UNITED STATES OF AMERICA

CENTERS FOR DISEASE CONTROL

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NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH

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ADVISORY BOARD ON RADIATION AND WORKER HEALTH

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TBD-6000 WORK GROUP

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MEETING

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THURSDAY
FEBRUARY 21, 2013

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The meeting convened in the Zurich Room of the Cincinnati Airport Marriott, 2395 Progress Drive, Hebron, Kentucky at 9:00 a.m., Paul L. Ziemer, Chairman, presiding.

PRESENT:

PAUL L. ZIEMER, Chairman
JOSIE BEACH, Member
WANDA I. MUNN, Member
JOHN W. POSTON, SR., Member*

ALSO PRESENT:

TED KATZ, Designated Federal Official
DAVE ALLEN, DCAS
BOB ANIGSTEIN, SC&A*
TERRIE BARRIE*
BOB BARTON, SC&A
PATRICIA JESKE*
JENNY LIN, HHS*
ARJUN MAKHIJANI, SC&A*
JOHN MAURO, SC&A*
DAN McKEEL*
JIM NETON, DCAS
JOHN RAMSPOTT*
LaVON RUTHERFORD, DCAS*
JOHN STIVER, SC&A*
TOM TOMES, DCAS

*Participating via telephone

T-A-B-L-E O-F C-O-N-T-E-N-T-S

P-R-O-C-E-E-D-I-N-G-S

9:00 a.m.

MR. KATZ: Good morning, everyone in the room and on the line. This is the Advisory Board of Radiation Worker Health, TBD-6000 Work Group. And we are going to get started. Let's begin with roll call, beginning with Board Members with folks in the room and let me remind everyone of agency-related, to speak to conflict of interest too.

We're speaking about three sites today, GSI, Baker Brothers and Simonds Saw and Steel. Thank you.

(Roll Call)

MR. KATZ: Okay, then. There are materials, an agenda and materials for this meeting, posted on the NIOSH website under the Board section, under the schedules, meeting schedules section, for today's date. And let me just remind everyone on the line to please mute your phones except when you're addressing the group. If you don't have a mute button,

please press *6 to mute your phone. And pressing *6 again will take your phone off of mute.

I can hear someone has a phone ringing in the background, so that phone should be muted. Thank you. And Paul, it's your agenda.

CHAIRMAN ZIEMER: Okay. I will officially call the meeting to order. Welcome everyone. We're pleased that all of you are here in the room and on by phone. We have three main categories on our agenda today really, sites to address. General Steel Industries is the first, then Baker Brothers, then Simonds Saw and Steel.

And the GSI one is an ongoing activity. Right now we're focused on the final models for dose reconstruction since the Board took action at the last meeting on the petition. So we're now focused specifically on the modeling of the doses for both the active and the residual period.

And then we have on Baker Brothers a carryover item that the Board assigned to us at the last meeting, that is to review the residual period and make a recommendation. And then finally, Simonds Saw and Steel, we have the issues matrix to deal with.

We're going to probably spend most of the morning, if not all of the morning, on General Steel Industries. And we'll plan for a lunch break at noon. We'll plan for a comfort break about midmorning as well.

Now on General Steel Industries there are two documents that we're dealing with today. One is the document prepared by NIOSH OCAS, DCAS by Dave Allen which summarizes the dose reconstruction results from the NIOSH models and also compares them with the SC&A models because really one of the jobs we have here today now is to take these models and look at the assumptions and come to some agreements on what assumptions should be best used to reach the final dose assignments

for each of these models.

And we also have a document from SC&A, which was distributed. And theirs is basically a response to the NIOSH report. So I thought it would be of value initially for Dave Allen to take a little time and highlight the items in his paper and any issues that he wants to raise with the Work Group. And then we'll have an opportunity for SC&A to give their take on it. Also we'll have opportunity for the petitioners to comment as well.

The SC&A material, I think there's a presentation that Bob Anigstein was going to make. Bob's been fighting some respiratory illness this week and hopefully will be on the phone. We have here in the room a projector with a copy of his presentation and Bob Barton is prepared to provide that for us. But is Bob Anigstein on the call yet?

DR. MAURO: Paul, this is John Mauro. I just called his home number and his office number and no one's picking up.

DR. ANIGSTEIN: John, I was on mute. I didn't answer.

DR. MAURO: Okay.

CHAIRMAN ZIEMER: There's Bob. Okay, Bob, thank you.

DR. MAURO: Thanks, Bob.

CHAIRMAN ZIEMER: Okay. So the record will show Bob now has joined the call as well.

MR. KATZ: Yes and for the record Bob has no conflict with GSI. And Bob it's correct, right, you have no conflict with Baker Brothers or Simonds Saw as well?

DR. ANIGSTEIN: No conflict.

MR. KATZ: Thank you.

CHAIRMAN ZIEMER: Okay. So let's begin. Dave, if you'll kick it off and make whatever comments you wish to on your GSI dose estimate comparison paper.

MR. ALLEN: Okay. When I started writing this I just note that there was a lot of models and a lot of tweaking that has gone

on in the last several years. So I tried to summarize or actually look up and find and summarize where we stood the last iteration of models, SC&A and ours.

And I just tried to put this in a summary form where you can see I just made four tables for the photon dose and divided it between radium era and the cobalt-60 era and also between radiographers and non-radiographers just to try to make a clear picture of where these models all stand.

I think that the last thing to do was see what the differences are in these models, see what the assumptions are, where there is disagreement and hopefully reach some sort of consensus on what assumptions we should use so we can then move forward, revise the Appendix and move on.

CHAIRMAN ZIEMER: Right. And as you get underway just for clarity, as I understand it would be NIOSH's intention to assign everybody into one of the categories,

either radiographers or what are we calling the others, others.

Everybody on the site would be in one of those two categories because we haven't separated out where people were working other than on those, we know who radiographers are but the others would be in the other category then.

MR. ALLEN: Yes and then as it turned out in the cobalt era it didn't matter. They all ended up with that layout worker dose would be applicable to either category.

CHAIRMAN ZIEMER: Okay. Go ahead.

MR. ALLEN: Okay. I'm not going to read the whole thing. You have it here. But you can see the numbers category by category. Once I got through that I tried to summarize what we had to sort out. So I listed what I thought were the issues where we agreed or models where we agreed and then unresolved issues. And I discussed those.

As it turned out I thought we were

to a point where it was essentially the radium source scenario and the layout man were the two models where there was any disagreements on the assumptions, et cetera. I think Bob pointed out in his reply that I think we're going to have to toss time line in there also as far as there is the 1962 era where it's not a nice clean break in the era there.

Essentially we have, I think, three areas where we need to discuss what the assumptions are and what we should use to proceed with revising the Appendix. Do you want me just --

CHAIRMAN ZIEMER: Go ahead and highlight those for the record. I think we want to have that on the record.

MR. ALLEN: Okay. The radium era is essentially, you know, the era from the beginning to that time frame in the 1962 type of era. And what we have right now is that for the radiographers NIOSH had an estimate that used parameters that we were told for the

fishing pole technique. And we used the middle.

We had, there was a range of four to six foot pole and 12 to 15 seconds to move the source. We used the middle at 13.5 seconds for an average and five feet for an average on the distance. SC&A used the one maximizing the short distance, the longer time frame to come up with their estimate.

And then probably the biggest difference is in our estimate we assumed that this wasn't all done by one person. There are a couple people doing radiography that would have traded off actually doing that. I think I am more than willing to pull back that assumption because it does look like, especially in these early years, it was maybe not a radiographer helper with the sources every time. Whereas we've been told something about radiographer helpers.

But there's really no information that was always the case or frequent or

anything else. So that particular assumption I'm more than willing to pull back. I don't have the number handy here but it raises our estimate to some five rem a year, five point something as I recall. I'm trying to find it.

In any case, it raises it to somewhere around there. Meanwhile we have Bob Anigstein at SC&A did a model estimate that resulted in a dose of 9.69 rem per year to the radiographers. That dose primarily from placing the source and removing the source from the fishing pole technique.

Bob also, I'm trying to get this right, he used a summary of a dose record we had from a radiographer and a telephone conversation with him that gave ranges of how often he did radiography. And he was part-time on the weekend doing radiography. So Bob prorated it based on those ranges, you know, to get a bound, essentially a minimum and maximum which came out to. I can't find this.

MEMBER MUNN: 9.39?

MR. ALLEN: Yes, I think it was 9.1 rem per year to 20.5 rem per year. And lastly, there was a, one of the statements in the application for an AEC license indicated that while they were doing this technique they had averaged less than 25 percent of the limit and had always been below the limit. All of the radiographers have always been below the limit.

The limit was essentially 15 rem for the first couple years, the first few years through I think 1954, 55. And after that it was essentially 12 rem a year. In reality it's three rem per quarter and there's a lifetime limit. But as long as they weren't close to the quarterly the lifetime limit didn't, usually wasn't the limiting factor.

So anyway, that's where we stand on that. My opinion on the 12 and 15 rem per year based on the limit, it's not really an estimate so much as we have a statement from GSI saying it was less than these numbers. So

I was looking at those as a less than 15 and a less than 12 rem per year.

The range, prorated range of 9.1 to 20.5 rem is an estimate. And then the 9.69 rem is for the model based on parameters given by, I believe, the same person, the same radiographer. And I think Bob had stated a couple of times that was convincing to him that, you know, three different methods all came up in a similar range.

For actually revising the TBD, like I said the 15 and the 12 rem I think are less than numbers and I can't really use those for doses that I put into an Appendix. The range, the 9.1 to 20.5, I can't so much put that in an Appendix either. But both of those, all those values are something that the estimate should fall somewhere in that range or that vicinity.

The 9.69 I consider to be a real estimate or a model. It is a maximizing like I said versus an average type of thing. But

it does fall into those ranges whereas ours does not fall the range of the 9.1 to 20.5 prorated that Bob calculated from the summary dose record.

So I'm not sure, this is one thing I wanted to get the feel of the Work Group on was where they felt comfortable with, we could use the maximizing parameters that SC&A used, they used the 9.69 model dose. Like I said I would not recommend using those prorated values other than to, as a, similar to what Bob did, to say this shows that these numbers are reasonable or another piece of information shows they're reasonable along with the less than 12 and less than 15.

CHAIRMAN ZIEMER: Well, let me make a comment here because this is a subset of a larger question that comes up under the issue of sufficient accuracy. And that is if one takes every assumption and uses the extreme value, not just here but in general, you end up with something that, surely it

bounds but it becomes non plausible.

I mean the SEC Work Group is dealing with this right now on the sufficient accuracy question because we have these cases where you have a whole series of assumptions and the claimant-favorable thing really comes in once you've made reasonable assumptions. And then you're taking the tail end of the distribution. You build in the claimant-favorability there.

Sometimes if you maximize each of these you come up with a bounding number that really isn't plausible. So I don't know that you can necessarily justify taking that maximum in every one of these assumption cases. Like you're maximizing the dose from the distance, you're maximizing it from the time factors, you're doing all of those little subsets and then you end up with this really high number that is not plausible.

MR. ALLEN: Yes, and that is a concern I had too. I'm well aware of, you

know, 95th and 95th and 95th and you end up with an unrealistic estimate. But in this particular case we were actually talking about two parameters.

It's the amount of time and the distance the person was. And the part I can't get over is the lower limit of the prorated dose from the summary that he had came out to be 9.1 rem. Putting those two together, you know, I'm willing to go with that estimate that Bob had with the 9.69.

CHAIRMAN ZIEMER: It's just two factors you mean.

MR. ALLEN: Yes, it's just the two factors. But maybe we should, you know, hear from Bob --

CHAIRMAN ZIEMER: We're not going to decide that this minute. It's sort of an open question. Let me ask another one here while we have this chart here. So if you're a radiographer in the radium era under the NIOSH scheme as it stands here, you would assign

that person three and a half, 3.573 for the radium work, plus you would assign the 2.6 for possible exposure to the St. Louis sources also?

MR. ALLEN: No, and that gets into the time frame is the --

CHAIRMAN ZIEMER: One of the three things. Well all right. Well let me do it a different way. The betatron operator sometimes serves as the layout man, right?

MR. ALLEN: Yes.

CHAIRMAN ZIEMER: You would give him both of those numbers or not?

MR. ALLEN: We would not.

DR. ANIGSTEIN: This is Bob. These are mutually exclusive.

CHAIRMAN ZIEMER: Well but we have layout man --

DR. ANIGSTEIN: Because he can't spend all of his shifts as a layout man and all of his shifts operating the betatron.

CHAIRMAN ZIEMER: Well I

understand that but we have a layout man on the radiographer chart. So --

MR. ALLEN: Yes, what I tried to do with this chart was to say that somebody that is a radiographer in his early years, he could have been doing radiography.

CHAIRMAN ZIEMER: You're going to parse it out like 50/50 or something.

MR. ALLEN: He could have done radiography there. He could have done radiography out in the plant. He could been working on the betatron. He could not be doing them all at the same time.

And since we can't really place him in one or the other it was list all these scenarios, estimate the dose and then pick the highest one, you know, what would be the worst case.

CHAIRMAN ZIEMER: Okay. Whatever the highest one is for him we give him that 100 percent of the time versus parsing it.

MR. ALLEN: Yes, so all of these

doses you see here are assuming full-time doing that job.

CHAIRMAN ZIEMER: Doing that job, okay. If a person was a radiographer you would still call him a layout man if he was, if that number came out higher for him.

MR. ALLEN: Yes, that layout job was done by radiographers.

CHAIRMAN ZIEMER: Yes, I know that. Okay. These are just the numbers your model came up with and then --

MR. ALLEN: Right.

CHAIRMAN ZIEMER: Okay. I got you. Other questions or comments for, do you want to go on to the next one or just --

MEMBER BEACH: This is Josie. I was just wondering under the Ra-226 source you've said that you didn't develop an estimate in the radiograph room. Where was that?

MR. ALLEN: At that time we thought that the dose outside of the

radiography room would be limiting and it wasn't clear that room existed in those early years. We knew it was either built or modified in '62. It's turned out we got better information now that it was modified, the shielding was modified in '62 and it actually did exist the whole time.

And I think Bob Anigstein, after talking to several of the former radiographers, came to the conclusion it was 99 percent of the time or more the radiography was in the radiography room. So essentially that's the estimate we probably should be using.

For the radiographers themselves, the vast majority of the dose comes from placing the source using the fishing pole technique. And that part of it ends up being the same whether it's in the radiography room or out. So there is a minor differences based on the area where they're actually doing it.

DR. ANIGSTEIN: We talked about

the radiography room. At this point we're talking about that concrete block structure in the Number 6 Building.

CHAIRMAN ZIEMER: Building 6, right.

DR. ANIGSTEIN: Not the betatron - -

CHAIRMAN ZIEMER: We understand.

MR. ALLEN: Yes, and it's probably good to point out.

CHAIRMAN ZIEMER: Okay, other questions? Are we on to the other tables or just general questions? No questions, Josie?

MEMBER BEACH: No.

MR. ALLEN: Okay, move on. Like I said that was one of the issues is the parameters for the radiography source scenario. Another one is the parameters for the layout man scenario and this is actually associated with the new betatron attached to Building 10 through a, what I call an equipment tunnel.

And that's where the bulk of the dose for this scenario comes from scattered radiation coming down that equipment tunnel. If they're working in Building 10 near the opening for that tunnel. It's called layout man scenario and it's based on the layout man, which is essentially just marking the castings for where to place film, et cetera for the next shots on a casting.

DR. ANIGSTEIN: Excuse me. Not to be a nit picker, what he's marking is the repair not for the next project. He's marking up the casting to tell the chippers and grinders and welders where there's a defect and where they should dig it out and repair.

MR. ALLEN: Okay. I was under the impression it was both and actually laying out a lot of those shots too. But either way it's essentially --

DR. ANIGSTEIN: The betatron operator in the betatron room laid out the shots.

MR. ALLEN: Yes, I thought we were told that sometimes they set those up ahead of time while they were shooting other castings to try to keep the betatron going. But in either case --

DR. ANIGSTEIN: Actually you may be right there.

MR. ALLEN: But in either case we are, you know, talking about a person that is working near that equipment door and there's a lot of this dose of scattered radiation coming down that equipment tunnel in some configurations of the betatron.

DR. ANIGSTEIN: The reason that's significant is if this was a fresh casting he would not be getting beta dose from the casting. And if it's been irradiated and he's marking it up for repair. My understanding is he held the film in one hand and a piece of chalk in the other hand and said here is a defect, let me mark it.

And therefore he was getting a

very high exposure with any activation of steel you would be getting a lot of beta exposure from the steel, which of course would not be the case if this was a casting that hadn't been irradiated yet.

MR. ALLEN: Yes, he'd be getting beta exposure and some photon exposure. And in either case I think both SC&A and our model assumed it's a freshly irradiated casting that he was working on.

DR. ANIGSTEIN: Okay, good.

MR. ALLEN: I think there is some marking up for the next shot even after the repair. Whether we call it the actual repair, or finding the repair, or marking for the shot after, it's very credible they're working on a freshly x-rayed casting. And so both models assume that and --

DR. ANIGSTEIN: I agree. If it's had already been repaired they would need to confirm the repair so it would have to be marked. Okay, I'm just being technical now.

MR. ALLEN: And, I lost my train of thought. Yes, I wanted to, we're talking about the layout man here doing this work on a casting but in reality, as Bob mentioned, it's also repair, et cetera. And those are not radiographers grinding out the defects of weld repairing or whatever.

So there is plenty of other non-radiographers that are in that same vicinity working in close proximity to the casting. So even though this is called layout man, it's really a scenario for radiographers and non-radiographers, which is --

DR. ANIGSTEIN: Right, I specified this was the layout man in the original report back in 2008. The layout man gets to the casting first so he gets the most of the activation product. By the time it gets to the grinders and chippers, it's already decayed a bit.

So he would be the most, the highest exposure would be to the layout man

because he has the freshest casting after the radiography and the others are ready maybe an hour later. That's the reason for that.

But that's not, the purpose was not to make light of the exposure to the other workers, it's just that the, if you take the layout man, his exposure will be bounding.

CHAIRMAN ZIEMER: Right, go ahead.

MR. ALLEN: Okay. The difference that we need to discuss here is in the NIOSH model we developed several shooting scenarios for the betatron if you are shooting near the, where the equipment is brought in on a railroad track type of, there's essentially some railroad tracks on a cart.

If it is shot while still sitting on that you get a considerable more amount of photon scatter down the equipment tunnel into where this layout man could be working. If it is put into the shooting room, casting is put further into the shooting room and shot there these numbers change quite a bit.

What we did in our model was to come up with a number of different scenarios, various angles and various locations in the shooting room and estimated the dose at a number of locations for each shot including, I think there was three spots in the control room and 10 Building where this layout man would be and several other places we explored.

And we used the work schedules that we had gotten from or actually SC&A had gotten from the workers and developed a shot scenario for the typical work environment. And we used a solver in Excel to come up with a combination of these scenarios that would give us 10 millirem in the control room and maximize the exposure in the Number 10 Building where this layout man would be.

And that's where we developed our model. And Bob can confirm that SC&A used a, they disagreed that all those shot scenarios were realistic and they used one that they considered to be realistic that maximized the

dose in the Number 10 Building.

And I still say that would end up resulting in more than 10 millirem each week on the film badges. And I think Bob had a disagreement based on what he has written in his response here recently. But I think that is explaining the issue or the layout man exposure model.

And then there's the one last issue I think or major category of issue here that I think we have to discuss. I did not discuss in this paper, my intentions and it is not written in there, by any means. My intentions when I wrote this paper were that the dates, the exact dates when they shifted from radium to cobalt and when they started up the new betatron we knew the year and approximately when it happened but not hard and fast dates.

So my intentions were to use the radium radiography as limiting through the end of 1962 and then the new betatron as limiting

starting in the beginning of '63 on. Bob in his reply, pointed out some other dates in there and broke it up into several, 1962 and in the 1963 time frame into several different categories.

And some of that I think he's got a good estimate there. I think there's, I take a little bit of issue with some of those dates. And I don't know if you want to start discussing the details on those at this point or?

CHAIRMAN ZIEMER: Well we'll hear from Bob and also from the petitioners and then we can try to come to agreement on some of these issues. Just want to get the issues out here, see what they are. So those are your main issues then, anything else that?

MR. ALLEN: No, I think everything else the neutron dose, et cetera falls into that, the scenarios that are used for the layout man. And I think we have agreement on the, how we go about the beta dose. It's just

got to be reran based on scenarios, et cetera.

