks there's not. And that we're bringing it to the Board for a thorough discussion and a final vote, I don't think any additional data is going to add to this.

I will disagree with Brad. I thought the analysis that we just recently performed was data -- really convinced me that this data is strong enough for dose reconstruction and that informed me in relationship with my change in position.

But, you know, it's my opinion as looking at the data over a period of time. But I think it has to go to the Board. I don't think any more delay is necessary here, and the Board will make the final decision.

Dr. Roberts: Okay. I do see a couple of hands raised. I see Jenny had her hand raised and also Tim.

Member Lockey: Okay.

Dr. Roberts: Jenny, did you have a question?

Ms. Naylor: So I have a couple comments. One, in the past, the Board has taken one definitive vote on the recommendation to the Secretary. And when that recommendation is voted on, it has certain clarity in terms of the Class Definition, the finding, that the dose that cannot be reconstructed costs -- you know, endanger the health of the class of worker.

So, you know, you should be ready to clarify for the Board the dose that cannot be reconstructed, and that is part one of your statutory responsibility.

And part two of your responsibility is to justify why that dose could cause harm to that class of workers. And as we know through the program's implementation, DOL has to be able to implement the Class.

So I think what's sort of missing from this conversation is who are precisely those subcontractor CTWs? How would DOL go about identifying them and putting them in the Class?

So that will be something that the Board would also need to clarify either through Brad's presentation or through the Board's discussion. But that part of the conversation needs to be fleshed out.

Chair Clawson: Well, Jenny, that sounds real wonderful. I'm glad you brought all that up. But guess what? We will have to be able to -- first of all, we have got to be able to get the Board one way or another and make the decision.

The Board will consider with DOL as appropriate to be able to implement this as we have always done and we have always brought up opinions of do we think that we can do this, do you see any issues for it, and I know that you've been involved with them.

And any dose -- you know, when it comes down to it, the Board should not have to clarify Class Definition endangerment with NIOSH. So that isn't the biggest issue.

We'll work through that and we'll go from there if -- and I know that we have got plenty of legal counsel there to be able to help us. So, first of all, we have got to get this to the Board a make the decision one way or the other.

Dr. Roberts: Okay. So just for my kind of -- just so that I'm really clear, so it almost seems like talking to the Board is going to be a two-part conversation almost, like, there's going to be a piece that focuses on, you know, whether or not data is adequate or whatever to construct the dose.

And then there's the question about the SEC Class. So it feels to me like those are two separate -- kind of a two-step conversation. Am I interpreting this correctly?

Chair Clawson: Well, a little. First of all, we have to take -- and we have to bring this before the Board. Given that NIOSH contests the -- you know, we accept NIOSH will disagree with the Class. It's not an issue.

But first things first is we have got to bring this before the Board. We have got to tell them where we feel at it. This was already brought to them once before. We had an awful lot of data that came in on that, and now it's going to be up for a vote.

Once the vote is taken, that is when we'd either decide their -- what the Class Definition is and everything else like that or we don't have to make the definition of the Class because it didn't pass.

So it's coming before the Board for the vote. I just want to make sure that if there are questions there that people are able to ask these questions and get clarifying questions answered.

There's an awful lot of data out there and a lot of Board Members may have to go through it and make up -- read before the presentation and go from there. But they've got all the data before them. Nothing's really changed except for what was discussed in this meeting.

Dr. Roberts: Okay. So I know Tim is --

Member Ziemer: A question, Brad or Rashaun.

Dr. Roberts: Yes.

Member Ziemer: Do we have a copy of the issue that was tabled? That's what's going to come up. The wording of what was tabled? Because the Board's going to need to know what years it covers and the exact subgroups.

You know, it's not everybody that worked at Savannah River during that year. So what is exactly in the motion that is coming off the table? Brad, that's what we'll -- we will be voting on, right?

Chair Clawson: Right, it's the -- right. Yeah, and it's the subcontractors, not --

Member Ziemer: And the years --

Chair Clawson: It's the subcontractor SP from 1972 to 1990. I believe it was December of 1990. Just CTWs -- subcontractor CTWs from 1972 to 1990.

Member Ziemer: And at this point, no one has clarified whether Department of Labor could --if this passed if Department of Labor could actually administer it with that description, that we have -- that remains to be the determined?

Chair Clawson: Well, that -- Paul, that would remain to be determined afterwards.

Member Ziemer: Okay.

Chair Clawson: But, you know, you've already looked

at -- NIOSH has already said, you know, that they're able to take all these CTWs and separate them out. So that really shouldn't be a, you know, an issue right there.