I think those three categories we've settled on what assumptions we use for those. I think we can go ahead and calculate all the doses.

CHAIRMAN ZIEMER: Any other questions from the, okay, let's hear from Bob Anigstein then. And we have the slide presentation here. And can we email that out? It hasn't been cleared yet.

MR. KATZ: It hasn't been cleared yet because I just got it.

DR. ANIGSTEIN: This is based entirely on cleared material. So we usually don't bother getting the presentation cleared because it's taken out of the cleared reports.

MS. LIN: Ted?

CHAIRMAN ZIEMER: Jenny, go ahead.

MS. LIN: This is Jenny with ODC. We just cleared that without PA redaction.

MR. KATZ: Okay, great. I'm not on my email so.

CHAIRMAN ZIEMER: Okay. So can we email that out to Dr. McKeel and to Mr. Ramspott?

MR. KATZ: Yes, I don't know if I have everybody's. I certainly know I have Dan's email.

CHAIRMAN ZIEMER: You have John Ramspott's also.

DR. ANIGSTEIN: I can email it myself if you like.

MR. KATZ: Yes, if you have Dan and John's emails and you do that, that's fine. Thank you.

CHAIRMAN ZIEMER: And also --

DR. ANIGSTEIN: Should I do it right this moment?

MR. KATZ: Yes, please.

DR. ANIGSTEIN: Okay, then just --

MR. RAMSPOTT: Could you send it to me too because I don't have it?

DR. ANIGSTEIN: Who are you?

(Simultaneous speaking.)

DR. ANIGSTEIN: Okay, sorry. Give me one minute. I'm going to put the phone down.

CHAIRMAN ZIEMER: Does he have Ms. Jeske's email also because she's on the --

MR. KATZ: Let me see if I can, while he's doing that let me see if I have --

CHAIRMAN ZIEMER: Okay. We're going to try to get it out to you Dan and John and Ms. Jeske.

MR. KATZ: I'll know in a second.

CHAIRMAN ZIEMER: Terrie Barrie, do you want a copy of this also?

MS. BARRIE: If it's not too much trouble. If not I can try to follow along. Thank you for asking.

CHAIRMAN ZIEMER: Terrie Barrie's --

MR. KATZ: I probably have Terrie's. I do have Terrie's so that's easy. I don't have Patricia's, I don't think. But Dan will have it and Dan can forward it on.

DR. ANIGSTEIN: I have John Ramspott's.

MR. KATZ: No, I know. And Dan has Patricia's. So Dan can forward it on.

DR. MCKEEL: Josh Kinman has Patricia's.

MR. KATZ: Yes, but Josh isn't on this call.

DR. MCKEEL: Well then maybe you can just get him to do that little task. Thank you.

MR. KATZ: Well I mean he's not, I can't reach him right now is what I'm saying. So you can forward it if you want her to have it now.

DR. MCKEEL: I'm really not at a computer where I can do that.

MR. KATZ: Okay. Well if you can't view it then there's no rush to get it anyone.

DR. MCKEEL: No, there's a rush to get it to us. I just can't view it. It's too

late.

CHAIRMAN ZIEMER: Okay, why don't you go ahead.

Bob, you can go ahead and start and as we proceed here. Bob Barton can advance it as he accepts cues from you.

MR. KATZ: And Terrie, I'll forward this to you.

DR. ANIGSTEIN: Sorry about that. Okay. So, Bob, you want to put on the, well put on the second slide. The first was just the title.

MEMBER MUNN: It's up.

MR. BARTON: All set, Bob, go ahead.

DR. ANIGSTEIN: You have the slide two up?

CHAIRMAN ZIEMER: Yes, the slides are up, Bob. Go ahead.

DR. ANIGSTEIN: Okay. So this is getting to the dates. Now I have to confess initially I thought we were just going to go

by calendar year. But I had the impression as it was developing this that NIOSH was subdividing into data.

And particularly the Work Group specified the date, I remember at the meeting back in November, they specified the date of the beginning of the radium operation. I'm sorry the end of the radium operation, the beginning of the cobalt. So I just put it down that the January 1st was the beginning of the cobalt operations.

There's a possibility now it's going to get moved back into '52. And according to the records, May 21st is when they acquired the cobalt sources. So presumably, that's the date on which they started to use them because they were under pressure to get rid of the radium.

And then sometime in '63, we don't know when so I just arbitrarily just to be on the conservative side, assumed it to be January 1st '63 was when St. Louis Testing

began radiography at GSI. The administrator that we talked to simply said he couldn't remember the dates but he remembers it's when they were working, they were simultaneously working on the Gateway Arch in St. Louis. And that began, construction on that began in '63.

Again, we don't know exactly when the new betatron went into operation. But we do have a photograph in the, one of the issues, the September issue of the magazine that John Ramspott very kindly furnished to me, which showed a photograph of this building being sort of like halfway built. The foundation was laid, the walls were going up.

So it would not have been before October 1st if they published this in September, the half-finished building. So it's just an estimate. Again, a conservative estimate because that's where the higher doses started. And then of course June 30 of '66 is the end of the AEC-covered period.

And then just summarizing them

going onto slide three, summarizing the sources of exposure, the direct penetrating radiation, photon radiation would be stray radiation during betatron operation and delayed radiation from activated metal. This means that the, so called, the technical term that comes out of the MCNP program, they call it delayed neutrons and delayed gammas.

Then the second category is the exposure to the sealed sources. So you have the two 500-millicurie radium sources starting from way back when, until presumably May 21, 1962. The two cobalt-60 sources were assayed some time in the spring at 260 and they requested 300 millicurie sources and they got slightly less. They got 260 and 280.

And these were used again until the end of operations. Of course they decayed a little bit during this time. Then you have this 10-curie cobalt-60 source employed by St. Louis Testing, presumably starting in January '63. And then there was a 50 curie iridium

source that they used occasionally.

They didn't use it too often because it, the radiographs were too good. They showed defects that they would just as soon not highlight. So they didn't use it very much. Then there was the exposure of skin to non-penetrating beta radiation. And this would be from the natural uranium, from handling the uranium.

And it turns out there were two short-lived isotopes of uranium which were created through photoactivation which were very strong beta emitters. They have half-lives only for a few minutes. But if they were handled immediately after radiography there would be some significant skin dose.

And then there was activated steel with a whole bunch of nuclides some of which are long-lived, some of them are very short-lived. The thing with activation is the stronger the intensity, it sort of works inversely. The stronger the intensity of the

radiation, the shorter the half-life.

So if someone comes out of the wash he could be exposed for a long time to a low activity or a short time to a high activity, depending on the isotope. But the doses tend to balance out in that respect.

And then getting down to where the rubber hits the road, pardon that expression. SC&A's position, I would disagree with Dave Allen. SC&A's position is that these 12 and 15 rem units are actually hard numbers. These men were badged, even though we don't have the badge records any longer.

They were badged, we know they were badged. We have good evidence they were badged as early as '53 and probably before both according to a photograph, which I know was called into question, I think most likely it's a photograph of a film badge and the testimony.

The one radiographer who goes back to '57 says he always wore a film badge and we

have his exposure records, which indicate that he was monitored or how else could they have assigned him an exposure of 9.2 rem over a period of 18 quarters. That was a part-time radiographer. A full-time employee but a part-time radiographer.

So we considered that these were records that they reported to the AEC that no one ever exceeded the dose. And it would seem reasonable to think well if no one ever exceeded half the dose they would say so. We are here with the limit. But, you know, the limit is 15, but nobody got more than 10 or nobody got more than five.

They didn't say that. And they didn't say that, probably it wouldn't have been true. So they did say no one exceeded the dose. Yes, it's true that the average was 25 percent. But we're not interested in compensating the average worker, we're just compensating the real worker who may have gotten that maximum dose. Since you don't

know who it is, somebody got that dose and you don't know who.

So our opinion is you assign this to everyone. And it's a number that you can nail down. It's not based on assumptions. It is limiting. It is on the high side. And furthermore, my impression and this is from being at the meeting in Knoxville and going over the transcripts of the meeting, this is what some of the Board Members assumed was going to be assigned to everyone.

Because they were talking about these are very high doses. I believe that they assumed and actually at that meeting Dave did not present this. His presentation was limited to the uranium dust scenarios. And this seemed to be the basis, the comments that I was asked to get up and make, seemed to be the basis of the Board's actions.

So I know that doesn't make it binding. But that's the impression that I had. Whereas the other, the model which I

don't agree that the model is necessarily bad. This is just based on this one person's recollections 50 years later, we have to remember. These are, this is a 50-year old memory and not many of us remember distinctly after 50 years or even five years.

And I think this gentleman was, did his best to give me an accurate recollection. But I would put more credence to the exposure limits or the dose limits in this case, the doses, then to the model. And my purpose, our purpose, SC&A purpose was to approach it from three different standpoints, the three things that we could find.

One was the actual recorded doses for a four and a half year period through this one part-time, this one man who did the radiography on weekends. And I was not like, I mean he said the 9.2 lower limit is simply, that's assuming that he worked the maximum number of shifts.

According to his recollection, I

asked him if he was there. He said, yes, he worked whenever he could. He needed the money. But he worked on most weekends 80 to 90 percent of the time, 80 to 90 percent of the weekends. But I said is it Saturday and Sunday or just one day? And he was not clear about that. He wasn't certain. Could have been both days, could have been one day.

So that nine point, that prorated 9.2 would mean that he worked 90 percent. So that he worked 45 weekends, full days, so 90 days, that's an extreme upper end. And the 20 rem would be that he worked the minimum.

He only worked 80 percent of the weekends or 40 weekends and only one day. So he works, so the range is he worked from 90, from 40 days to 90 days and that's how those got prorated.

So these are just, these are useful numbers. I wouldn't call them good numbers. They are useful numbers. And they're useful because they show the range.

The 9.2 to 20 exactly brackets this 12 rem and 15 rem.

And the 15 rem of course was earlier then this man's employment with the '53 to '54 period and he didn't start doing radiography until '57, in the middle of '57 according to my back, you know, counting his exposure records.

So and we also believe and that's a, it came as a little bit of a surprise to me because it was my impression and perhaps it was an incorrect one, incorrect conclusion, that based on the discussion of the betatron operator and the layout man, it was my impression that NIOSH had decided to give the highest doses to all workers.

Just like they did there I assumed that their position would be the same would apply to the radiographers during the radium period. And I was a little surprised to discover, no, that's not what they had in mind.

So again, these 12 and 15 rem are limiting, are bounding and given that you don't know who the radiographers were, for instance if this, if somebody like the person who I interviewed did radiography on weekends or did it part-time or did it who knows when he may have had another job this person was a laboratory technician or laboratory worker in his normal Monday through Friday shift.

I could very well see a claim coming in for a deceased worker or the family members, yes, Grandpa was, had such and such a job and they didn't know that he also did radiography. And I would say therefore it makes, it's reasonable, it's claimant-favorable to give them the maximum. Again, that's a decision I would assume the Work Group would have to intervene at this point.

Then the scenarios that are lesser issues the neutron and beta exposures are, the layout here by which my scheme is to first give you the overview and then a deeper

discussion of some of the detail, that we have the neutron dose, the limiting dose as to the betatron operator during all periods even though given that the betatron in the earlier days was slightly less energetic.

We had a 24 MeV betatron. Then is '63 they got the 25 MeV betatron that's, the so-called new betatron actually was older than the old betatron. That's a minor point. And then the old betatron was at the same time upgraded to 25 MeVs. So we ended up with two 25 MeV betatrons for this period.

And so we had the same without making allowances for this difference in energy, 480 millirem per year of neutron dose. Whereas NIOSH had the limiting dose to the layout man and so only a third as much. And similarly the beta dose, ours is higher. I think we were using, I think the difference was we were using a newer version of MCNP.

This was a new capability they had introduced into MCNP being able to do these

activation projects. And then over a period of several years from 2007 when we first started using it to 2012, the capabilities have gotten much more refined. So the newer model is a more precise implementation of the, the science hasn't changed but the programmers implemented it.

So that's the reason for the difference in the beta dose in SC&A and NIOSH. Then the, I kind of stole my own thunder because going on to the radiographers.

The 18 quarters for what we have that would be his record, Form 4. And so 18 quarters total, there's no breakdown because this was, this form was prepared when this new company, I mean new, by new meaning new to the GSI site, Nuclear Consulting Corporation was brought in to assist them in getting in the AEC license.

So they did a survey and they started furnishing the film batches. We never did find out, we could never find out, they

didn't manufacture the film badges. We could never find out where they procured them. It wasn't Landauer as far as we could tell. So that's why there were no records of those film badges.

But based on supplying the film badges in May, you know, April, May through 1962, and they simply gave each worker a record of his prior exposure. And the basis was simply said records. They don't say how the measurement was made. They just say records. And they just recorded total dose for 18 quarters at 9.1 rem.

So that's the basis of that prorated over, you know, depending on how many days a year he actually spent doing the radiography. And I list it here on, we should be on slide 6, is that correct?

CHAIRMAN ZIEMER: Yes.

DR. ANIGSTEIN: So that is listed here. And then there is the exposure rate analysis. And I would just say that's a mix

actually. We, the R, most of that I simply calculated by simply taking the distance and using the gamma factor, it was 8.25 or for radium-226.

And the exposure rate and the particular point where, the nearest point on the worker's body. But this is not really a dose of the whole body. This is from a point source. That's why it's not really an accurate determination. The one where he's sitting in the office in between shots, that was done with MCNP and that's reasonably accurate.

But that's a very small component of the dose. Then the betatron operator, I won't go into all the details of this, we assumed that it would be, on Slide 7, the maximum dose would be 26 millirem per week. That's because it is theoretically possible that there was 30 keV of radiation coming from the betatron aimed at the back the workers.

This is residual radiation which

was reported by this former Allis-Chalmers engineer. And we've never been able to explain this. But just saying for the, giving the workers the benefit of the doubt, let's say there was 30 keV.

Then this would amount to a dose of, for 10, you could be getting 26 millirem and only 10 millirem would register on the film badge because the radiation was coming from behind. So this is limiting, again, I'm not saying it's accurate but it's limiting.

It doesn't really matter because the layout man is a limiting scenario. So this is not actually used. Then the exposure to the, I put it here because the time sequence, because this is from the beginning. There was always the betatron, depending on whether it was one betatron or two betatron.

The exposure to the St. Louis Testing sources, SLTL, the St. Louis Testing Laboratories, was based on the fact that they reported that the longest shot was 180 hours.

I believe they put it was one week and a half a day. And they said there were 10 shots during a six month period.

So the maximum fraction at the time they had been shooting over would be 41 percent. Interesting enough that's the same as the duty cycle for the betatron, based on the workers' accounts. And so if you go with the accounts as I said we had an exclusion area boundary of two mR per hour.

The first thing they do is they set up the shot and then the St. Louis Testing radiographer, not a GSI employee, so he's not covered, he's not a covered employee, would come out and lay out this rope. It's a familiar yellow/magenta rope marking off this two mR per hour. And contrary to an earlier assumption whether the guy takes a break, it says, he doesn't take breaks.

If he has to go, he retracts his source and stops the exposure and the source is retracted, like a lead shield so that he

said the exposed source was never left unattended. That's why he could have only one worker instead of having to have two workers that would of course double his labor costs.

So we assume that there is no reason to distinguish between GSI radiographers because GSI radiographers probably have no reason to be involved with this. If anybody it would be people in production who would say this is the casting we need to be radiographed, here's where I'd like you to take the shot. And they might be the ones who will be standing around waiting for the shots and waiting for the films to come back.

So this limiting dose would be to some GSI worker not clearly identified, not, most likely not a radiographer. So again during this short period of time of say early '63, January '63 until the time the new betatron came in, this would be the limiting dose would be the 2.67 R per year limiting

exposure.

And then finally I want to get into the modeling of the layout man. We're on Slide 8 now. And this is a drawing that's taken from the AEC records. And right in the center you see, the center of the slide you see the control room. There was a desk, presumably that's where the radiographer would sit some of the time.

Now the reason that there is not a 10 millirem limit for the control room is not viable because initially there was an assumption made by NIOSH that this was the total dose through the film and also that there was a control batch. We don't, we really have no information for part of the time, not all the time, but for part of the time the Landauer records have a badge that's called betatron control one.

The serial number of the badge is one, and it's abbreviated betatron CTL. We really don't know anything about that. One

former worker that was, I got second hand information, I didn't speak to him directly, but got second hand information was, who said he handled the badges at one time, he distributed them. He doesn't remember anything about such a batch.

So I'm not saying it didn't exist, but I'm saying you cannot use that as a source. And then, as explained in my report, the doses reported were not the absolute readings on the film badge. They were differential readings.

You would first have an unnumbered badge that was stored in the same rack where all the other badges were, so whether it was near the shooting area or far from the shooting area, it really did not matter because the first thing they would do when Landauer would get the badges they would develop them all in a single batch so there would be no variation like the developer changes strength from day to day, which it

does, temperature changes.

And they would take the betatron, the control badge, not the betatron control, but the real control, their control badge and they would measure the density. Everything has some density or some, the film was never totally clear. There was some background fogging. And they would measure the density.

And they would take that number and subtract it from all the other badge readings. It's analogous like if you took a urine sample that would have a blank. And they would subtract whatever came up off the blank from all the other readings. So you could actually sometimes end up with a negative reading because for some reason the real badge has a lower density then the control badge, but it's just variation.

So the fact that no, and then secondly, as it's shown where it says A in a circle in the center, there is a doorway from the control room back into the processing

area. The radiographer may have been going out, he had a one-hour shot. Once he sees that the betatron is steady and operating, there's really no real need that he has to just sit there for an hour and stare at the dials.

He may take a rest room break. He may go out into the processing area and help with the film development or do many other things. So it's not necessarily true that he was always in the control room when the betatron was operating. We can't make that assumption. It may be the case, may not be the case.

So I don't consider that to be the limit. And furthermore that aside, by our MCNP model we ran, we looked at this and we tracked the results. The same exposures, several exposure scenarios that give 9.2 to the layout man, the 9.2 is combined betatron radiation and radiation from the casting. But it's almost all betatron. It's about 8.9

something from the betatron.

Actually corresponds to 9.4 millirem per week at the control room desk. So it is within that limit, within that 10 mR ever if you wanted to argue that the worker did stay there the whole time. So that's basically it.

The next slide, the last slide, Number 9, is simply the same picture as the previous one. But here is the actual, here's how we coded it into MCNP. It doesn't show the control room. It just shows, but it does show the position of the layout man who -- he's obviously in the center. If you flip back, Bob, if you can flip back to the previous one you see the railroad track going into the Number 10 Building.

Obviously he's not going to be spending his time on the railroad track because you can't get the casting cars in and out. So this is assuming that, the two models and it had the casting like a few feet to

either, the way this is oriented above or below the railroad track. And it turns out here with the limiting exposure scenario.

At this point, actually within line of sight of the betatron, so it's not actually scattered radiation, he's getting the penumbra of the betatron beam. It's very strongly focused forward. There isn't much going off at such a steep angle, but there still is some.

So that's the source of this radiation. And again, I'm not saying that this particular scenario was 100 percent of the time. But we don't know, so rather than having this assortment based on a number of exposure scenarios which were not consistent that NIOSH did, a number of those are simply not consistent with radiography shooting.

Shooting the casting at an angle, the purpose of it is to get through the casting at the thinnest point and not to put in more material and have it at an angle it

would take longer to shoot. So these are just not real. I don't think that those are valid. I mean, it's an ingenious approach. But I don't think it works in this instance. So that's basically our position.

CHAIRMAN ZIEMER: Okay. Thank you, Bob. We'll have some questions here. And let me start.

It appears to me now that your argument or approach, which I didn't gather from your initial paper, but now from your presentation, is that, since your model values are all below those existing limits of 15 and then 12 rem per year for the early years, that you're advocating that those upper limits, those sort of regulatory limits be used in assigning the --

DR. ANIGSTEIN: One of the model values is actually higher --

CHAIRMAN ZIEMER: -- bounding values.

DR. ANIGSTEIN: Excuse me. One of

the model values is actually higher. You can call it a model, not the MCNP model but the extrapolation from the badge readings, it could be as high as 20.

But we're settling -- but that's an extreme and therefore the way, I think the most telling is that the nine -- just rounding off the numbers -- the range of nine to 20 brackets the range of 12 to 15, and therefore confirms the 12 to 15 as a plausible upper bound.

CHAIRMAN ZIEMER: You are arguing, rather than use for example the 9.2 for the layout man, you would --

DR. ANIGSTEIN: No, no, that's a different period. This is during the radium era from '53 to May '62. The layout man scenario could not have happened until they installed the new betatron late in 1963.

CHAIRMAN ZIEMER: Let's say the radium value of 9.39 during the radium era, you would say instead of using that, which

comes out of your calculation you would recommend using either the 12 or the --

DR. ANIGSTEIN: That's right, that's right.

CHAIRMAN ZIEMER: -- or the 15?

DR. ANIGSTEIN: I'm actually more comfortable with that.

CHAIRMAN ZIEMER: Yes, thank you. I didn't gather that from your write-up. But that's what you appear to be saying in your presentation.

DR. ANIGSTEIN: And this is, by the way, this presentation is similar to the one from the Santa Fe meeting, if we can remember that far back.

CHAIRMAN ZIEMER: Let me see if there are some other questions here, Wanda?

MEMBER MUNN: No, I don't, I haven't been able to formulate a real question. I guess I am a little skeptical about using those upper regulatory limits based on the information that we have with

respect to actual exposure.

DR. ANIGSTEIN: Wanda, I am having trouble hearing you. Could you speak into the microphone?

MEMBER MUNN: I guess I'm a little segregated from a microphone.

DR. ANIGSTEIN: That's better.

MEMBER MUNN: We are looking for the right microphone. Bob, I just said that although I haven't been able to articulate very well why I'm uncomfortable with it, I remain a little uncomfortable about using the regulatory limits, the upper regulatory limits as a reasonable bounding dose. It just seems to me the information that I believe I've read consistently says nobody came close to those limits.

DR. ANIGSTEIN: That's not correct. It simply said nobody exceeded the limit.

MEMBER MUNN: Yes.

DR. NETON: Bob, this is Jim. I'm

reading from your bullet on Slide 6 that says, part of the quote from the facility in their license applications. They were never exceeding an average under 25 percent.

DR. ANIGSTEIN: They were never exceeded, right. So that nobody exceeded --

DR. NETON: Right, but they averaged under 25 percent.

DR. ANIGSTEIN: That's right. But again, my, our position is we're not compensating the average worker. We're making a compensation decision on an individual worker who might have been at the high end.

MR. ALLEN: This is Dave Allen. And I took that, I am not trying to compensate the average worker or whatever at about the same. But the document itself says the average is less than 25 percent, which to me implies someone may have exceeded 25 percent. It says no one ever exceeded the maximum.

So I'm really looking at that entire statement as a range. And the range is

three to 12.

DR. ANIGSTEIN: I disagree with that. I mean, that's a matter of interpretation. It says, let's just look at the whole, the previous sentence. The exposure limits published by AEC were followed. Limits mean that you can't get more than 12 or 15. Those are the limits that were followed. They were never exceeded, period.

And then this is a second statement and by the way, I'm throwing that in, they averaged under 25 percent. But that doesn't mean that everyone got 25 percent or less.

MR. ALLEN: Right, so I think that means the maximum exposed guy you could say got more than 25 percent, but less than 100 percent.

DR. ANIGSTEIN: Well, never exceeded means they could have equaled. That's the way I interpret this. Mathematically that's how I interpret it.

MR. ALLEN: Okay. So three to 12 rem inclusive.

DR. ANIGSTEIN: I say that never exceeded means it could have been as high as 12 or 15.

CHAIRMAN ZIEMER: Dave was asking you if the range then is three to 12.

DR. ANIGSTEIN: Well, there's a range.

CHAIRMAN ZIEMER: Yes.

DR. ANIGSTEIN: But again, it's the, I mean our position is that it should be the maximum.

CHAIRMAN ZIEMER: Okay, understood. Other questions here or comments? Now, so on the radium era where your calculational value, the 9.69 --

DR. ANIGSTEIN: Right.

CHAIRMAN ZIEMER: -- you would say well, rather than that you would use either 12 or 15 depending on which year it was?

DR. ANIGSTEIN: Correct.

CHAIRMAN ZIEMER: I'm just trying to understand this. And then for the cobalt era you would actually use the model values.

DR. ANIGSTEIN: Because that's all we have, yes. That's --

CHAIRMAN ZIEMER: And so in the cobalt era your maximum is a 9.2 for the layout man. Is that right?

DR. ANIGSTEIN: Yes.

CHAIRMAN ZIEMER: Okay.

DR. ANIGSTEIN: That's the layout man era. So there was a slight -- I don't know. I have no problem if NIOSH wants to keep it simple.

CHAIRMAN ZIEMER: No, I understand. I just wanted to see what your bottom line was here. And then for example, if it were a skin cancer, then you would assign the whole body dose value to the skin and you add in the beta, I guess, right?

DR. ANIGSTEIN: Yes.

CHAIRMAN ZIEMER: Right. And then

in all of these you would add in the neutron, although it's pretty small, but technically would be added in, I think, right?

MEMBER MUNN: But it's essentially non-existent.

CHAIRMAN ZIEMER: No, they have some numbers.

MEMBER MUNN: It's there. Yes, I know.

CHAIRMAN ZIEMER: NIOSH would add it in.

MR. ALLEN: It's in the three digits to millirem.

CHAIRMAN ZIEMER: Yes, but it still gets added in.

DR. ANIGSTEIN: Well, the neutron -- well, you don't just add the highest neutron. It was, if the betatron, if for some reason the dose reconstruction was such that the neutron dose was important, and I can't imagine that would be the case. But then again, I'm not deeply involved in that, there

should be added a dose of the betatron operator.

However, there is a different neutron dose to the betatron operator and to the layout man. So whichever, again, is the more limiting for an individual dose reconstruction should be used. My guess is it would be the layout man. Even though the neutron dose is lower, the photon dose is much higher.

MEMBER POSTON: Paul?

CHAIRMAN ZIEMER: Yes.

MEMBER POSTON: This is John Poston.

CHAIRMAN ZIEMER: Hi, John.

MEMBER POSTON: I was waiting for a time to break in. Just got back from class.

CHAIRMAN ZIEMER: Okay, welcome.

MR. KATZ: Welcome back, John.

CHAIRMAN ZIEMER: Did you have some comments at this point? I don't know when you came in on this, John.

MEMBER POSTON: No, I've only heard the last five minutes. I just got out of class. And I wanted to let you know I was on the line.

CHAIRMAN ZIEMER: Thank you. Okay.

DR. MAKHIJANI: Hi, this is Arjun. Since Dr. Poston introduced himself, I remembered that I am conflicted for Simonds Saw, and I'll be signing off at that time.

CHAIRMAN ZIEMER: Yes, thank you. Okay. Any other comments here or questions in the room? Okay. I want to give the petitioners a chance to comment and ask questions as well. Dan, let me ask you if you wanted to start with any comments or questions at this point. And I'm not -- you may be on mute. I'm not hearing any.

DR. MCKEEL: Can you hear me now?

CHAIRMAN ZIEMER: Yes, there you go.

DR. MCKEEL: Okay. Well, I thank

you very much for giving me an opportunity to comment this morning. I'm going to try to cover a few things that were just said during the meeting. My general comment is that in my opinion, the full Board needed to have both of these papers by Allen and SC&A which were delivered in February before they voted on December the 11th to deny the GSI SEC.

It seems to me that these two papers show that both DCAS and SC&A are still far apart in their dose estimates and the dose estimates that they give in the tables differ by two to tenfold. And it seems to me that although there has been some attempt at resolving those differences, that really hasn't happened so far in the meeting.

The SEC 105 deliberations are over, except for the administrative appeal and now the main Work Group task is to resolve all the TBD-6000 Appendix BB remaining issues. And I guess that ought to be related back to the latest Appendix BB issues matrix which --

the one I have is from November the 26th. And on that basis then, and this discussion I presume, Rev 0 of Appendix BB from June of 2007 can be revised.

One thing that has never been mentioned in this Work Group or by the full Board, by anybody, and is very important apropos today's Appendix B revision discussion, is that NIOSH needs to acknowledge that the GSI operational period has now been extended by both DOE and DOL to include the October 1 through December 31, 1952, period. And that has happened.

I don't know exactly when it happened. But I believe it happened some time during January because the DOE facilities database is so modified to indicate that fact. I will say about the two papers that we're talking about today, neither one of them directly address the assigned doses in Appendix B, Rev 0.

And neither one of them really

mention anything about the SC&A 2008 calculations and compare them with the 2012, 2013 doses. And it seems to me this is a huge oversight and really is irresponsible. The two latest 2013 papers do not reflect the fact that earlier estimates gave radiographers a tenfold higher dose then other workers, whereas the reverse ratio was a result of calculations four years later.

That's what we're talking about today. The layout men, the layout workers, all other workers in the plant are now assigned a higher dose then the betatron, the radiographers. The full Board on 12/11 was not told how this magical reversal of betatron non radiographer doses ratio took place between Appendix BB and the 2008 computer models and the 2012/2013 dose calculations and models.

Mr. Allen's 12/11 assertion that GSI non radiographers routinely got credit for the highest dose scenario was inaccurate.

Under Appendix BB, Rev 0, which all but four early GSI dose reconstructions have relied upon, radiographers got the highest dose whereas now both NIOSH and SC&A have flip flopped and conclude the reverse is true.

So layout men are assigned a much higher dose and betatron isotope radiographers using exactly the same computer models, but this time they factored in an occult film badge normalization process that really neither Dave Allen nor SC&A has described adequately enough to be properly evaluated by anyone, including me.

What precisely was the process of film badge normalization? I hope that could be discussed. We know that non-radiographers often get assigned the Appendix BB, Rev 0 lower dose level, contradicting what Mr. Allen told the full Board in December.

Anyway, Dave Allen points out in his latest paper that NIOSH did not estimate the radium-226 doses in the radiography room

in Building 6, relying instead on SC&A's dose estimates. And he explained why. And we have said all along that the block building used for radiography in Building 6 had existed well before 1962.

And I think we finally convinced the Work Group that was true. My problem when only SC&A calculates a dose in the radiography room, then who will perform the validity check on SC&A's methods? Would DCAS be evaluating SC&A science? Conversely, SC&A did not estimate doses for radium-226 and check DCAS' dose estimates outside the Building 6 radiography facility.

Both cobalt-60, radium-226 sources, both the cobalt-60 and the radium-226 sources, were used outside the Building 6 block building used for radiography according to one worker, [identifying information redacted]. And sometimes those exposures were unattended, according to the same GSI worker supervisor.

I believe that it was very misleading of Mr. Allen to imply on 12/11 to the Board that being awarded an SEC would be a bad thing for GSI claimants. That statement is false. And I will transmit after this meeting to the Board a brief analysis that I've done comparing 11 sites that shows quite clearly that if you have an SEC, these are all AWE sites, and that if you have an SEC you get paid higher percentages under Part B.

My analysis shows that at the SEC sites, 52.43 percent of the claims were paid. Those other than SEC, 26.43 percent of the claims were paid, that is, compensated. And even when you look at the completed dose reconstructions for the non-SEC sites they were lower, 26.2 percent then were the percentage of dose reconstructions paid at the SEC sites, which were 39.3 percent.

I also want to comment that there has been much made of tying the present dose bounds to the AEC regulatory limits in 1954

and 1955. But I have not seen the source citation for that information. And I think that ought to be put into the record. And it certainly ought to be documented clearly in Appendix BB, Rev 1.

Early in the process of getting GSI film badges, the folks at Landauer kindly sent me, Emily Quirke and Chris Passmore, kindly sent me their version of what the regulatory limits were during the period that Landauer was issuing their film badges to GSI. And as I remember that data it was somewhat different from the regulatory limits we're mentioning right now. So I think that point ought to be made very, very clear in the revised Appendix BB.

Also although Paul mentioned that there would be discussion about the residual period doses, there was absolutely no discussion, has been no discussion in the two latest papers or today that TIB-70 does not include the cyclical pattern of usage that GSI

buildings in the uranium path got because there was numerous resurfacing of those facilities by multiple commercial entities during the residual period from mid-1966 through 1992.

So I think that NIOSH plans to use TIB-70. But the exact intake model that NIOSH will use for dose reconstructions has not been spelled out clearly. Also, doses in neither of these papers, bounding doses I'm talking about, have been assigned for the two GSI 250 kVp portable X-ray machines or for the GSI-owned iridium-192 source that six workers say that GSI owned in either of the latest two papers.

Then I wanted to mention that two emails, which I will soon put into the record in the administrative appeal, that are very disturbing to me. And they've both been posted in recent ANWAG blogs on the ECAP Board website.

One of those was an email exchange

in 2010, in which, at DCAS' request, the DFO rank-ordered various sites with pending SECs based on the degree of -- the term used was, "political heat" that might be brought to bear on SEC decisions. And for example, in that email, both Los Alamos and Linde Ceramics received high political heat ratings, whereas GSI received a low rating.

And another SEC that I've been involved with, Texas City Chemicals, and several other sites received a quote, "never mind" political heat rating by the DFO. I personally believe this is one reason that GSI SEC 105 has taken so long to adjudicate.

The other email thread was even more disturbing. It was related to the issue of using surrogate data at the Hooker Electrochemical site and occurred during late 2009. In that email Dave Allen outlined his quote, "throw them a bone" strategy this way. I quote from his e-mail dated 12/19/09, found on Page 4 of the FOIA file that was obtained

by the Hooker petitioner and forwarded to ANWAG to be distributed to me.

The email is to Timothy Adler. It's from David Allen. The subject is good Hooker reading. And the body of the message is as follows. Quote: "The truth is", this is Dave Allen speaking. "The truth is my intent is to, quote, 'throw-them-a-bone strategy.' Basically give SC&A an obvious point to pick on, so they will. Often they stop once they find one. At that point I walk into a Work Group meeting and agree 100 percent with all their hits and let Work Group Members try to figure out how they're going to make it an SEC when there is total agreement." End quote.

I certainly plan to include this information in my SEC 105 appeal. For I believe the same deplorable tactic has been used repeatedly during the deliberations on GSI Appendix BB, the TBD-6000 and during the decision process on SEC 105.

Finally, I need to make two

comments about things said today, which are: Dr. Anigstein described correctly that St. Louis Testing used two sources, one cobalt and one iridium-192. And yet, in the Allen paper the dose assigned for St. Louis Testing is just a single dose.

They're not separately bounded in Allen or by St. Louis Testing. I don't think we have good separate doses for the St. Louis Testing cobalt and iridium sources. And they need to be entered as separate doses and decided upon actually.

And then the final comment is about an illogical set of assumptions that apparently the Work Group, SC&A and Mr. Allen are ready to accept. And that is as follows. A lot of credence has been placed on a statement in a GSI license application to the SEC. This is not a statement by the AEC. This is a statement by GSI management.

And it was made in 1963, actually by Gordon McMillan who was the vice president

and general manager at GSI. And it was Gordon McMillan's application to the AEC that said that people had always been badged for the preceding 20 years and that the dose limits were never exceeded and that the average was around 25 percent.

But I need to put on the record again, I think it's ridiculous to accept such a statement, despite what Dr. Anigstein has said about why would GSI management lie. The reason they would lie is because, in fact, there's voluminous testimony that there was essentially no radiation safety program that was effective at GSI up until 1963. It really didn't exist.

But here's the illogic that you all seem to accept. Dr. Anigstein says that Nuclear Consulting Corporation, Dr. Connaker's organization, who came in and helped GSI prepare their license exam in 1962, Dr. Anigstein says that in May of 1962, NCC furnished film badges to GSI.

Now why would they have to do that if in fact, as Gordon McMillan said, people had always been badged at GSI for the last 20 years? The other illogic that I think you all have really, I don't know a better word but accepted sort of uncritically, is the fact that nobody has ever produced the actual film badge records. Nobody has ever produced whose badges they actually were.

Dr. Anigstein admitted this morning, I think he's correct, that nobody's ever actually identified where NCC badges presumably given to GSI workers, where they came from. So I'm suggesting that unless and until those actual film badge records are obtained, that you have nothing in that but a statement from a GSI management person who has a clear-cut financial interest and business interest in having this license approved, who had essentially no safety program that anyone has documented, radiation safety program.

Now GSI had safety programs for

other aspects, like who got hit in the eye by hot particles from the molten steel and so forth. But I'm talking about a radiation safety program. It really didn't exist effectively before 1963.

And I think that information on which a lot has been based is really too bad. And the final comment I have is: I want to underscore what Dr. Anigstein said. Not only he, but the petitioners were strongly under the impression that David Allen was saying to the Board on December 11, 2012, that all workers at GSI would be assigned the high doses of, you know, 15 rem per year.

And I didn't think that was true that day. I don't think it's true now. And I think that's a very, very serious thing that's happened. And the final comment is: this will be a major element of my appeal. I think that was a mistake for the Board to allow that sort of a statement to be made knowing that it was inaccurate.

And I think it was very wrong of Mr. Allen to even imply that to the full Board. I think it was very misleading. So that's my comment for today. Thank you very much.

And I hope the Appendix BB matrix issues are not glossed through but are considered in detail apart from this discussion and resolved and closed. And I hope it happens today. Thank you very much.

CHAIRMAN ZIEMER: Okay, thank you, Dan, for those comments. I want to give also Ms. Jeske an opportunity to comment or add to this discussion if she wishes.

MS. JESKE: Yes, I agree with Dan on -- the voters were looking for a clarification that day, and Mr. Allen misleading them with the 12 to 15 rem was crucial, I would think, in the vote. I may be wrong, but I think it may have swayed some of them, the Board Members, and of course that will be part of our appeal when that time

comes.

I would like some clarification on this. And I'm a little concerned too, I guess, about so much emphasis being put on one part-time radiographer, how accurate maybe that would be for the Appendix BB revision. Just concerns that I have and of course we'll attach those to the appeal when the time comes.

And the overtime for the part-time radiographer, just a little clarification there. Is that supposed to be in the revision given to all the employees, that assumption that they all worked that same amount of overtime or is -- I mean, how is that going to apply?

CHAIRMAN ZIEMER: I'll answer that in part, and maybe Dr. Anigstein can add to it. But I think he was using that to estimate his number for that particular worker, which I think he ended up saying he used something like 80 percent of that. But we already have

a change in Appendix BB which has to show up yet, which will affect everybody, and that is that rather than the 40-hour work week there is a higher number, which -- I forget what it is right off the top of my head.

That was agreed to some time ago, but it hasn't shown up because Appendix B's revision has not yet occurred. But all past dose reconstructions will include that, as far as I know, a higher work week value.

MR. ALLEN: Sixty-five hours a week.

CHAIRMAN ZIEMER: Sixty-five hours a week. So everyone, I believe, will get that benefit. That will be the value that will be in Appendix BB.

MS. JESKE: Okay.

CHAIRMAN ZIEMER: Okay. Thank you very much. I think we're going to take a comfort break right now for 15 minutes and then we'll return.

MR. RAMSPOTT: Dr. Ziemer?

CHAIRMAN ZIEMER: Yes.

MR. RAMSPOTT: John Ramspott.

CHAIRMAN ZIEMER: Hi, John.

MR. RAMSPOTT: Could I make a comment after your comfort break?

CHAIRMAN ZIEMER: Oh, you bet.

MR. RAMSPOTT: Thank you.

MR. KATZ: Okay. So 15 minutes. Five of we'll resume.

(Whereupon, the above-entitled matter went off the record at 10:41 a.m. and resumed at 10:56 a.m.)

MR. KATZ: Okay, we are ready to reconvene.

CHAIRMAN ZIEMER: We're back in session. We're going to hear from Mr. Ramspott next.

MR. RAMSPOTT: Dr. Ziemer, can you hear me clearly?

CHAIRMAN ZIEMER: Yes, go ahead, John.

MR. RAMSPOTT: I appreciate the

opportunity as well. And Dr. McKeel has touched on a number of the items I was going to talk about, so I won't beat a dead horse. But I'd like to bring to attention just a couple things here.

First off, I wanted to thank the entire Board for taking the vote and making the vote as close as it was. And I thank those who I feel did the right thing. But I too, one of the first things I looked at were these two reports from SC&A and NIOSH. And it's really, really unexplainable why the full Board was not given privy to these two reports before they took a vote because, like others, I also felt very misled.

And I can't speak for the Board Members as the information that Dave Allen had given to the Board about the doses that were going to be granted. I thought maybe it was just my own personal opinion.

But I went back and I've reread the transcript of the meeting about ten times

now. And I clearly see exactly what was trying to be sold at the time to the Board and it's not what's in the current White Paper.

I'm going to come to something everybody seems to be basing a lot of information on today. And a lot of the SEC issues really are dose reconstruction issues, they're the same thing.