Dr. Roberts: Okay. I know that --

Member Ziemer: I just wanted to make sure that the Board knew what they would be voting on.

Chair Clawson: Right.

Dr. Roberts: Right. And I know Tim has had his hand raised for a bit. Tim?

(No response.)

Dr. Roberts: Tim, I think you're on mute.

Dr. Taulbee: Thank you very much. Sorry. This is a question for you, Brad, as to what your expectations are for us as to whether you want us to do a -- I heard a short four-slide type of presentation, which we can certainly do if you would like.

I'm just trying to figure out your expectations of a presentation for the full Board. Is a four-slide summary acceptable to you? Is that what you want? Or do you want us to just give it to you all?

Chair Clawson: You know, I'm going to be -- if you take a look at the last four years of the information that we have gone through on this, I wanted to make sure that you, as NIOSH, have the opportunity, too. But we really did this last time. My whole thing is I'm just untabling the motion that was put before the Board.

But I feel that you need to be prepared to be able to -- if there is discussion to be able to discuss it, and I was thinking four-page -- four slides to be able to just bring them back to speed of where we're at and why you feel the way that you do and why SC&A feels the way they do.

Dr. Taulbee: Okay.

Chair Clawson: And I know that there's a lot of data out there, but a lot of this is we get data overload and I just want the main pitch.

Dr. Taulbee: Understood. We can certainly try and summarize it in four slides and then SC&A can do theirs and to the Board, then.

Chair Clawson: Right, and, like anything, we need to have this well before the Board meeting so that the Board Members that are reviewing this have the opportunity to be able to review it and make questions to be able to ask and go forth from here.

We have been privileged to be able to have the opportunity to go through all these discussions that they have not, and I just want to make sure that they deal with it the best that they can.

Dr. Taulbee: Understood.

Member Lockey: You're going to have your four slides, but I would have backup slides and then I would get all the backup information that those two slides rely on to the Board Members so they had a chance to review it before the meeting, because we don't want them to say, well, I don't have all the data.

I'd like to have them have the data that your slides are relying on ahead of time so they have something to refer back to. That'll save us a lot of time.

Dr. Taulbee: Understood. What I wanted to know if this would be acceptable. I mean, most of this is -- in fact, all of this has been presented before.

So we will pull a compendium together of all of the slides that we have been presenting and then I will just do a quick four-slide summary of pointing to the key points that you could find within all that background material.

Member Lockey: And they should have that background material --

Dr. Taulbee: Yes.

Member Lockey: -- so that they can refer to it. And --

Member Ziemer: Quick question.

Chair Clawson: Go ahead, Paul.

Member Ziemer: Brad, is somebody making sure that David has been brought up to speed on all the different issues? I don't think he was at the last meeting either.

Chair Clawson: He wasn't -- he was to part of it and he was part into the Board meeting. I'll touch base with him. I'll reach out and touch base with him and let him know where we're going.

The biggest thing is, and Rashaun, this is going to come down to you, is to make sure that the Board has all this. Well, they've gotten it several times.

I just want to make sure that they have the data that they have been presented and gone forth from there.

Dr. Roberts: Right. And that's why, you know, I do want to just touch base both with NIOSH and SC&A just to make sure because the Board meeting is not that far away.

So do you have sufficient time to pull together what's being requested including the compendium of data that's more like reference material for the Board so we have adequate time to get everything together?

Dr. Taulbee: This is Tim. From my standpoint, we can certainly get a four-slide presentation together. That's not a problem from our standpoint.

Pulling everything together, we'll get with our team tomorrow and go through to make sure of that. But I

don't really foresee any issues from that either because everything is actually out on the web already.

All of the key documents are. It's more of us pointing folks to those key documents that are all out there at this time. So --

Dr. Roberts: Okay. Great. SC&A?

Mr. Barton: Yeah. Right along the lines of what Tim just said, I mean, the information is already out there. The reports are -- I think all of them are posted online at this point, and it's just a question of putting together some summary slides, again, pointing back to those reference documents or previous presentations, what have you. I don't think -- I don't foresee that being a big issue.

Dr. Roberts: Okay.

Chair Clawson: Yeah, Rashaun. I just -- Rashaun, this is Brad. I didn't see the information being that big of a deal because it's already been presented to everybody.

It's just this last time was data overload. And so I would suggest that maybe we send out that they review this, that this is going to be coming up for a vote and that all this information is in the last couple of Board meetings.