And one of them is there appears, and maybe you guys can tell me I'm wrong, but it appears the layout man is the one that got the highest dose according to everybody's current models. Is that correct?

MR. ALLEN: I think what it is, is the layout man is the limiting case once the new betatron building is built.

MR. RAMSPOTT: Okay. Thanks, Dave, because that's one of the things I wanted to point out. Everybody seems to be missing the point. There were a lot of workers outside that old betatron building. I mean, we've had workers tell you that,

railroad guys, chainmen, yard guys.

That old betatron had activity outside it too, inspectors, people had to go there, wait to get in when the shots were done and there was just current, everyday activity. There were people replacing railroad ties. We've presented pictures that clearly show that old betatron is not way out by itself. If you look you see all kinds of activity going right outside that door.

CHAIRMAN ZIEMER: John, you understand that although they're labeled layout men here that those doses would be assigned to everybody.

MR. RAMSPOTT: You know, I do and that's the next fault. Thank you, because that's my next point. We're basing, we're saying a layout guy apparently got the greatest dose and we've got a GSI letter to the Atomic Energy Commission with their application and Dr. McKeel's totally correct, that's not from the AEC saying they never

exceeded.

It's GSI management saying they never exceeded, actually from an individual that was there for a pretty short period of time. He's not one of the guys that was right on the betatrons all those years. But I think everybody's missing the point.

If those people -- now everybody agrees the layout people got the most dose and no one ever exceeded, those layout people never wore a badge in their entire time. So how can anybody at GSI know whether those people ever exceeded an AEC limit? They can't. That whole theory is fallacious.

You're basing something on a GSI letter on something that's totally implausible and unscientific. They never took a badge reading from a layout man ever. The only readings they got over that whole period of time, the 13 years of the contract, were from a few betatron people.

And yet you're using that "never

exceeded" as your guideline. How can you say they never exceeded when you don't know what the layout guy ever got? There never was a badge. There never was a control badge. Everything, all the badges were held in the betatron buildings. They were never worn out there.

We've heard that testimony from people over and over and over. That whole theory which it seems like both these reports are based on, doesn't work. It's not valid. Now, you know, somebody could correct me on that and say, well, the guy out there wore a badge.

I may have missed the boat, but I don't think so. I've talked to too many people. I mean, is there a comment on that, because I seem to say things, but I never get comments back?

CHAIRMAN ZIEMER: Okay, here is a comment. Here's Dave Allen with a comment.

MR. RAMSPOTT: Okay.

MR. ALLEN: John, this is Dave Allen. That whole statement about the AEC limits was only used as a check or, well, I'd call it a debate. But I think Bob wants to use that as our dose estimate and we want to use that as a check on the model.

But it's only for the radiographers in the radium era. It wasn't, it didn't affect the layout man dose at all. It wasn't part of that argument or that discussion.

MR. RAMSPOTT: Yes, but the whole thing, it sounds like the whole thing -- no, Dave, I disagree. It sounds like the entire program is being based on never going over that limit.

MR. ALLEN: No, that was just a statement in the application for the license in 1962 that the radiographers used radium prior to that and none of them ever exceeded the limit.

MR. RAMSPOTT: Well how can you

say that?

DR. ANIGSTEIN: The radium -- this is Bob. The radium, all of the radiographers wore badges whether they were in the betatron room or whether they were the so-called isotope, what they called isotope operators who might have been in Building 6, they still wore badges.

I agree that the layout man did not wear a badge. The workers in the finishing buildings didn't wear badges because they were doing repair work on the castings and there were -- the management was afraid that the badges might get damaged with the sparks flying from the steel.

However, there is consensus that the worker whom I interviewed said he always, with the radium radiography said he always wore a badge.

MR. RAMSPOTT: The radiographer may have worn a badge. But you're also ignoring the fact that the radiographer

everybody seems to want to talk about is the guy that's in the little 6 Building. Everybody seems to ignore [identifying information redacted] who did both radium, cobalt and betatron work from time to time.

He said those sources and both sources, not just cobalt but radium, were used out in the plant. If everybody recalls, a plumb-bob which contained radium was stolen in 10 Building, which brings me to another point.

DR. ANIGSTEIN: I hate to say that there is no consistency on that plumb-bob. The stories including the gentleman whom you just mentioned, his story is completely inconsistent with that of other people that I interviewed.

MR. RAMSPOTT: I've talked to ten different guys that maybe they weren't there, but they've heard that exact story, one of them being the manager of the betatron building who said they thought the source actually got ground up and went into the

silica sand.

DR. ANIGSTEIN: I was there when he said that.

MR. RAMSPOTT: Okay. So there's another source.

DR. ANIGSTEIN: That was, I'm just saying [identifying information redacted] account was at variance with the others. He told me that somebody walked off with the source, threw it in the back of his car, threw it over by the railroad tracks, completely different story.

CHAIRMAN ZIEMER: Look, guys, I am going to interrupt this discussion. We've talked about that incident over and over again. And we've agreed that if somebody made, if a claimant says I was the one who took that, that would be reconstructed specifically for that individual. We've done this before on incidents. That's not part of this dose reconstruction.

MR. RAMSPOTT: Okay, Paul, I'll

back off of that. I guess I'll go back to my main subject.

CHAIRMAN ZIEMER: Yes, if there was a person who said you know what, when I was there, I'm the guy that took the source that would be handled differently. So that's not part of this.

MR. RAMSPOTT: Okay. My main point is: we're basing everything on people who never wore badges. And I find that kind of unusual. The other topic that I think was being missed for dose reconstruction, which is what we're after today, let's talk about the layout man.

He's working on an activated casting. He's also getting hit with what's coming down that tunnel from the betatron and we know radiography was done in 10 Building from other people, you know, with the -- whether it was a plumb-bob or it was a cobalt device camera, there's three sources that layout man really should be subject to.

At the same time, everybody says he can't get -- actually I heard Bob say this morning correctly, he had an activated casting and he was catching something coming down the tracks. But there was also a radioactive source out there besides those two, according to all other accounts.

DR. ANIGSTEIN: We are already, John, already doing the absolute maximum exposure he could have had. To say that he was in the worst possible position, I'll admit this is highly limiting to say that he was in the worst possible position with the betatron being operated in the worst possible position, this is already an extreme limit.

To say then, oh, and by the way someone was right next to him using radium. That's just not plausible. That's just too much, you know, I mean, you can just pile one implausible scenario on top of another implausible scenario and it gets to the point where it just, it passes the credulity.

MR. RAMSPOTT: If you say all three add up to that, I take your word, sir.

DR. ANIGSTEIN: I mean, he may have had one or the other. To say all at once is just too unlikely.

MR. RAMSPOTT: At least two anyway are very likely.

CHAIRMAN ZIEMER: Any other comments, John?

MR. RAMSPOTT: No, I think for right now that's it. I appreciate your time.

CHAIRMAN ZIEMER: Okay. Thank you. Okay.

DR. ANIGSTEIN: And I would like to make a couple of responses.

CHAIRMAN ZIEMER: Okay. Go ahead, Bob.

DR. ANIGSTEIN: As far as John's comment --

CHAIRMAN ZIEMER: Speak into your phone, or your mic.

DR. ANIGSTEIN: The presentation

that was just done on my behalf by Bob Barton was basically, I took -- that briefing was essentially copied, not exactly because I made some changes, from the briefing that was presented to the Board at the meeting in Santa Fe back in June. So the Board had certainly gotten this information.

From the SC&A standpoint, this last report is just -- there's nothing really new. It just confirms and affirms our position and what we did before. But all of this had been presented to the Work Group and was presumably available to the Board at earlier times. So it's not, this is not brand new information that is just being brought out now after the SEC vote. That's one thing.

And I also have some rather strong objections to comments made by Dr. McKeel. I don't think Dr. McKeel, I don't think it's appropriate him for to be using the term irresponsible. That's completely out of line. And I don't want to get into who's being

irresponsible here.

As far as saying it's irresponsible that we did not explain the difference, yes, in 2008, we did the initial analysis. We had limited information on the betatron building. The only information that we had was from the FUSRAP report, which was not designed to give you an accurate drawing of it. Their only interest was looking for uranium contamination. And they gave an outline drawing to show where they sampled for uranium.

The most important thing is why did the dose to the betatron operator change drastically? Because we got the film badges since then, thanks to Dr. McKeel who helped track them down. As he knows very well, he got, we got the film badges subsequent to that 2008 analysis, whether it was started in 2007, our report came out in 2008.

We got that, those film badges subsequent to that. He knows perfectly well

that that happened. And it's totally reckless to say we were irresponsible for not explaining the difference. I take great offense at that.

And as far as the normalization to the film badges, that was something that was done by NIOSH. This is not something that was done by SC&A. We don't accept that. So I don't have to explain that because we didn't do that.

As far as the -- minor points -- as far as the sources, the fact that St. Louis Testing used both cobalt-60 and iridium-192, first of all they used the iridium-192 rather infrequently. And second of all, it makes no difference what the source is because the exposure assessment, the exposure estimate was simply based on someone standing at the boundary which was laid out at 2 mR per hour.

So 2 mR is 2mR whether it's from cobalt or from iridium. The conversion from the photon flux and the exposure to actual

dose is slightly different. But we weren't talking about it. We were just talking about the exposure rate. So that is not a valid point whatsoever.

And as far as the film badges being supplied by the Nuclear Consulting Corporation, I believe it is, there's nothing illogical about that. They were brought in as their radiation safety consultant. Here was a highly reputable, highly recognized, unusual credentials at that time certainly, of somebody with a PhD in nuclear physics who was also a certified health physicist. And he was brought in.

And so it's not illogical that he would be asked to supply the film badges as opposed to whoever had supplied the film badges before. Previously, they had film badges. It seems to be quite clear. They would simply be sent in by some outside vendor and distributed among the workers.

And here Dr. Connaker became the

middle man and handled the badges and reviewed the results. So that was simply, I'm sure he's probably a package deal where he did, they did the radiation protection survey to see whether there was adequate shielding. They handled the film badges.

They calibrated, they even calibrated the sources, those 260, 280 millicurie cobalt-60 sources were purchased from a purveyor of the sources. But they were calibrated and certified by Dr. Connaker, who also --

CHAIRMAN ZIEMER: I'm going to interrupt, Bob. I think we're rehashing old ground that we've gone over many times.

DR. ANIGSTEIN: All right.

CHAIRMAN ZIEMER: What we need now is to focus on these two, we have the NIOSH summaries where they've compared what they did and what SC&A did and tried to identify some areas where we haven't come to total agreement on what assumptions should be made. I think

what we'd like to do now is try to close some of these uncertainties to the extent that it's possible.

And so let me go back, Dave, I'd like -- Dave Allen, I'd like you to kind of take the lead on this and let's go through the issues individually that we need to, where there's a difference in what you are recommending versus what SC&A is recommending. And let's see if we can get some consensus with the Work Group here on those so.

MR. ALLEN: Okay. I've got it in essentially three categories here. And the first one is not on that White Paper, it came up after. And that is the time line. And I'm gathering Bob doesn't have much difficulty with what I was proposing earlier in the meeting.

And I'd like to get the Work Group's take on that. But my opinion the cobalt-60 sources were purchased in May 21, 1962, and that was what Bob was using as a

start of a different era when cobalt sources were used. I think they were -- the time line I had they were purchased in. But I don't think I can actually guarantee they were put into service at that point.

CHAIRMAN ZIEMER: Actually, I think we found a purchase order dated May 5th in the original documents that Dr. McKeel had. But I think the 21st was possibly a shipping date. I don't recall. Maybe Bob Anigstein --

DR. ANIGSTEIN: I believe that there was a statement in one of the AEC documents that said that's when they were acquired. I mean that's when they actually --

CHAIRMAN ZIEMER: Actually came on site.

DR. ANIGSTEIN: -- came, you know, arrived on site. So whether -- now I have by the way, I meant to, I didn't get a chance to break in with this comment earlier. I had no problem if NIOSH wants to use round numbers and say, okay, all of '62 is the radium era

and '63 on is the new betatron era. That's fine.

Earlier, I had assumed they were doing that and then later on I got the impression they were going to get down to precise dates. So either way is fine. If they want to just make it simple and make it a whole year, everybody working there gets a limiting dose for that year, I have no problems with that. It's simple, it's somewhat claimant-favorable. It's not terribly exaggerated. So either way is fine.

CHAIRMAN ZIEMER: It's a little more claimant-favorable to assume that the radium continued through the end of the year even though --

DR. ANIGSTEIN: Yes.

CHAIRMAN ZIEMER: -- a little transition period.

MR. ALLEN: I mean, the other piece of information there was the radiography room with the cobalt sources exposed was

surveyed June 24th of '62. But then in June and July, they modified the shielding and resurveyed it again August 1st. There's a real chance they were modifying things, getting everything in position before they actually started utilizing them routinely.

So I would like, as Bob said, round it off to the end of '62 for the radium era. That is slightly favorable and I don't know if we have a really good, solid date on exactly when they started using.

CHAIRMAN ZIEMER: The stop and start. Other Members of the Work Group, can we agree to identify the radium period as going through to the end of '62?

MEMBER MUNN: Yes, if you give the situation a little reality check. What do we really know about how things really operate in production facilities? To my knowledge, nothing just comes in and is immediately done.

So there's always an enormous and usually fairly long changeover period. It

appears to me that from May to the end of the year for 1962 would be a reasonable time to assume that you still had the original exposure.

CHAIRMAN ZIEMER: Okay. John Poston, are you on the line?

MEMBER POSTON: Yes, I'm here.

CHAIRMAN ZIEMER: Are you okay with that also?

MEMBER POSTON: Yes, sir.

CHAIRMAN ZIEMER: Okay. Then we'll agree that would be the transition date then that you would, in terms of your dose reconstruction, you would continue the radium assignments through the end of the year, 1962.

MR. ALLEN: And I was going to pick up the limiting of the later years, January 1st of '63, which would end up being the layout man. Again, we know that's a little early on that. But as Bob called it rounding off to the full year. As long as nobody has any objection to that, that's the

way I would like to do it.

MEMBER MUNN: None here.

CHAIRMAN ZIEMER: Let me just raise this question. I wasn't aware until the petitioner identified, I guess the Department of Labor has added the early year to this whole thing. That has apparently occurred in the last few weeks, I gather.

DR. NETON: I don't recall when.

MR. ALLEN: It's been more than that. It's been the last few months I think.

CHAIRMAN ZIEMER: Does that automatically get added in and does that get added to the --

MR. ALLEN: Yes, they extended the start date from the beginning, from January 1st '53 to October 1st of '52.

CHAIRMAN ZIEMER: Has that wording automatically been put into the --

MEMBER MUNN: Petition?

CHAIRMAN ZIEMER: -- petition?

MR. ALLEN: The petition, I don't

know. But it's going to go into the Appendix. The revision of the Appendix will --

CHAIRMAN ZIEMER: But there's a petition that because of -- the petition originally started in --

DR. NETON: At the start of the covered period.

CHAIRMAN ZIEMER: Right. And does that get changed? The material, I assume, is somewhere --

DR. NETON: Well, the petition has already been dealt with on the definition that was in place at the time.

CHAIRMAN ZIEMER: Right, but we acted in December, and I assume by the time it got to the Secretary the change might have occurred. Well, we can't handle anything like that here.

DR. NETON: We will certainly add that extra time frame for the three months or so at the beginning of -- prior to '53.

MR. ALLEN: It's certainly going

to be added to dose reconstruction, et cetera.

CHAIRMAN ZIEMER: So the starting period here is --

DR. NETON: The main difference is Department of Labor can start sending cases for people that have employment prior to '53.

MEMBER MUNN: Right, earlier.

DR. NETON: That's the main difference. And we will reconstruct the doses, because we'll have to go back and look at the dose reconstructions.

CHAIRMAN ZIEMER: And there are some that will get some additional assignment.

MR. ALLEN: But I think in those situations, if DOL goes back and looks to verify -- because sometimes they will verify employment only from the start of the covered period when there's actually reason to verify earlier.

CHAIRMAN ZIEMER: Okay. Thank you. We have agreement on that point. Let's go to the next one.

MR. ALLEN: Okay. The next one is the radium era, then, as far as radiographers. Again, I don't think we have agreement with SC&A on this. But I'm looking at the letter or the statement to the AEC from GSI, the 25 percent versus 100 percent, saying the maximum person was exposed to between 3 and 12 rem.

Then looking at Bob's prorated full year estimate for the part-time radiographer falling between 9 and 20 rem. And then the SC&A model of the radiographer was 9.69 rem. And I know in his statements, I think he made the same statement during the Board meeting. I know he has during the Work Group more than once, that these three independent analyses all kind of point to the same range. And that's been convincing some people for sure. And I don't believe we ought to be using the 12 or the 15 as Bob is recommending. I'm thinking more that 9.69 seems to fall right there and be consistent with all three of these.

CHAIRMAN ZIEMER: You previously had the 3.573 as your -- or no.

MR. ALLEN: Yes.

CHAIRMAN ZIEMER: Yes, 3.573 as your maximum based on a longer distance, or a longer fish pole, and what else?

MR. ALLEN: It was the median point of the range that he said the fish pole -- he would be four to six feet, we used five.

CHAIRMAN ZIEMER: He was using four.

MR. ALLEN: Bob used four. And it was a --

CHAIRMAN ZIEMER: And you used five?

MR. ALLEN: Yes.

DR. ANIGSTEIN: My objection to that is that I thought of that model based on the radiographer's recollection as sort of a reality check. Once again, we're dealing with, I was talking to one person, a 50-year old recollection. And also perhaps, I'm just

saying, when you said 12 to 15 seconds, that was his recollection. It could have been longer.

Maybe he was very spry and really, you know, was trying to minimize his radiation exposure. Other workers might have been a little less efficient. Maybe they spent, you know, maybe they weren't quite as quick at moving the sources.

CHAIRMAN ZIEMER: Yes, understood.

DR. ANIGSTEIN: That's why I think this is just a single point, a single data point as a reality check. But I would not rest the dose limit on that. And I know I'm beginning to sound redundant. Whereas the 12 and 15, again, these were records which we don't have today. But they did exist at the time.

The AEC inspectors could have very easily said, let me see those records that you've been maintaining. They went to the site. This was based -- the statement was

based -- it was made a couple of times.

It was also made by the radiation -- not by the vice president, but by the radiation safety supervisor who had been there as it happened. He started at GSI just about the beginning of the period of covered AEC operations.

CHAIRMAN ZIEMER: Bob, we understand that --

DR. ANIGSTEIN: More or less, given a year --

CHAIRMAN ZIEMER: Bob, we've gone through this. We don't have to repeat this.

DR. ANIGSTEIN: All right. It seems like it's not --

CHAIRMAN ZIEMER: It's the issue of whether or not to use the model that --

DR. ANIGSTEIN: I'm saying there's more than one place that this statement was made. And, okay. I'm sorry if I'm beating a dead horse.

CHAIRMAN ZIEMER: No, but the

issue, it's kind of a conceptual issue of whether to use the --

DR. ANIGSTEIN: The maximum.

CHAIRMAN ZIEMER: -- the dose limits, which I don't think we've done before ever.

DR. NETON: I don't recall --

CHAIRMAN ZIEMER: -- versus a model, I mean every place, a lot of places that had dose limits, but we don't necessarily use those as the bounds.

MEMBER MUNN: No, there is no evidence to support using those as the bounds.

CHAIRMAN ZIEMER: Well, but these numbers are very close to that. You're talking about something that's close to 10 R per year versus 12 in some cases.

MEMBER BEACH: I have a question for Dave. Dave, are you talking about using that 9.69 for the entire period, the '52 through end of '62?

MR. ALLEN: Through end of '62,

yes.

MEMBER BEACH: Okay. Because SCA has thought the dose would be higher in the early couple of years versus --

MR. ALLEN: They were basing that on the limit being higher. So the AEC statement was really, when it said no one exceeded a limit, it could have been as high as 15 rem up and through 54 --

DR. ANIGSTEIN: Through 54. They changed it to 55.

MR. ALLEN: Through 54, and then the limit was three rem per quarter after that, so they changed it to 12 rem per year was the maximum. But there's no information or evidence that anything actually changed as far as procedures or processes or anything like that. So I was -- this is kind of a less than limit is how I was looking it, hitting the twelve.

DR. ANIGSTEIN: I thought it was significant that this statement was made, that

they said, specifically didn't say, well we've never exceeded the current AEC limit. That would have been slightly more favorable.

He very carefully hedged it by saying we never exceeded the then-applicable, the limits applicable for each period. So they were aware that the limits changed. And they very carefully hedged their statement.

DR. NETON: Well Bob, that's sort of a general statement. I mean the guy, you know, he didn't maybe have the numbers at his fingertips. He wasn't going to say we've never exceeded nine rem or 10 rem or --

DR. ANIGSTEIN: I know. But it seems to me --

DR. NETON: You're reading more into it, I think, than is there, to be honest with you.

DR. ANIGSTEIN: I know, again, there's more than one way of interpreting it. But it seems like he was very carefully hedging and saying we never exceeded the

limits applicable at that time.

So it would seem to me like they were taking advantage of the more permissive limit at the time and then said, whoops, now we're going down because if they were sending their film badges in to be read the, again, we don't have those records.

But the film badge company, such as the equivalent to Landauer in its time, would be keeping the cumulative records and would be sending back a report saying, hey, this guy is close to the limit. But, you know, and they would have warned them. So it seems to be that there would have been some logic behind that, okay. I'm probably going on --

CHAIRMAN ZIEMER: Okay, well, I guess we need, I think we need input now from the Work Group as to what direction you want to go on this and what made this, hear what are your feelings on this. John Poston, let me start with you. Since you're not here,

I'll pick on you.

We're talking about using the, what was then the legal limit versus the number that we come up with calculationally. And if you're responding, you're probably on mute. I'm not hearing --

MR. KATZ: John Poston, are you on the line?

(No response.)

CHAIRMAN ZIEMER: Okay, Josie.

MEMBER BEACH: I'm going to have to agree with SC&A on this one and go with the higher limit since we don't know for sure. That's my opinion.

CHAIRMAN ZIEMER: You are more comfortable with the 12, the 15 and the 12?

MEMBER BEACH: Yes.

CHAIRMAN ZIEMER: Wanda?

MEMBER MUNN: No, as I stated earlier, I can see no justification. There is no evidence to support the assumption that a limit that was established by regulation was

actually the highest, was anywhere near the dosage that was actually being received by any of the people.

We have evidence to the contrary. We have evidence showing what some of the doses were and we know what the source terms were. Therefore, it seems to me that the model has a basis in rational science.

And I'm not sure that one can say that for accepting a regulatory boundary as being a justification for assigning dose. That doesn't meet the criterion that we often talk about with respect to the science, in my view.

MEMBER BEACH: Don't we also have evidence in one case that was higher, up to 20?

MR. ALLEN: It's a range of values that Bob calculated from a summary --

(Simultaneous speaking.)

CHAIRMAN ZIEMER: Yes, it's not an actual exposure. Remind me of the distances,

no, not the distances, the amount of time that you used for --

MR. ALLEN: The individuals, that was the fishing pole technique it took them 12 to 15 seconds to place the source and the same amount to remove it.

CHAIRMAN ZIEMER: And Bob used --

DR. ANIGSTEIN: I used the 15.

MR. ALLEN: He used --

CHAIRMAN ZIEMER: And you used.

MR. ALLEN: I used 13 and a half, the midpoint.

CHAIRMAN ZIEMER: Thirteen and a half.

MR. ALLEN: And the same story with the distances. It was four to six feet. I used five and Bob used four.

CHAIRMAN ZIEMER: The biggest difference comes from the distance thing than the few seconds.

MR. ALLEN: I think so, yes.

MEMBER MUNN: Four feet is not

much of a pole. Those of us who've used poles.

DR. NETON: I might propose something here that might help. I don't know if it will or not. But we've got some differences of opinions about what the range of the doses are and Dave's original analysis was around three. SC&A, using the same scenario, being more conservative, came up with around nine.

There is no possibility that the person could have been exposed at the regulatory limit. So perhaps maybe a distribution could be used of these doses as input in the program.

CHAIRMAN ZIEMER: And then you would take the tail end?

DR. NETON: No, it would sample. But I'm just, I'm not saying this would be the ultimate one. But say a triangular distribution with three as the low, nine as the central estimate and upper regulatory

limit as the high end. And that would be the input term as the person's dose for that year.

CHAIRMAN ZIEMER: And then what would happen? The computer would --

DR. NETON: Sample it.

CHAIRMAN ZIEMER: -- come up with a, is this a Monte Carlo type sampling?

MR. ALLEN: We can, I mean we can put a triangular distribution into IREP and then IREP does a Monte Carlo type of --

DR. NETON: Because that allows for all possibilities. It allows for, I personally don't believe that it's appropriate to assign everybody that ever worked at that plant the regulatory limit for every year they worked there. That just seems to be, this allows for that possibility at the upper limit.

IREP, you know, is picked, the PoC is picked at the 95 percentile. How much that contributes overall is hard to determine because the uncertainty and all the other

parameters are factored in there.

But at least they would sample a certain percentage of the time the fact that it could have been as high as the regulatory limit. Just an option.

CHAIRMAN ZIEMER: Yes.

MEMBER MUNN: It's a good option.

MEMBER BEACH: Yes, I agree. I'd like to see what that would look like.

CHAIRMAN ZIEMER: If you do that --

DR. NETON: It would not be the same as assigning everybody the maximum.

MEMBER MUNN: No.

DR. NETON: I'm not saying that because it would --

CHAIRMAN ZIEMER: For a given individual, you would get a little different value for each of the years of work. How does that --

DR. NETON: No, each input year would be the distribution --

CHAIRMAN ZIEMER: You input the year.

DR. NETON: That year, each year would have that input distribution and the upper limit would either be 12 or 15 depending on the year. The lower and the middle values would be the same. And it would sample that distribution --

DR. ANIGSTEIN: What would be your mode in the triangular distribution?

DR. NETON: I think it would be 9, 9.6, whatever the one, the model dose that Dave was agreeing to earlier in the day. And three would be a lower value, which would be the lower end of the estimate based on the fishing pole, you know, technique.

DR. ANIGSTEIN: I can't, wait a second. The lower value would be three?

DR. NETON: Yes or whatever --

MR. ALLEN: Well it's, the value in the White Paper I put out was three point --

MEMBER MUNN: 3.5.

DR. ANIGSTEIN: But that's based on two radiographers.

MR. ALLEN: That's based on two radiographers and I was going to --

DR. ANIGSTEIN: And that's not consistent with the --

MR. ALLEN: I think it comes out around five and half or so.

DR. NETON: I'm just proposing, I'm not suggesting the final distribution here. But I think --

DR. ANIGSTEIN: I can't agree with that lower bound.

CHAIRMAN ZIEMER: I think it's his footnote D is 5.411, if you said it's a single radiographer which --

DR. NETON: If it's a single, then it's five.

CHAIRMAN ZIEMER: So you've got five, nine and 12.

DR. NETON: Twelve or 15 depending

on the year.

CHAIRMAN ZIEMER: Twelve or 15.

MR. ALLEN: The lower end would be modeled with the --

DR. ANIGSTEIN: But this is inconsistent with the range of nine to 20 which is based on a real person and his real records extrapolated to a full-time worker.

DR. NETON: But I thought you just agreed that no one had exceeded the limit, though.

DR. ANIGSTEIN: No, I know, but the point is the lower limit should be no lower than about nine.

DR. NETON: Why?

MEMBER MUNN: Why?

DR. ANIGSTEIN: Because that's the, that is taking the 18 quarters of records --

CHAIRMAN ZIEMER: But of one worker.

DR. NETON: Bob, they said 25

percent, no one, most of the workers didn't exceed 25 percent of the limit in their own statement.

DR. ANIGSTEIN: Right.

DR. NETON: So I don't know why the low should be nine then.

DR. ANIGSTEIN: Well that's just based on this one worker.

CHAIRMAN ZIEMER: Yes, that was my point.

DR. NETON: But I am saying that in statements, AEC said --

DR. ANIGSTEIN: Yes, right. So somebody, I mean some workers got nothing.

MEMBER MUNN: Absolutely.

DR. ANIGSTEIN: And you know, you can go, you can say some people got zero because they were never near the sources. They had other jobs. The whole point is --

DR. NETON: Three, I don't think zero is an appropriate level --

DR. ANIGSTEIN: I didn't say it

is. But I'm simply saying, by the same logic, the three I don't think should be included. I think it should be somewhere between nine and 12, I wouldn't disagree strongly.

CHAIRMAN ZIEMER: Bob, we're talking about 5.4 as the lower part of this, which in itself is still above the 25 percent average.

MEMBER MUNN: And 3 R is not negligible. If you're talking 3 mR that's one thing. But 3 R is not negligible, for goodness' sake. That's a dose.

DR. NETON: I don't know if we can flesh out the exact details here. But is there, I think --

CHAIRMAN ZIEMER: Well, I certainly would be comfortable in principle with using the triangular distribution that included the 5.4, whatever that turns out to be or exactly with the 9.69 as the central.

DR. ANIGSTEIN: I'm sorry. Where did the 5.4 come from?

CHAIRMAN ZIEMER: That's by having one radiographer instead of two. Remember the 3.5 --

DR. ANIGSTEIN: But if you had, right here, I see the two radiographers -- you had, I'm just looking at Dave's chart. It's, I see, no, 5.4 is the fishing pole -- according to the footnote D as in dog, 5.4 is for the fishing pole technique divided between two radiographers plus 8.68, .868 at the boundary.

(Simultaneous speaking.)

DR. ANIGSTEIN: It's still assuming that the work was divided and I don't think we can --

CHAIRMAN ZIEMER: No.

DR. ANIGSTEIN: That's what the 5.4 is.

MR. ALLEN: No, it's a footnote to the 3.573 in the table.

DR. ANIGSTEIN: That's exactly what I'm looking at.

MR. ALLEN: Yes, so the footnote says that 3.573 came from 5.411 divided by two radiographers plus the .868.

DR. ANIGSTEIN: Sorry, thank you. Thank you. I got it the other way around. So 5.4 is what you modeled. But you did not include the, anything at the -- at the boundary.

MR. ALLEN: That is true. It's actually 5.41 plus the .868 is what the low limit would be.

DR. ANIGSTEIN: So it should be about 6.3?

CHAIRMAN ZIEMER: Yes, so it's 6.3 and then --

DR. ANIGSTEIN: Okay. If that's the lower bound, sure I can go along with, I think that's reasonable.

CHAIRMAN ZIEMER: And then a nine, and then a 12 or 15. Josie, are you okay on that?

MEMBER BEACH: I am comfortable.

I'd like to see that.

MR. STIVER: Okay. Triangular distribution method?

CHAIRMAN ZIEMER: Wanda?

MEMBER MUNN: Yes.

DR. NETON: You can't do anything other than triangular, I don't think.

MR. ALLEN: Not with that. I don't think you could.

CHAIRMAN ZIEMER: Okay. That certainly seems -- and I don't know if John Poston got back on the line yet or not. John, if you did, you can weigh in on this.

MEMBER MUNN: That is very favorable.

CHAIRMAN ZIEMER: So that would be assigned to all.

MR. KATZ: John, are you on the line, John Poston?

CHAIRMAN ZIEMER: This would be assigned to whom?

MR. ALLEN: Well, that's the next

question on this one.

DR. NETON: If it was six point, the lower bound was --

MEMBER BEACH: Five point --

MR. ALLEN: It's 5.411 plus .868. Footnote D to my right.

DR. NETON: Like 6.3 or something like that.

MR. ALLEN: Yes, 6.2, almost 6.3.

CHAIRMAN ZIEMER: We don't need it exactly.

MR. ALLEN: Almost 6.3.

MEMBER MUNN: At the millirem levels.

CHAIRMAN ZIEMER: Who is this assigned to?

MR. ALLEN: Okay, that's the next question on there. And the model I had and what's in the White Paper here would be that would be, there's no doubt that's for the radiographers in the radium era.

Then the question is for the

others whether they should be assigned the radiographer dose or whether they should be assigned a different dose. And my opinion was with this era, it should be a different dose for non-radiographers because the vast majority of this dose from all models comes from the fishing pole technique and placing the source.

And that's not from working near the area or something that other workers would get. And currently SC&A had an argument or a model showing 2.087 for others from radiography in the building, in the radiography room of Building 6 and a blower outside.

DR. ANIGSTEIN: That was based on a very arbitrary -- it was just like sort of in -- perhaps I didn't make it clear at the time, it was sort of an arbitrary, it was like an illustration with here's how we could model this.

And this was based on an

assumption made in the Nuclear Consulting Corporation's report saying if -- they didn't even make the statement like we believe -- if we assume there is a 25 percent occupancy factor, it just said if we assume that, then this is the dose rate that would be given at this location.

That was based on the cobalt. So I just said well if we assume the 25 percent occupancy factor we get two, two point something. But if we assume a 100 percent occupancy factor then you get close to nine. So I don't know how well based that occupancy factor is.

It certainly was not based, I mean as someone who had done a limited amount of radiation surveys a very long time ago, it certainly was not based on someone staying there and taking a census of how many workers spent how much time there. It was just some kind of, it was just an off-the-cuff estimate.

So I don't think that's a very

strong number. And also there seems to be an inconsistency that if we're going to give the highest dose regardless of occupation in the betatron era, for the betatron exposures, then it would seem that the same and I think this is what the Board assumed based on a couple of comments of, gee, we're assigning some very high doses.

I don't think they were thinking just of radiographers because I don't know if this appropriate or not, but just out of curiosity, Bob Barton at John Mauro's request actually looked at all the pending, all the claims that had up to now, under the initial, there were a 100, whatever number there were that were that had a PoC of below 50 percent. There was only one radiographer there.

So we're talking about who is going to be affected by a new dose assignment, we're talking about one person. And it may be four or six, Bob, correct me if I'm wrong, that were, whose duties were unknown. So what

do you, so basically there was 160-odd others who are not even being affected by any of this.

MR. ALLEN: Well that's not --

DR. ANIGSTEIN: And this dose of two point something is actually lower than the initial skyshine dose that was assigned of .7, if you take .72 mR, it's not clear whether it was mR or millirem. It's stated differently in different parts of Appendix B, Appendix BB.

But if you take the number of .72 and multiply it by the new work hours of 3250 a year, you end up with actually 2.3 R or rem, whichever the correct unit is, per year, which is actually, so the old numbers were actually higher than what is now being proposed.

CHAIRMAN ZIEMER: Well you have the possibility of, well you have betatron operators still in that early era, right?

MR. ALLEN: Yes, there is no agreement there either, I mean --

DR. ANIGSTEIN: But we're talking

and perhaps we should just restrict this to the radium era first.

CHAIRMAN ZIEMER: Well I'm talking about the radium era and we have, SC&A has or NIOSH has a table called radium era. And you have some values for betatron operators.

DR. ANIGSTEIN: Yes, that's in the old betatron.

CHAIRMAN ZIEMER: Right, right.

DR. ANIGSTEIN: Yes, you have the betatron operator. But a radiographer can be either --

CHAIRMAN ZIEMER: That's my point.

DR. ANIGSTEIN: -- and as a matter of fact the gentleman doing my interview who worked on weekends said he spent time, some of the time he was in the betatron. Apparently he was qualified to operate a betatron. Sometimes he was in the betatron and some of the time he was in the Number 6 Building with the radium sources.

CHAIRMAN ZIEMER: Right. So

you've got both those. And then you also have other people. I mean, so it's not clear to me how that's, how we're proposing to do that. I mean for example if you have the radiographer who is also a betatron operator, he can't be doing both at the same time.

DR. ANIGSTEIN: A betatron, excuse me, a betatron operator is a radiographer.

CHAIRMAN ZIEMER: I'm saying though, he can't get 100 percent of the radium source dose plus a 100 percent of the betatron dose.

DR. ANIGSTEIN: Right, that is correct. But we don't know who did what.

CHAIRMAN ZIEMER: So you either parse it out or you give him the highest of the two.

DR. ANIGSTEIN: Later, in the later era, there actually were separate licenses.

CHAIRMAN ZIEMER: I understand but --

DR. ANIGSTEIN: You had to be licensed to be an isotope operator but not to be a betatron operator.

CHAIRMAN ZIEMER: Right, so and then in addition we still have the rest of the population. So that's what I want to get clear. It's not clear to me what's being proposed for the folks, the multiple duty. For example, if the person's a betatron operator and we don't know that he wasn't a radiographer as well, are we going to give him the radiography dose as --

MR. ALLEN: For those early years he would get the triangular that we just talked about.

CHAIRMAN ZIEMER: Okay. He would get the higher one. Okay. What about the rest of the folks there?

MR. ALLEN: That's the question we've been working on here. And I was proposing using SC&A's model at 2.087. Bob says that's based on a 25 percent occupancy

that he considered arbitrary.

CHAIRMAN ZIEMER: That's other people going into the source room.

DR. ANIGSTEIN: That model was assuming that someone was standing one meter outside the thin, the hollow steel door.

CHAIRMAN ZIEMER: Which value are you talking about, the source?

MR. ALLEN: The 2.087.

DR. ANIGSTEIN: Yes, that number, it assumes that somebody was standing outside the door with no connection necessarily with the radiographic operation, was standing outside the door. And while the, you could have two radium sources exposed at the same time because you could do it by putting a shield in between them. You could do two, you could radiograph two castings simultaneously.

CHAIRMAN ZIEMER: How did you end up with a higher value for that where they were outside the room versus those --

DR. ANIGSTEIN: Higher value for?

CHAIRMAN ZIEMER: Versus source outside the room. That was because you assumed a certain percent of the shots were inside versus outside?

DR. ANIGSTEIN: No, I assumed that all of the shots were in the center of the radiography room.

CHAIRMAN ZIEMER: Okay. But what about the second line, sources outside the room?

DR. ANIGSTEIN: I did not believe that was a credible scenario so we didn't bother with that. It wouldn't have made any difference.

CHAIRMAN ZIEMER: You have a number.

MR. ALLEN: I put that in and said I inferred it from --

CHAIRMAN ZIEMER: I got you.

MR. ALLEN: But no, they did not state that number.

CHAIRMAN ZIEMER: I got you,

because your footnote said inferred from that. Okay. So NIOSH is proposing that everybody else in the plant would be given the number for standing outside the source room.

DR. ANIGSTEIN: Again, the 25 percent is just an assumption without firm, without any firm information.

CHAIRMAN ZIEMER: Let's see, is it any different if the source is out, if it's out you have the two mR per hour mark off plus walking through the thing.

MR. ALLEN: NIOSH's last model on outside the radiography room is over and down one. It's 1.353 --

CHAIRMAN ZIEMER: That includes people walking through it?

MR. ALLEN: Yes.

CHAIRMAN ZIEMER: So it's more claimant-favorable to assume that, if the source is inside then they're standing adjacent --

MR. ALLEN: Near the door, yes.

CHAIRMAN ZIEMER: -- near the door. Did that, what was the dose rate at the door? Was that above two mR, Bob?

DR. ANIGSTEIN: I'm sorry, say this again.

CHAIRMAN ZIEMER: Well why would the radiography outside, for the source being in the room end up higher then when you had an outside --

DR. ANIGSTEIN: I'm sorry. I don't understand the question because --

CHAIRMAN ZIEMER: Okay. If they take the radium source --

DR. ANIGSTEIN: We did not model, we did not model radiography outside the --

CHAIRMAN ZIEMER: Well I'm asking what the dose rate was at the wall, then, where the source is inside? What was it?

DR. ANIGSTEIN: The dose rate at the wall?

CHAIRMAN ZIEMER: Yes or where a person was standing to get the 2.087?

DR. ANIGSTEIN: That was based on our MCNP model. It was, we actually modeled the radiographic facility using MCNP.

CHAIRMAN ZIEMER: Right, the implication is that they're getting more dose then if the source was out and roped off at two mR per hour.

DR. ANIGSTEIN: It may very well have been more than two mR per hour.

CHAIRMAN ZIEMER: Okay. That's what I was asking.

DR. ANIGSTEIN: Yes, it may have been. Let's see, what I would have to do is --

CHAIRMAN ZIEMER: That's all right, okay. I just --

DR. ANIGSTEIN: Just a second. Take 2.08 --

MR. ALLEN: Okay, I got it. It's in, it says exposure mR per hour 8.56 outside the door. That's in the October 2011 SC&A write up, Page 7.

MEMBER MUNN: 8.56 mR?

MR. ALLEN: 8.56 mR per hour while the sources were exposed, which is not 100 percent of the time, et cetera.

DR. ANIGSTEIN: Right. It's based on the ten exposures.

CHAIRMAN ZIEMER: It's actually worse than having the source out and roped off. It doesn't sound right.