Plus, they're able to go into our Work Group meeting and pull what has been discussed there, too. So I don't see that as a real big issue. I just want to --

Dr. Roberts: Sure. But considering -- but considering the packet with the -- I just wanted confirmation that it is reasonable to expect that everybody get that together, given the short turn around, and it sounds like both are able to do that.

My next question is then how much time are we talking on the agenda? Because we, certainly, don't

want to be cut off. You know, we want to be able to have a full discussion this time around. So how much time, roughly, do we need to carve out?

Member Lockey: Rashaun, what's on the schedule now?

Dr. Roberts: I'm sorry? How much time is on it now?

Member Lockey: Yes.

Dr. Roberts: I actually don't have it in front of me. I'd have to pull it to see how much time is now. But, you know, that was an estimate, you know, just kind of based on my best guess.

So I don't think that that's necessarily something to go by. But yeah, how much time do we think we need for the --

Chair Clawson: Personally, me -- here's kind of what I would like to have. I'd like to be able to have it -- I'd like to be able to have at least a minimum of two to two and a half hours.

I'd like it at the beginning of our Board meeting instead of at the end so that if anything comes up we'll go from there. I think, myself, I think two and a half hours is ample time.

Dr. Roberts: Okay. And in terms of your presentation to NIOSH and SC&A, you know, how much time are you looking at? It sounds like a very brief presentation that's being requested and --

Dr. Taulbee: Yes, very brief.

Dr. Roberts: -- I just think --

Dr. Taulbee: It's -- like I said, it's more just stating our position and pointing to the documents of how we formed that basis. That's it.

Dr. Roberts: Okay. So right now, it's -- SRS is right after the DOE program update on the first day, and

you said, Brad, at least two and a half hours, two and a half to maybe three hours for that. And I can, certainly, try to find time for that.

Chair Clawson: Okay.

Dr. Roberts: Okay. Very good.

Chair Clawson: I'll get Dave Richardson caught up with it. He wanted me to let him know where we were at and so forth. So I'll bring him up to speed on where we're going and what we're doing.

Dr. Roberts: Okay. That sounds good. And I'm trying to think if there's anything else. Brad, is there anything else that you wanted to cover? I think that kind of brings us to the end.

Chair Clawson: No, that's all I wanted to cover and all we're going to do is what was put before the Board at the last one. I'll make sure that we have got the same verbiage that we presented to them before and we'll still overview and then be able to have discussion on it.

But I would like, Rashaun, that we make sure that before the Board knows this is coming to a vote and this information in these areas of the Work Group, the last presentations of NIOSH and SC&A at the last couple of Board meetings.

Dr. Roberts: Okay. But we're relying on SC&A and NIOSH to actually pull together those materials, correct?

Chair Clawson: For the presentation or for review?

Dr. Roberts: And the background materials, et cetera.

Chair Clawson: Well, it's our -- I don't know if we really have to. It's out there already for them. They've already seen -- it's already been presented to them.

So I've just looked at the last Savannah River presentations that we have got. It's there for them to be able to get clarifying questions answered.

Member Lockey: And I would -- this is Jim Lockey. (Audio interference) need you to reference the documents that it's based on.

Dr. Taulbee: Could you say that again, Dr. Lockey? You're breaking up.

Member Lockey: If you're making references on your four slides, you have to back it up with the documents you referring to and where they're located so people can find them.

Dr. Taulbee: That's correct, and my plan, hoping we can execute this, is to actually make sure those are copied under the supporting materials for the Board meeting. So that we'll get another link there on the website that people can click on to get those documents.

Member Lockey: Okay.

Chair Clawson: Okay.

Dr. Roberts: Okay.

Chair Clawson: Rashaun, anything else?

Dr. Roberts: No, I don't believe so. I don't believe so.

Adjourn

Chair Clawson: Okay. That sounds good. With that being said, I'd like to tell everyone I appreciate their time today. Been a long time coming and everything else.

We are always going to have opportunities to disagree with one another. And guess what? That's why this Board is set up the way it is.

I appreciate Dr. Ziemer's comment on that because I

think of -- over the years of some of the discussions that we have really had, and I will be truthful, there's been a lot of times that I've been swayed different ways than what I was thinking and sometimes not.

But the thing is, is this is why this Board was set forth the way it was, and I feel that it's very important that we do have these discussions.

With that being said, I call this meeting adjourned. I have a beach to go see.

(Whereupon, the above-entitled matter went off the record at 4:10 p.m.)