DR. ANIGSTEIN: I think there was a 30 percent duty cycle, was cited by the supervisor and confirmed by the AEC inspector.

CHAIRMAN ZIEMER: Well this is radium. This is radium.

MR. ALLEN: Yes, that was still --

MEMBER MUNN: That sure seems high.

CHAIRMAN ZIEMER: That is a little puzzling. So the proposal then is that everybody gets assigned that value that's not a radiographer or a betatron operator.

MR. ALLEN: Yes.

CHAIRMAN ZIEMER: Okay. Work Group?

MEMBER BEACH: Okay. So which value are we going to go with?

CHAIRMAN ZIEMER: He's talking about 2.087. Did you double check?

MR. ALLEN: I did not check the MCNP run. I checked the math from there and then starting with that 8.56.

CHAIRMAN ZIEMER: Right, you would have to confirm that because that's SC&A's value.

MR. ALLEN: I would have to --

CHAIRMAN ZIEMER: If there was a question why the petitioner is, you would check their value and then you certainly wouldn't -- do that. But assuming that comes out, let me hear input. Wanda?

MEMBER MUNN: Well that's certainly more claimant-favorable than I would expect real life to be.

CHAIRMAN ZIEMER: Well sure,

because you have, you know, the likelihood of everybody in the plant spending that much time at this location is so small.

MEMBER MUNN: It's vanishingly small.

CHAIRMAN ZIEMER: Right, it's extremely claimant-favorable. Josie, you're okay?

MEMBER BEACH: Yes, I'm fine with that.

CHAIRMAN ZIEMER: I certainly agree it's very claimant-favorable. John, are you on the line?

MR. KATZ: John, are you trying to speak and just low volume, or?

MEMBER POSTON: I guess. I also have a cold. Can you hear me?

MR. KATZ: Yes, we can hear you fine now.

MEMBER POSTON: Okay. I got closer to the phone. I was on mute so every time you would call my name, I have to unmute.

MR. KATZ: So did you hear all of that discussion?

MEMBER POSTON: Yes, I did.

CHAIRMAN ZIEMER: So are you okay with going ahead with this for the radium era for the rest of the population in the plant who are not radiographers or betatron people?

MEMBER POSTON: Yes, I am. I think it's very claimant-favorable. It appears to be.

CHAIRMAN ZIEMER: Okay. Thank you.

MEMBER POSTON: Paul, I'm going to, I have another class coming in 15 minutes. So I will disappear here soon.

CHAIRMAN ZIEMER: We're going to break in a couple minutes anyway for lunch. Okay.

MEMBER POSTON: I'll be back on the line after I get out of class.

CHAIRMAN ZIEMER: SC&A, are you okay with this then?

DR. ANIGSTEIN: I'm not.

DR. MAURO: And this is John Mauro. I am. So, Bob, you and I disagree.

DR. ANIGSTEIN: This is a good time to come --

DR. MAURO: I'm sorry --

CHAIRMAN ZIEMER: Bob, we're using your value.

DR. MAURO: This is John Mauro again. I've been listening carefully. First I want to compliment Jim on, Jim Neton on coming up with a solution to a very difficult problem. He should work in Congress.

(Laughter.)

DR. MAURO: So I know that Bob and I do not always agree. And you're watching the sausage being made. But I think this compromise is elegant.

CHAIRMAN ZIEMER: We're talking about the radium --

DR. MAURO: The radium period range with the, that was just described

applied to all workers. And I think if that's the way I understood --

CHAIRMAN ZIEMER: We're not talking about the triangular distribution now. We're talking about the, yes, just the, it would be Bob's second table --

DR. ANIGSTEIN: The sticking point is the 25 percent occupancy. That is just an assumption. That's the problem, that's the place I have a problem with.

MEMBER MUNN: But it's a generous enough assumption for goodness' sake.

DR. MAURO: Remember we are applying this to a person that's working there all the time, year in and year out. Not in a given moment in time, not in a given month. So when you think in terms of the aggregate, it falls in a place that gives me comfort, the whole idea --

DR. ANIGSTEIN: And it's also averaged over the exposure. In other words, if for some reason he was more likely to be

there during the exposure, it's a 25 percent multiplied by a 30 percent. Thirty percent is the time spent on, that the radiography was actually taking place during any one shift.

And then you're throwing in another factor of 25 percent to say, well, the occupancy factor for that location. So we're actually talking about seven and a half percent of the time that he's being exposed to that radiation coming through the door.

MEMBER MUNN: Bob, I missed your mathematics there somewhere.

DR. ANIGSTEIN: Well if the, this is the table and Dave correctly cited --

MEMBER MUNN: I'm looking at the table.

DR. ANIGSTEIN: No, if you're seeing the, this is a report entitled Update Sources Two. Unfortunately this is probably a slightly longer one when Nancy Johnson sent these out. She adds on PA-cleared not PA-cleared. But this was a report which was not,

you know, it's not something that was given, it's not something that's in today's report.

MEMBER MUNN: Oh, so I don't have it.

DR. ANIGSTEIN: Well you do have it somewhere. But not probably handy.

MEMBER BEACH: Was it in your slides, Bob?

DR. ANIGSTEIN: Pardon?

MEMBER BEACH: Was that one of your tables in the slides that you presented earlier?

DR. ANIGSTEIN: No, no, no. We didn't present it because we're no longer, I was no longer standing behind this.

CHAIRMAN ZIEMER: Well, Bob, the value --

DR. ANIGSTEIN: I don't think there's any quick way, unfortunately if I were there, I could put it on the screen. But I can't.

CHAIRMAN ZIEMER: Okay, the value

of 2.087 for sources in the radiography room exposure to someone outside the room.

DR. ANIGSTEIN: Right.

CHAIRMAN ZIEMER: I understand the 25 percent occupancy.

DR. ANIGSTEIN: This is calculated by saying there's a 25 percent occupancy factor, so you multiply by 25 percent and then there's also a 30 percent duty cycle, let's call it, I call it here exposure duration, that there is only 30 percent of the time are they using the radiography.

CHAIRMAN ZIEMER: Yes, I understood.

DR. ANIGSTEIN: So during any eight-hour shift. So you're taking a 25 percent, multiplying by 30 percent, multiplying by the exposure rate at that location.

CHAIRMAN ZIEMER: Right.

DR. ANIGSTEIN: So what you're really getting is the exposure rate of .856

but only assigned seven and a half percent total.

DR. NETON: Well what you're saying, Bob, is that 25 percent of the time the source is open, people could have been standing there.

DR. ANIGSTEIN: In other words, 30, right.

CHAIRMAN ZIEMER: It doesn't matter if they're there the rest of the time because the source is not out.

DR. ANIGSTEIN: I'm sorry. I didn't follow that.

CHAIRMAN ZIEMER: Well you're only concerned with the time when the source is out.

DR. ANIGSTEIN: That is correct. But you know --

CHAIRMAN ZIEMER: You're saying --

DR. NETON: You're suggesting that it would be --

DR. ANIGSTEIN: -- a correlation -

-

CHAIRMAN ZIEMER: Well it sounds like you're arguing against your own number.

DR. ANIGSTEIN: Yes, I am. I gave this as an example a year and a half ago.

CHAIRMAN ZIEMER: Are you thinking that the occupancy should be greater?

DR. ANIGSTEIN: I'm not sure what the occupancy should be. The 25 percent was just not even a number that was used by the people making this assessment.

They just said if it's 25 percent here this is for cobalt so it's the same facility, if the occupancy is 25 percent, this is what the dose would be outside the radiography room. They didn't say, they didn't give any justification of why it should be 25 percent. It was just a hypothesis.

MEMBER MUNN: What did you say about cobalt? We're talking about the radium source, right?

DR. ANIGSTEIN: Well we're

assigning it, there was no survey done that we know of, of the radium facility during the period of radium usage. So I got that 25 percent from the survey done for the cobalt-60 sources which were brought in later in that same room.

MEMBER MUNN: There would be no reason to assume that the source exposures were significantly --

DR. ANIGSTEIN: I can't hear that.

MEMBER MUNN: That's okay. I was just muttering to myself.

CHAIRMAN ZIEMER: Well the real question is whether or not really then is the 25 percent occupancy reasonable, unreasonable? Is it way high, way low? It's sort of what is the probability that someone in the plant is standing there for a year, more than 25 percent of the time when the source is out.

MEMBER MUNN: It's a reasonable assertion.

CHAIRMAN ZIEMER: It seems like a

high number to me. I mean we're making judgments here.

MEMBER MUNN: But it's certainly claimant-favorable in my view.

CHAIRMAN ZIEMER: I mean you could say 100 percent is claimant-favorable. But to me it's not plausible.

MEMBER MUNN: But it's unreasonable.

CHAIRMAN ZIEMER: Other workers can't be standing there 100 percent of the time.

MEMBER MUNN: No. No one is standing there 100 percent of the time. Twenty-five percent is reasonable.

CHAIRMAN ZIEMER: I would think 25 percent is pretty generous. But it's a judgment. I don't know.

MR. RAMSPOTT: Dr. Ziemer.

CHAIRMAN ZIEMER: Yes, John.

MR. RAMSPOTT: May I just add one thing. I will be very brief.

CHAIRMAN ZIEMER: Yes.

MR. RAMSPOTT: Where they were doing the radiography work in 6 Building was at the time one of the main finishing buildings. And there were workers in there 100 percent of the time. They actually have photographs of that room.

It's a very big building. And there definitely were and the workers have said they were, you know, right near that building and they've looked over the top of it. But that definitely was a very heavily occupied building.

CHAIRMAN ZIEMER: Yes, I think the question is we're using a dose rate right at the wall.

DR. ANIGSTEIN: He's using a dose rate one meter from the door.

CHAIRMAN ZIEMER: One meter from the wall. What would be the probability of somebody spending 25 percent of their time that close?

MR. RAMSPOTT: Very likely. They were working there. That was the finishing building. And due to factors, you just don't know who was right there next to that wall, you know.

CHAIRMAN ZIEMER: Yes, I understand. Were there workstations right at the, by the wall there?

MR. RAMSPOTT: Absolutely, sir.

CHAIRMAN ZIEMER: Got you.

MR. RAMSPOTT: And we've got workers that will definitely attest to that.

DR. NETON: Well, was there a difference of the door and the wall? I mean the door was less shielding.

DR. ANIGSTEIN: I used the door because that would be higher. The walls we found were thick and fairly --

CHAIRMAN ZIEMER: So it's only at the door.

DR. NETON: They would have to be standing a meter from the door the entire time

or 25 percent of the time.

MEMBER MUNN: And that's the point. It's not the level of occupancy of the room. We're talking about an individual here. And how long an individual would be there.

CHAIRMAN ZIEMER: At that door.

MEMBER MUNN: At that door, yes. And they're not going to be there 100 percent of the time. No one is.

MEMBER BEACH: Well what's the difference between the door and the wall because if there's work stations at the wall they could be there 100 percent of --

MEMBER MUNN: The wall shields.

MEMBER BEACH: Right, I understand that.

DR. ANIGSTEIN: The wall was much thicker than the door. It provided much more shielding.

DR. NETON: Standing right at the, a meter from the door was higher --

DR. ANIGSTEIN: The door is

essentially, the way we modeled it, essentially two sheets of steel an eighth of an inch thick, a hollow door. So there was very little --

CHAIRMAN ZIEMER: Very little shielding.

DR. ANIGSTEIN: -- very little shielding whereas the walls are 16 to 24 inches thick and they're filled. They're solid, they're not hollow.

MEMBER MUNN: So to sum, as I understand it, the individual who has given us the 2.087 R figure says he doesn't think it's applicable in this case. And his boss says he's, well, that we should accept it. Is that essentially the bottom line here?

CHAIRMAN ZIEMER: I think that Dr. Anigstein was saying that he was using it more as an example than a firm assumption. But it's moved from that point to us saying is that a reasonable assumption, 25 percent, and is it claimant-favorable also? And John

Mauro, were you speaking to that point or were you speaking to the previous point about the triangular distribution?

DR. MAURO: Yes, let me --

DR. ANIGSTEIN: Wait a minute, can I just, before John answers, I'd make this one point. As I said before this 2.08 is lower than the current Appendix BB default value for non-radiographers, which if you escalate the work hours -- don't change anything else -- just escalate the work hours to 30 to 55 hours a week, you end up with about 2.3 instead of 2.08. So you're already reducing it by about 15 percent.

DR. MAURO: And let me help out a little. What I'm hearing, I don't operate at that level of granularity. What I'm saying is a strategy has been put forth that I think is bringing us to home plate.

One is that we could list the 15 at the upper end or 12, the nine as a mode --

CHAIRMAN ZIEMER: John, we're not

talking about that right now.

DR. MAURO: Then I have to say I lost track of where we are. I thought we were talking about pegging the lower end of the distribution.

CHAIRMAN ZIEMER: No, no.

DR. MAURO: I'm sorry.

CHAIRMAN ZIEMER: We're on a different subject.

DR. ANIGSTEIN: John, we're talking about going back and having a different dose reconstruction for non-radiographers and for radiographers.

DR. MAURO: Let me, then let me. I didn't hear that. I have to apologize. I'm -- a member of this group having a Working Group where we're airing things out.

So you have to understand where I am right now is all workers, triangular distribution, and what I'm saying, what I heard and I guess my take-away is a place that I'm at right now is not parsed between

different categories of workers. All workers would be getting this low end, which might be two, 2.8 or 3.

DR. ANIGSTEIN: That's not at all what they were talking about, John. You're mistaken.

DR. MAURO: Not just parse it between different workers.

DR. ANIGSTEIN: That's not at all what they were talking about.

DR. MAURO: All right. Then my apologies. I might have just misspoke. Get me aligned please so I can get back into this. I thought that's where we were.

CHAIRMAN ZIEMER: We had been talking about radiographers before when we talked about radiographers and betatron operators and so on. That was that triangular distribution issue.

MEMBER MUNN: We're in a different era now.

CHAIRMAN ZIEMER: Now, well, we're

still in the radium era. But now we're talking about others in the plant and their exposures to the radium source if they are outside of the radiography room when the source is out.

And SC&A had a value which turns out to be 2.087 R per year and NIOSH has said that they would accept that. And it is based on people spending 25 percent of the time that the source is out near the doorway to the source room. It's nothing to do with the triangular distribution. It's a different set of information.

DR. MAURO: Are we still talking though, there's a time period where we're calling it the radiographer time period, that from 19, October 1952, up to the, I guess the end of October '52 up through --

(Simultaneous speaking.)

DR. ANIGSTEIN: We're going by whole years now.

DR. MAURO: That's what I'm

getting at. I understand that.

CHAIRMAN ZIEMER: Yes, it's the radium era, John. The radium era, so we're still in the radium era. But we're not talking about the radiographers anymore. That was the triangular distribution.

DR. MAURO: Yes, that's where I do have a problem. Where we are parsing, when the dose reconstruction is done, some judgment is going to be made whether a person is a radiographer and gets this distribution or dose and if he's or he's some other category of worker which would be something different.

Based on everything that I've been looking at, listening to and working with Bob on, making that distinction during the radiographer era should not be done.

CHAIRMAN ZIEMER: John, the main reason it's done in this case is that the high dose comes from the fish pole technique. And you know who does the fish pole part. That's what, that's the controlling dose on the

radium sources for radiographers. It's the controlling dose whether they're a betatron operator or a radium source radiographer.

But the rest of the plant people, presumably, are not holding the fish pole. But they may be near the source. And that's the difference.

DR. ANIGSTEIN: In that case, which we also have to include what John Ramspott pointed out, is the old betatron building: we really don't have any detailed information of what was going on outside that building, whether there was any significant exposure or not, I cannot say. And it was not this 2.08, was not meant to be bounding for all other non-radiographer exposures in GSI during that time period.

We simply did not look at them because we didn't have enough information. And also were not motivated to look at it because we assumed eventually that the radiographer dose would be assigned to all

workers and therefore, why bother looking at all these other scenarios where we don't have very detailed information.

CHAIRMAN ZIEMER: Well, that wasn't clear to me from your report.

DR. ANIGSTEIN: Well, the report in October 2011, was entitled "Update on Sealed Sources." We did not talk about this specifically, because NIOSH had prepared a report that summer on sealed sources. And we responded with two reports, one in September and a second one in October, dealing with sealed sources alone.

No mention was made of the betatron. NIOSH did not produce a report on the betatron until the following January. And at that time, we discussed the betatron. So we were not at that point, we were doing just some scientific studies, some mathematical calculations, computer modeling of what if, what about this position, what about this location, without making a final

recommendation as to what should be the bounding dose.

And again, we keep going back and I think John is in agreement with me -- there was a misunderstanding about what we were talking about -- that it's very difficult, I mean it's inconsistent, Dave Allen in the report on the betatron said, we really don't know what the various duties were. We assign everyone the highest dose.

And suddenly we go back years earlier and now we do know, NIOSH presumes to know, what the duties are and is going to assign different doses to different people. And it seems to me to be inconsistent. And without a really firm basis --

MR. ALLEN: Well, the difference --

DR. ANIGSTEIN: -- the firm basis that the radiographer dose was not likely -- for several reasons, the radiographer dose was not likely to have been exceeded. One, only

one of the reasons is the fish pole model.

CHAIRMAN ZIEMER: So I'm understanding you to be saying then that SC&A would propose that the triangular distribution apply to others as well.

DR. ANIGSTEIN: Correct.

DR. MAURO: Correct.

CHAIRMAN ZIEMER: Okay. Now I understand. Dave, do you have a response to that?

MR. ALLEN: Yes, I mean, it's not inconsistent, even though Bob says that. The question is the credibility of exposure scenario for someone that's not a radiographer.

And as far as the layout man with the new betatron building near the tunnel there, it's very credible that somebody's doing a weld repair or doing some other kind of work with a casting right in that vicinity that's not a radiographer, has nothing to do with radiography.

On the other hand, the vast majority of the dose to the radiographer during the radium era is from handling the source and placing it next to the casting for a few seconds every shot. And that's where the vast majority of his dose comes from, and it's not credible that other people, a welder or an electrician or somebody else is going to be doing that on a routine basis. That's why there's a difference in the radium era versus the betatron era.

DR. ANIGSTEIN: Actually, I agree in one part. In one sense, I agree with what Dave is saying. On the other hand, the problem there is: this is a limiting dose. And we can be very comfortable saying it's highly unlikely that anyone else would have exceeded it.

When you start getting down to what is the limiting exposure scenario for the non-radiographer, it's very hard to define that because it could be the person standing

outside the door. It could be the -- there were several accidental exposures.

There was a case of someone being inside the Army tank that was being radiographed by the betatron, and he went inside to take measurements and was oblivious to the alarm, and stayed inside the tank while the betatron was on. And you won't know who that is. I mean, in that particular setting, we have a name. But basically, you won't know who that is because the dose --

CHAIRMAN ZIEMER: We're not modeling accidents in this.

DR. ANIGSTEIN: Pardon?

CHAIRMAN ZIEMER: We're not modeling accidents in these things. If someone has that in their claim --

DR. ANIGSTEIN: But the point is the accidents happened.

CHAIRMAN ZIEMER: All right.

DR. ANIGSTEIN: And there is not necessarily any record. Not every one of

these things has been documented. And these are only a couple of anecdotal accounts that we heard, whereas there could be others. And again, the person, the dose reconstructor would say, "Well, this is an engineer, a design engineer, so what on earth is he doing in the betatron room?" Well, he happened to have been there. But the dose reconstructor won't know that.

DR. MAURO: Yes, let me add, all along for the past five years I have been struggling, and everyone knows, with this idea of unmonitored workers working with these sources. And so much work went into looking at these scenarios and off-normal conditions.

I have to say that this is what when I started out, the idea that there could be off-normal conditions that occur, you know, quite often. And we looked at that. And Bob and David both came up with different approaches where people are walking by some type of on-site mishandling, some perhaps

short periods of a lack of adequate control over the source and training.

All of this is a collective picture that emerged, which brought me to a place that said that, you know, we don't, it's very difficult to assign exposures to real people. But it is possible now.

And that's why we walked away with our recommendation that you could place a plausible upper bound. And after a great deal of soul-searching we did come, Bob and I, to a place where we were comfortable with the 15 and the 12 as being the place to peg it as being a plausible upper bound.

And so that's why we supported our position, as articulated related to the SEC decision. Now we're at another place. We're saying, okay, we agreed that we are able to place a plausible upper bound on the limiting individuals, whoever they may be.

But we don't know who those individuals are. And the idea that we could

operate at this next level of granularity where we could place a plausible upper bound on different categories of individuals, to think that we actually could identify who those people are that fall into those categories and what their plausible upper bound is, I think that's carrying our ability to reconstruct doses here at a level of granularity that we cannot achieve.

And so SC&A's position -- and I'm sure Bob -- and we're working this out all of us together at this time -- feels that we're having conversations about different jobs, different concepts of where a person might have been and how long. We cannot operate at that granularity.

And Jim came up with a strategy that -- and this is something that you individually have to become comfortable with -- that for any given worker we're going to have one hard time saying we could place a plausible upper bound on different categories

of workers.

We're going to have a hard time just identifying different categories, what they did and their potential for exposure from all of these variations that we've been talking about. The people up in the rafters, and people might have been over here or there or doing this or in the bathroom.

I mean, it goes on and on and on. Why I became comfortable with the position we're in is the idea that we would assign to all of the claimants this idea of this distribution is the solution. And the idea that you would have different distributions or doses for different categories of people that you feel you can do that -- when it's time to do the dose reconstruction, I don't think that you could do that.

You know, this almost becomes an implementation question. You know, when you get a particular claimant, what I'm hearing is: well, we have different ways of dealing

with -- we're going to drop that claimant in a box. We're going to call them this, a layout man, we're going to call -- whatever it is you want to call them --

CHAIRMAN ZIEMER: John, I'm going to interrupt you at this point. I understand your point. I think one of the things, one of the assumptions I was operating at was that we could in fact identify worker categories. If we can't do that at this site, then exactly what you say is true.

But I think I heard someone, maybe it was Bob earlier, say that you went back to the dose reconstructions that had been done and you separated out the radiographers from the others for some purpose. But if we can't tell who's the radiographer, I agree with you.

This is what we do at other sites. Am I wrong in the assumption that we can or can't? Can we separate out? See, if we don't know who is a radiographer you're exactly right. If we do know, then there's the next

level. This is what we had at many sites, remember?

And we've had this at Savannah River, you know, we had all these different coded jobs and so on. And it became a question of: do we really know where workers were or were they not based on their jobs? And many of these sites we don't.

And so the job category -- or we don't even know the job categories. So I know we know who had badges.

MR. ALLEN: Yes, that's a very small number of people.

CHAIRMAN ZIEMER: The rest of the people, if we don't know whether they're radiographers or if we don't know whether they're betatron operators, then what you say is exactly right. What do we know on this?

MEMBER MUNN: Well, I've heard that also, that we knew who were radiographers.

CHAIRMAN ZIEMER: Yes, I thought we did.

MR. ALLEN: Here's -- maybe this will -- this is my quote, transcript from the December Board meeting. It says, "If we don't know, we go through the possible scenarios. If we do not know for all the radiographers -- we do not know who all the radiographers were in the early years. So we had no choice but to assume the worst, unless we know something else. A lot of times survivors don't know exactly what their loved one did, but they might know that he was a lawyer or accountant or something. And generally, we won't give the really high doses to someone like that."

That's from the Board meeting. That was the last discussion on whether we're separating or not separating before the vote came down.

CHAIRMAN ZIEMER: Okay. I am going to ask you all to ponder this. We need to take our lunch break. And we'll reconvene at 1:25, okay?

(Whereupon, the above-entitled

matter went off the record at 12:23 p.m. and resumed at 1:26 p.m.)

CHAIRMAN ZIEMER: Okay, thank you. We're ready to resume. I want to check and see if Dr. Poston is on the line. I know he had a class. He may not be back from that yet. John, if you're on the line just let us know.

MR. KATZ: John Poston, are you on the line, maybe on mute?

CHAIRMAN ZIEMER: Okay, I understand we got an email from Dr. McKeel; he wants to make a comment. Dr. McKeel, are you on the line?

DR. MAKHIJANI: The line is open. This is Arjun.

CHAIRMAN ZIEMER: Okay. Dan McKeel, are you back from lunch?

DR. MCKEEL: Yes, I'm back from lunch.

CHAIRMAN ZIEMER: Oh, Dan, you indicated you wanted to make a two-minute

statement. Should I start my stopwatch? Just kidding. Go ahead.

DR. MCKEEL: I'll hurry up.

CHAIRMAN ZIEMER: That's fine. Go ahead.

DR. MCKEEL: All right. I just wanted to make two small but important points, I think, and that is: we were talking about the GSI radiographers.

And just to remind us all, there were Landauer film badges only for 89 individuals from 1963 to mid-1966 of the operation period.

So there was no Landauer film badge monitoring data for anyone at the GSI plant from October the 1st, 1952, through 1962, and that included radiographers and non-radiographers. There was that summary report for 18 months from one radiographer.

So I've made this point many times, but that means that at least 97 percent of the GSI workforce was never badged, and in

our opinion, although obviously some badge information is valid and important, the film badge data we have doesn't span but a small portion of the operational period.

The second point I needed to make was that even though film badge data was available, that in no way invalidates the fact that when MCNPx and ATTILA were used to model the betatron doses in Appendix BB and in 2008 by SC&A, the external doses for both codes were far higher than in 2012/2013.

And the point is that they were 10- to 12-fold higher than the readings the film badges show.

And it seems to me that this discrepancy between the model data, when you use model data for the betatrons in the 2012 and 2013 doses, is a major problem that just can't be solved by simply ignoring the betatron early computing models.

So in other words, another way to look at it is the 2007/2008 MCNPx and Attila

codes, those doses that were calculated were not validated by the actual measured data from the film badges, and that's my comment. Thank you very much.

CHAIRMAN ZIEMER: Okay, thanks, Dan. Just before lunch we were talking about the assignment of doses to individuals who were other than radiographers and we had the discussion about whether or not one could actually make that distinction.

Let me give a few more thoughts and then ask for others to comment. One thing that we have here that's a little different from an SEC, in an SEC, Labor has to be able to put people in different places.

Here we're dealing with Appendix BB, which will have set forth some principles of how dose is to be calculated.

And although it's entirely possible that a given claim we wouldn't be able to distinguish what the work was, in which case that person would be assigned the

maximum. I think it would be the radiography dose or the layout depending on the years, but if, in the claim itself it were established that this person were an administrator who was not a foreman or not working in the production area -- I'm talking sort of in general terms here, not specifically GSI -- but if it could be well established that it was, say, a secretary or a budget person or somebody who would rarely frequent, I'm not saying would never, but would rarely frequent the production area, it seems to me that it would still be appropriate to have in Appendix BB a method that could be used in those cases, again recognizing that if you could not clearly establish that as a fact you would default to the higher dose.

I think we've done this in other cases. I've had a two, what did I call it, maybe a two-level sort of reconstruction where we had the sort of nuclear workers and then, say, the office workers, if I can make that

kind of a distinction or that may not be a good description.

But my thinking now is, and I want to hear from SC&A on this, John, I understand the argument for saying sort of let's handle everybody the same because we can't establish, you know, specific work locations.

But it seems to me that it might be possible in specific cases to establish that they were not individuals who worked in the area where the sources were.

And I'd like to ask Jim Neton if he could sort of elaborate on what's been done in other situations and then get some feedback maybe from SC&A on this as well.

DR. NETON: Well, yes. This is Jim. I can think of a few examples. The one that comes to mind first is our coworker model approach where we use the 50th or 95th percentile doses to assign to workers who were not monitored based on the determination of whether they were really production workers in

there, chemical operators, or people who sort of infrequently went to the plant and security guards, that type of scenario.

The other one that comes to mind is the TBD-6000. I think we have several different job categories in there for --

CHAIRMAN ZIEMER: Already.

DR. NETON: -- already for supervisors and main process workers, that sort of thing, so the precedent is certainly there so it's not something that we haven't done in the past. This is frequently done.

I think the question here, though, and what I hear John say and maybe Bob too, that it'd be difficult to come up with an alternative bounding scenario.

We are very comfortable, I think, with the bounding scenario that we've established now, maybe using a triangular distribution.

But then what's the second cut point? And here we're only talking about two

different classes of workers, you know, the radiographers and then everyone else. We're not talking about teasing it out into four or five different categories.

So the question is, you know, we've done a lot of work on all the radiation sources and exposures at the plant and is there one that is less than a radiographer dose that we believe could cap doses to the other workers that pretty clearly weren't working with radiography or betatron?

CHAIRMAN ZIEMER: Or not in the production area, yes.

DR. NETON: Or outside the production area.

CHAIRMAN ZIEMER: Yes, outside of these areas. John?

DR. MAURO: Paul and Jim, I agree with what you just said. My trouble was that there will be workers who were in and around the radiography area doing various jobs.

And maybe they're not actually

formally designated as radiographers but they certainly were in locations where they had a potential for significant exposure. That's where I was coming from.

Now, what you just described, Paul, is that what we have really is two categories of people, those people who had a potential for radiological exposures because the types of jobs they had, where they physically were located throughout their work history, and then these other people that were more like, as you pointed out, office workers that maybe on some rare occasion they may have gone into a radiological situation. I'm okay with that distinction.

The problem I had was that it's very possible that there may have only been a limited number of people who were formally designated as radiographers but there may have been a large number of other people that worked in and around in various functions, whether it's maintenance or related

activities, in and around the facility. I don't think you can make the departure there.

DR. ANIGSTEIN: John, may I interject?

DR. MAURO: Yes, please.

DR. ANIGSTEIN: We have literally one identified, literally one person out of 169 or 100 something -- Bob Barton, you can correct me on that information -- 100-odd workers who were there during the radium era who had dose reconstructions of less than 50 percent and only one is identified as a radiographer, so we're talking about a minuscule number of identified radiographers.

And the question, the issue that John and I have, I suppose that we agree on, is: how do you assign doses to those people? How do you parse out all the situations?

We have only the analysis of the dose standing one meter outside the door of the radiographic facility, used for the radium.

It's only one scenario, the people who may have been in and out of the old betatron building -- new betatron didn't exist yet -- the people who may have been working on the roof servicing the fan. There are so many different possible scenarios.

CHAIRMAN ZIEMER: Yes, let me make it clear, Bob, that I was not using radiographer as a category.

DR. MAURO: Ah, okay.

CHAIRMAN ZIEMER: I was using -- if I can call the plant where the work is done the production area. In other words, yes, radiographers, layout men, all of those. I think we're including all of those in the first category. We're talking here about in the admin building maybe.

MR. KATZ: Was there an admin building?

DR. ANIGSTEIN: That's not the impression I got from Jim and Dave in discussing triangular.

They said the triangular distribution that we have consensus on applies only to known radiographers or to people who are not known not to be radiographers. That's what I understood from this morning.

CHAIRMAN ZIEMER: Yes, if they're known not to be is another question. I guess we may have morphed a little bit.

I think, in our early part of this discussion, some of us were thinking about others in the plant area who were not in the category of either radiographers, betatron operators or -- well, I guess we were calling everybody else layout men if we couldn't distinguish otherwise, weren't we?

MR. ALLEN: In the later time frame?

CHAIRMAN ZIEMER: In the later category.

DR. ANIGSTEIN: Yes, but the layout men only applied to '63, I thought.

CHAIRMAN ZIEMER: Right, but in

the earlier era we were, I think, including betatron operators and radiographers together, isn't that correct, and then everybody else?

DR. NETON: I've always considered betatron --

DR. ANIGSTEIN: Can I just make an observation?

MR. KATZ: Wait, before you do, Bob --

DR. ANIGSTEIN: Can I be a stickler for detail? Betatron operators were radiographers, so what we mean is the isotopes. They would have been called isotope operators to distinguish them from the betatron operators.

CHAIRMAN ZIEMER: Well, all right.

MR. KATZ: Bob, I don't think you could hear Dave on the line because Wanda coughed at the same moment Dave was speaking.

But Dave was saying the category of people not known not to be radiographers is the big category actually. There are a lot of

--

CHAIRMAN ZIEMER: Known not to be.

MR. KATZ: In other words there are probably a lot of people, claimants, this is what I understood they're saying, a lot of claimants who may not be specified as radiographers but you can't rule them out as if they might have been radiographers because you don't have that much information for a lot of people.

CHAIRMAN ZIEMER: So you would put them in that category.

MR. KATZ: So that you would put them in the radiographer category. So despite Bob Barton having looked and seen who is actually specified as a radiographer, a lot of other individuals may fall in that basket.

DR. ANIGSTEIN: Just for this purpose, let me read to you. I have this list right in front of me. Let me just go through it very quickly.

Switchman fast conductor; laborer;

mill laborer; pipefitter; grinder, inspector; office manager; maintenance welder; clerk; weigher and checker; crane operator; laborer, millwright; laborer millwright helper millwright; laborer; unknown; maintenance welder; ironworker; timekeeper; core room hydraulic presses; industrial engineer/superintendent/accounting department; furnace worker, truck driver; laborer, roller; control specialist -- I won't read every one. This is just in random order, just giving a sample.

I mean, I would not want to be in the position of a dose reconstructor, particularly a dose reconstructor who didn't spend five years studying GSI as I have, having to make that decision based on this cursory description. How do you know what this guy really did?

The one worker for whom we have this detailed information because he submitted his AEC exposure record, he happens to be

alive and well and is not a claimant.

But suppose this is somebody -- you know, just find another person who had passed away and for whom his survivors are filing a claim. They would have said, well, what did your father or grandfather do?

Oh, he was a lab technician. Well, that's not a radiographer, not knowing he did radiography on weekends. I mean, that's a perfect example where the distinction is so blurred.

CHAIRMAN ZIEMER: Okay, I understand the point. I think we need to ask NIOSH what they think is actually workable in these cases.

DR. ANIGSTEIN: Even this one category, which I just think is funny. This applies to one person, maybe from a different one of his survivors. Maybe he had children. That strikes me as odd. Industrial engineer/superintendent/accounting department. To my knowledge, industrial engineers don't

work in accounting departments.

CHAIRMAN ZIEMER: My point was that if you could establish --

DR. ANIGSTEIN: Yes, but the point is "if." That's the biggest thing, if. Is NIOSH going to, is Dave Allen's Appendix BB, whoever writes the workbooks for the dose reconstructors, are they going to be able, to use John Mauro's phrase, parse the category? Are they going to be able to give unmistakable instructions to --

CHAIRMAN ZIEMER: I don't know. I think that's what I'm asking NIOSH, whether they can do that or not, okay?

DR. ANIGSTEIN: Okay, sorry. I misunderstood.

MR. ALLEN: All right, this is something that I did want to have some conversation about so might as well get it going here. We're just talking about the radium era here first of all, right?

DR. ANIGSTEIN: Yes, and years.

MR. ALLEN: Those years. And the bulk of the dose for the radiographer himself from every model comes out to be from placing the source and pulling the source back out using the fishing pole technique.

I drafted up over lunch here just a paragraph or something for at least discussion.

Something along those lines is what I'd like to put in the Appendix as a guideline, not a prescriptive, you know, definitive thing for dose reconstructors, just some guidelines on who to assign radiographer versus non-radiographer and, at least like to hear everybody's comments on it.

So I'll just read it off here. It's about a paragraph and I was going to say something like, "In general, radiographer dose should be assigned to anyone who may have handled sources to initiate or end the radiographic examination.

"A complete list of radiographers

in this time frame is not available so the dose reconstructor should consider anyone whose job includes inspections to have been a radiographer.

"This would include but is not limited to those known as radiographers, quality control, nondestructive testing or inspectors. It would not normally include those in administrative jobs.

"Claims with other job titles should be reviewed carefully to attempt to determine if they may have been involved in radiography.

"However, it should be noted that at least one individual working in a chemistry lab also performed radiography on the weekends, so dose reconstructors should review telephone interviews and any other available information to determine if the individual energy employee may have been involved with radiography."

I also included after that, "Also,

the models do not include dose associated with incidents or unusual events.

"So if there is indication of such an event, such an event could have affected the energy employee's radiation dose. The dose reconstructor should account for that dose separately." That's kind of a separate issue.

CHAIRMAN ZIEMER: Okay. Now, if you had something like that, if the dose reconstructor can't establish specifically that the person didn't fit in the category, for example, maybe it's a claimant, the son or daughter of a deceased claimant --

MR. KATZ: Right, a survivor.

CHAIRMAN ZIEMER: A survivor. In the absence of specific knowledge, then you go ahead and assume, right? Because if they say "I don't know," then you assume.

MR. ALLEN: Well, I think one of the job titles or whatever that Bob read off there was "unknown."

CHAIRMAN ZIEMER: Right, yes.

MR. ALLEN: You're stuck.

DR. ANIGSTEIN: There's only a few of those.

MR. ALLEN: Yes, there's not a lot. Usually survivors know something. They know their husband was a welder or electrician or, you know, lawyer or something.

DR. ANIGSTEIN: And a welder could be someone repairing the castings right after being radiographed and waiting for the next radiograph.

MR. ALLEN: Right, but over the radium era --

DR. ANIGSTEIN: The real problem that SC&A, John Mauro and I have with this is: granted, there are some people who are unlikely to have been radiographers. How do you assign them a dose?

If you use this limiting approach and say, well, no one is any worse than that, we're on fairly firm ground. We have good

justification. We have models. We have the evidentiary, the testimony. We have this one film badge, one exposure record.

And otherwise you're on very unfirm ground. We don't know. Yes, okay, let's say we all agree that it's not likely this man was a radiographer. What do you give him?

Do you assume that he was outside the door? Somebody could say no, no. He wasn't outside that door. He was actually working on the roof of the old betatron building some of the time. He was outside the door of the old betatron building.

Question whether there would have really been very much exposure outside the old betatron building if they didn't do that technique of shooting down the corridor.

On the other hand, they did have a sign that said, "Stay 100 feet," "Radiation danger," which I believe Mr. Ramspott or Dr. McKeel furnished a photograph saying,

"Radiation danger," "Stay away 100 feet." Now, that could have just been a --

CHAIRMAN ZIEMER: Well, your point is if we don't assign the triangular distribution, what do you use for the --

DR. ANIGSTEIN: Exactly, exactly.

CHAIRMAN ZIEMER: -- for the alternative.

DR. ANIGSTEIN: Exactly.

CHAIRMAN ZIEMER: And NIOSH is --

DR. ANIGSTEIN: We could spend the next ten years working up those scenarios.

CHAIRMAN ZIEMER: I think NIOSH was proposing using your value for the source in the radiography room, but you indicated that was only there as an example, not for a specific recommendation.

DR. ANIGSTEIN: Yes.

CHAIRMAN ZIEMER: So we're sort of back to what is it that's going to be used if we use anything, you know?

MR. ALLEN: And I think that's

going to affect how that decision's made from like that paragraph I just read.

If we come up with an estimate that's based on the worst, you know, what some non-radiographer could have done, you know, such as standing outside the radiography room 100 percent of the time, you know, working right next to it or whatever, that should cover a large number of the people in the plant.

If we come up with an estimate that's the shine, you know, 100 feet away from the old betatron building, it's going to be a fairly low number and that estimate should not cover, you know, much more than administrative.

CHAIRMAN ZIEMER: Yes, but if you go from the 25 percent occupancy to the 100, which in my mind is really not plausible, but if you do that, you go from 2 R per year basically to 8 and you're right back in the other distribution anyway.

DR. ANIGSTEIN: Exactly.

CHAIRMAN ZIEMER: Okay, other comments? Jim, give us some wisdom here. Got any left?

DR. NETON: I used up my wisdom.

CHAIRMAN ZIEMER: You used it up in the morning, yes.

(Laughter.)

DR. NETON: I don't know. I still feel that if there are people at a minimum that are clearly in administrative classes of work, I mean, to assign them 9 rem as a central estimate just seems to be not appropriate.

I think we've looked at all these potential sources of exposures that we could bound, at least in administrative Class work. That's just my opinion. I think most of those stand out pretty clearly. It's something that we do routinely at all the other sites.

I'm not sure why, in this

particular instance, SC&A has decided to draw a line in the sand and say, well, you have no idea what these workers did.

We do this all the time. Judgments have to be made at certain points. Otherwise, why don't we have one model for everybody?

DR. MAURO: Jim, I would say, if you would apply that philosophy liberally, what I mean by that, there's going to be this blurry line. We heard a whole list of names, of categories of workers, industrial hygienists.

I think the instructions that go to your dose reconstructor are going to be, really, the burden of proof is going to be on them, that they're confident that this person did not work anywhere near a radiological area most of the time.

And, you know, if that argument can be made based on the person's records, whatever you have, interviews --

DR. ANIGSTEIN: But there are none, John. There are no records.

DR. MAURO: Oh, well, I'm sorry.

DR. ANIGSTEIN: Interviews only.

DR. MAURO: Based on whatever information you have regarding a particular worker.

I think the burden of proof would be on NIOSH to say, listen, we could say with confidence that there was little likelihood that this guy spent a substantial amount of time in what we would call this radiological envelope, whatever that might be.

MR. ALLEN: Well, again, that would depend on how we estimate that non-radiographer dose. If it's only going to apply to administrative workers, it shouldn't be the 25 percent of the time next to the radiography building. It should be something considerably lower.

DR. ANIGSTEIN: How could you come up with it? Do a dose estimate for the

office?

MR. ALLEN: If that's the only people it would apply to, I would think yes.

DR. ANIGSTEIN: Well, here's a category of "office manager," another one of "clerk."

My concern is that the outcome would be sort of a toss. The outcome will depend on which particular dose reconstructor does it. They may have different approaches. It's a very, very nebulous, vague standard.

CHAIRMAN ZIEMER: Well, wait. You're going to have that at every site. If the instructions are so vague that that makes a difference, then the instructions are not right, because, you know, to some extent one of the reasons we review dose reconstructions is for consistency in applying those things.

So, yes, you'd have to have a fairly clear approach, and if the dose reconstructor can't firmly establish that the person was outside the radiological area, then

he's got to give them the benefit of the doubt in the other area. Philosophically, I mean, I don't think we can use the argument --

DR. ANIGSTEIN: I would assert that this is a very significant -- one dose reconstructor might be easily convinced and another one might be more skeptical. Then it becomes very subjective.

CHAIRMAN ZIEMER: Yes, but you have that at every site. I don't think that --

DR. ANIGSTEIN: I guess I'm not that familiar with the other sites.

CHAIRMAN ZIEMER: Well, I mean, you know, no site has one dose reconstructor doing them all. They have many dose reconstructors.

DR. MAURO: This is John. I'm philosophically in agreement with what was just described, you know, and because in effect, as Jim pointed out, they do have coworker models and they do parse.

However, I would like to say, though, in those circumstances where very often that's at a DOE facility that has an established health physics oversight program, there's a lot more richness to the records and the information regarding the workers and what they did, where they were, that sort of thing.

And so you could say with some degree of confidence whether we're going to say this person, you know, whether he's going to be at the 50th percentile, the 95th percentile or at what they call the environmental level.

You have enough information regarding these people, when you look at primarily DOE. That's where you find the application of these coworker models.

This is not like the other sites. This is a very unusual circumstance. It's different than any of the AWE facilities I worked on where it was always uranium that was being milled or machined.

This is a very different situation. We had this external exposure situation and depending on where you placed the person, when and for how long, you know, will affect what the doses are without film badge data and this troubled me from the beginning.

So, I mean, I would argue that philosophically I agree. If you can parse and say with confidence, I like to use the term "the radiological envelope," where people were really outside that envelope, that that envelope could be defined, you know, great.

Then you have these two categories. One category gets the full distribution -- and this is only during what I would call the radium era now. I understand we're only talking about that right now.

So during the radium era, I think that there should be a big tent, that is, most of the people you're going to find, you're going to have a hard time saying they're not

in the envelope. But if you can say that, sure. Use the other approach. But right now it's not apparent to me, you know --

DR. ANIGSTEIN: But what is the other approach?

DR. MAURO: Right, we don't know that, no. But right now what I'm saying is that I am not averse to the philosophy that was just described.

I'm only concerned that it be applied in a consistent way and one that does give the benefit of the doubt to the claimant.

We haven't heard what that approach is, but what I was reacting to earlier was in effect parsing into three categories, you know, in the classic sense, you know, the high-exposed group and then there's this other group and then of course the people who really received very little or no exposure.

I think what we really have here is two groups and I think that's where this

site is different than other facilities, where we try to create these three categories where the coworker model would apply.

And so I think, Jim, I'm philosophically in agreement with you. However, I don't think right now we have a good picture of how you're going to make that distinction and what you're going to assign to this other group that you're going to consider to be virtually unexposed.

CHAIRMAN ZIEMER: John, I think in reality, in my mind, we actually do have three groups. We may not be able to distinguish between the two --

DR. MAURO: Yes, I agree with that. I agree with that.

CHAIRMAN ZIEMER: -- but, remember, this dose distribution that we're talking about is really based on the fishpole technique and that's a limited number of people actually doing that.

The bystanders, which is what

we're sort of talking about here, yes, certainly the dose for the handlers, there's certainly an upper limit over others.

Excuse me, my phone's here ringing and I've got to turn it off.

In any event, that other group, we may not be able to distinguish who they are, so they get thrown in with the radiographers but --

DR. MAURO: Remember, though, also that the 15, which is where we came in at and the 12 number, the philosophy there was we could say with confidence that no individual got more than that in a given year.

The way we came out of this was: that's what we could say with confidence and, in fact, I believe that's the reason why the SEC ended up being denied. That does represent this roof.

CHAIRMAN ZIEMER: In the radium era, all of that's still based on those people using a fishpole technique. All I'm saying

is, philosophically, in my mind we have that group.

We have the others who are around there and we were trying to originally, I think, capture them with this standing outside the door, standing near the source and apply that.

And then you have the office workers who I don't think we talked about originally but are another group.

It's certainly true that the bounding value for the radiographers bounds everybody. The question is: is it appropriate to bound the office workers with that?

DR. NETON: Well, see, that's my problem, I think, is that the bounding dose that's been established was really for radiographers.

I mean, that's what we talked about, that's what we decided was the highest exposed worker and now we're saying that, well, everybody's a radiographer. We don't

know who wasn't a radiographer.

The fact is, we do know for the most part who was a radiographer -- or not who was a radiographer, but who potentially was doing radiography work.

DR. MAURO: Jim, the reason I came around to where I came in supporting the recommended denial of the SEC was: I've always been troubled by the fact that we're dealing with sources.

And we all know if we go back to this using radioactive sources and nondestructive testing is notoriously problematic where there's a lot of mishandling going on.

However, through a great deal of hard work by both Dave and Bob in modeling what I consider to be a relatively small source -- I think it's a 500-millicurie source of radium.

DR. ANIGSTEIN: Right, two of them.

DR. MAURO: There were two of them. I felt that I wasn't thinking in terms of radiographers.

I was thinking in terms of the possible mishandling of sources, the lack of controls -- on site, now, not someone taking it home, putting in their pocket -- but just the fact that we've got this situation.

We've got these sources and there's some question regarding the degree to which we could understand and model what might have happened to any given person who may have entered into these areas whatever his purpose, especially maintenance and that sort of thing, pipefitters, all these different types of people.

So my degree of comfort came from the fact that, yes, I feel confident that the calculations that were done and the arguments that were made, which included the statement about "did not exceed the regulatory limits," went a long way toward my, you know, coming

out of this where I did and where SC&A came out on this.

DR. ANIGSTEIN: And we had this -- if I could throw something in.

DR. MAURO: Sure, sure.

DR. ANIGSTEIN: There was this incident which now we've nailed down or limited that was not during the radium era, probably was with the cobalt sources, where the cobalt sources that should have been safer because they were inside a lead shield and they would be remotely extended outside the shield through a mechanical cable that pushed them out when the radiographer was safely behind the steel shield operating that, there was at least one instance when it got left out, either negligence or malfunction. The radiographer thought it had been pulled back into the shield and it wasn't.

And the interesting thing is: the supervisor came in and said there's something wrong with my meter. My meter is pegged.

There's something wrong with the reading.

And they called in the administrator from St. Louis Testing, not to check and see what's wrong with the source, but what's wrong with the meter?

And of course what he found was there was nothing wrong with the meter. The source had been left out.

DR. MAURO: Bob, that's one good example. Jim, I think I've found the essence of where I'm, you know, I'm trying to crystalize my thinking.

I think the 15 and the 12 as the upper bound peg on this triangular captures my concern regarding mishandling and that applies to anyone who might have somehow got caught up in this situation where they were -- the type you just heard from Bob is one example.

So I would think of it like this. The 15 places the bound to make sure that we don't miss anybody who may have come into contact or come close to a situation of some

kind of mishandling which is commonplace in these kind of facilities.

I think the mode is the number that is like what you would consider to be a reasonable upper bound for the radiographers and, you know, I think that's where we're coming in.

And then you got this other low-end number that was selected for the reasons described earlier.

So I would argue that the 15 is the one that establishes this assurance that we're not going to be missing some exposures that may have occurred due to -- I'm not going to call it accidents. It would be inappropriate to call it that.

But the large number of mishandling things that often happened, especially in the early years when people were working with these sources.

MR. ALLEN: Hey, John, this is Dave. What are you basing the idea that that

number captures things you don't know about?

DR. MAURO: Because of the statement made that no one ever got more than 15 rem in a year, you know, the limit that was in the application. That was --

DR. ANIGSTEIN: Well, I have to say -- now I'm arguing against myself -- that, of course, only applies to badged workers. I mean, they cannot say that for an unbadged worker.

So you cannot say that somebody who was inadvertently exposed by a source being left out or something would have been covered by that.

CHAIRMAN ZIEMER: Well, we're kind of --

DR. ANIGSTEIN: But then I would go on to say --

CHAIRMAN ZIEMER: Bob, I'm going to stop you. Bob, we're rehashing -- we've agreed to the triangular distribution, okay?

DR. ANIGSTEIN: Yes.

CHAIRMAN ZIEMER: Let's not re-debate it.

DR. ANIGSTEIN: Okay, fine.

CHAIRMAN ZIEMER: The question was --

DR. ANIGSTEIN: You misunderstood me. I was not reopening that.

CHAIRMAN ZIEMER: Well, the question really is: is there another group? I'll limit it to one. I'm thinking in my mind there's two other groups.

I don't know if we can distinguish between that middle group that, during the radium period, that's not handling the sources but they are around, number one. I mean, it's clear that the bounding from the other group bounds them. It bounds all the workers.

The question in my mind is: is that plausible? Is that a plausible bound for those who are, say, office workers or is there another value?

If there's another value, we don't

know what it would be because we haven't had a separate calculation of that. We do have a proposed one for the middle group but we may not be able to distinguish them.

It seems to me that we're not going to be able to close that part of the loop right now.

I mean, we're talking about some ideas but I think I'm going to have to put the burden onto NIOSH to come back to us and say, do you propose a way to bound the -- I'll call them office workers right now -- separately and, if so, how will you do that?

And maybe you know the answer to that right now because it is kind of like the background exposure and maybe some skyshine and some other stuff contributing so that's one.

And then the other is: if or should we even consider this other group? Is there a way to truly distinguish them when you do a dose reconstruction? And, if so, some

modification of this thing that was originally given as an example might work.

But it seems to me that we're not at a point where we can address that. I mean, we could say, yes, the one bounding covers everybody and be done with it.

MR. ALLEN: Honestly that's where I'm at.

DR. NETON: My concern is if you have a --

CHAIRMAN ZIEMER: Well, NIOSH may want to say that's what we want to do.

MR. ALLEN: The more you parse people, the more you're going to be wrong, you know, so parsing it into three groups is not, you know, too difficult, especially if one is an admin group or whatever. You can come up with some sort of estimate.

But you always have someone that is an office worker that says and, you know, honestly says I was in there every day collecting time cards, delivering mail,

routinely going --

CHAIRMAN ZIEMER: Yes, but if you get that information, then you put them in the other category. I mean, I don't know. I'm just --

DR. NETON: Or you establish a higher bound for office workers than you would think, based on the fact that they could have frequented the plant since access controls were not met.

MR. ALLEN: Yes, and this was the '50s, this radium era, primarily, and that kind of information is not something survivors often know as far as they worked in an office but they were routinely walking through the plant.

MEMBER BEACH: But then if it's an unknown, it goes up into a higher category anyway.

CHAIRMAN ZIEMER: Right.

MR. ALLEN: If it's a complete unknown, it goes even higher. Yes, that's

right.

CHAIRMAN ZIEMER: I guess the question is: does NIOSH wish to parse it more than the one bound?

DR. ANIGSTEIN: There are some categories, again, I'm going over this list, that can be very confusing.

CHAIRMAN ZIEMER: Well, we know that, Bob. You don't have to go through that.

DR. ANIGSTEIN: No, no, no. I know, but I'm just saying --

CHAIRMAN ZIEMER: I think NIOSH has to decide --

DR. ANIGSTEIN: Okay.

CHAIRMAN ZIEMER: -- how they want to approach it and if --

MR. ALLEN: My preference, and I wanted to get the feel of the Work Group here, but my preference would be this, what's turned out now to be a triangular for the radiographers, based primarily on placing the source, which is not something done by most

people in the plant.

Then one other bounding dose estimate based on somebody routinely, you know, not 100 percent of the time but routinely, working right next to that radiography room. That 25 percent seems like a reasonable professional judgment to me.

DR. ANIGSTEIN: What about the betatron, the old betatron that was operating at the same time?

MR. ALLEN: We've gone through a lot of estimates, Bob, and I think we ended up where this would still be a limiting factor.

DR. ANIGSTEIN: I don't know at any time we actually compared the two, but those are treated separately. It may be, but I don't know what that exposure would be.

MR. ALLEN: Well, let's put it this way. We got the radiographer film badges in the later years from the higher --

DR. ANIGSTEIN: No, no. We have to -- yes, we can assume, right. But I'm

saying we just don't know about the unbadged non-radiographers who would have been in the vicinity, again, maintaining the fans on the roof. We could probably do an exposure analysis of that.

MR. ALLEN: We did do that, Bob.

CHAIRMAN ZIEMER: NIOSH has a value for the betatron operators and --

DR. ANIGSTEIN: Yes, okay, that one.

MR. ALLEN: The estimates went through somebody repairing the fans on top of the betatron building, somebody working on top of the Number 6 Building above the radiography room, the crane operator above the radiography room --

DR. ANIGSTEIN: Yes, I remember that.

MR. ALLEN: -- walking through the area outside, if there was radiography going on outside the radiography room. We've gone through about every scenario that anybody's

come up with, and it's come down to these are the bounding scenarios here.

DR. ANIGSTEIN: Okay, I got it.

CHAIRMAN ZIEMER: Jim, you got any comments or --

DR. NETON: I feel at least one additional category needs to be there, and I'm open to the second one Dave talked about, but I think we need to go back and maybe look at it and get a more firm proposal of how we parse that.

CHAIRMAN ZIEMER: The second category being the office workers?

DR. NETON: Well, office workers and non-radiographers.

CHAIRMAN ZIEMER: Outside John Mauro's envelope.

DR. NETON: Yes, yes. I know for sure that I feel like we would need to have an administrator category of some type, because what bothers me with job titles is we often have CATIs on these workers which go into a

lot more detail.

And if you have a full CATI on a person that says, I was a clerk and I only went in the plant once or twice a year and I walked through, I just don't feel right providing that person with 9 rem exposure. I mean, because clearly the record indicates it wasn't there.

And by just this one-size-fits-all model, it leaves us no recourse and flies in the face of logic, I mean, if I'm your dose reconstructor.

MR. ALLEN: I agree it shouldn't be one. I was just saying two rather than three, but --

DR. NETON: Okay, okay. Then I was vague, but one additional category beyond the radiography, is that what you're saying?

MR. ALLEN: Yes.

DR. MAURO: I'm very comfortable with the idea of two categories so, I mean, I don't want to say that we're holding on to

this one category.

DR. ANIGSTEIN: But we just talked about three.

DR. MAURO: I'm hearing that there's a --

CHAIRMAN ZIEMER: We're changing it to two.

DR. MAURO: -- re-thinking, maybe only two categories or, Jim, are you still thinking maybe you can do three?

DR. NETON: No, no. I said I was comfortable with one more. I thought Dave had an idea that he might want to explore a second one or a third one and he's saying no, so I'm okay with having two categories.

DR. MAURO: I think we have come to agreement.

CHAIRMAN ZIEMER: Is that agreeable with the Work Group? We would ask NIOSH to then tell us how they would bound that --

MR. ALLEN: Second category.

CHAIRMAN ZIEMER: -- second category.

DR. NETON: And provide some examples of how that would play out, yes. This is something that happens a lot and, like I say, you want to have some options when you start doing dose reconstructions to use the facts that you have available to you, and when you do this one-size-fits-all, then I don't know why we bother doing CATIs and all that sort of stuff.

CHAIRMAN ZIEMER: Right. Yes, you don't need that information.

DR. NETON: You don't need any of that information. I think we should be able to use the information we have at hand, acknowledging, though, that we'll always err on the side of higher dose when it's uncertain when we look at it. That's the way we operate.

CHAIRMAN ZIEMER: Yes. Now, I think, Dave, you had one additional issue now.

We've covered the timeline issue. We've covered now the triangular distribution. We've covered the idea of having another category during the radium era for office workers. And now there was one other area that we needed to define. That was what?

MR. ALLEN: The layout man dose estimate. SC&A's estimate is --

CHAIRMAN ZIEMER: This is during the cobalt era?

MR. ALLEN: Yes, this is the later years.

MEMBER BEACH: SC&A's is 9.2?

MR. ALLEN: Yes, and ours is 4 --

MEMBER BEACH: 4.483.

MR. ALLEN: Yes. And that's the last thing is the assumptions that went into those models and how we would, you know, basically get a feel from the Work Group which way we should go or if there's something in between.

To summarize what it was, I think

I roughly, quickly did earlier, we estimated a number of shots, various angles, various locations in the betatron building and then used Excel Solver to come up with the dose or with the scenario that would give us 10 millirem per week in the control room and maximize the dose in the Number 10 Building.

SC&A decided some of those exposure -- or shot scenarios were not realistic and they went back to just a few of those and the one that gave a highest dose in the Number 10 Building and in this latest reply from SC&A they said it was still less than 10 millirem in the control room.

DR. ANIGSTEIN: Excuse me, less than 10 millirem to the worker, to the betatron operator in the control room during the shots.

Dave's analysis, as I understand it, assumed that -- his limit is 10 millirem for 168 hours a week and we categorically disagree with that.

MR. ALLEN: Okay, and the reason stated in your paper that you disagree with that, if I can get it, the first was that there would be control badges where dose was subtracted from the -- doggone it -- from the film badges, therefore there may have been more reading on there.

And my reply to that is, that's true. Landauer and most companies will have a control badge that goes with the whole batch of badges. That is developed along with the other badges and any dose on that is subtracted from the other badges.

But Landauer always included the dose in the dose report from the control badge.

DR. ANIGSTEIN: There is this betatron control.

MR. ALLEN: I'm not talking about the betatron control room. That's Badge Number 1. Badge Number 0 is the control badge and it's --

DR. ANIGSTEIN: That apparently must have been subtracted from itself because, according to Joseph Zlotnicki, former vice president of Landauer, he said every dose report included with the densitometer readings were subtracted. The density was always a difference between the 0 badge, the unnumbered badge and the worker badge.

MR. ALLEN: Yes, but it normally wasn't the densitometer reading that was subtracted. It was the dose.

DR. ANIGSTEIN: That is not the information I have straight from the horse's mouth. It was the densitometer reading that was subtracted.

MR. ALLEN: Actually --

DR. ANIGSTEIN: Oh, excuse me, the dose that was reported was the difference between the unnumbered control badge and the actual badge issued to the worker.

CHAIRMAN ZIEMER: On a dose basis.

DR. ANIGSTEIN: That is the

report.

MR. ALLEN: On a dose basis.

DR. ANIGSTEIN: Pardon me?

MR. ALLEN: On a dose basis, the difference. I mean, what you wrote in one of your --

DR. ANIGSTEIN: Well, I mean --

MR. ALLEN: What you wrote in one of your reports was a number derived from the density, which there's only one number derived from the density and that's the dose.

DR. ANIGSTEIN: Well, let's see now. I believe I quoted -- this was a direct quote. I would have to --

MR. ALLEN: Yes, and the direct quote said "derived."

DR. ANIGSTEIN: Derived, okay. Then that's what it is.

MR. ALLEN: But in any case --

DR. ANIGSTEIN: But at any rate, I mean, I think we're quibbling about a technicality. The idea that you can say the

control room, not the betatron operator in the control room, to say that the control room never got more than 10 mR per week, I don't believe that's defensible.

MR. ALLEN: Well, I think it is, because the control badges are recorded on all of the badge reports. Every one of them in the covered period is zero. The only two that were not --

DR. ANIGSTEIN: Okay, now, there were two betatrons operating and there was only one control badge. How do we even know which building it was in?

MR. ALLEN: These would be with the badges, wherever they are.

DR. ANIGSTEIN: The one that said the Number 1 Badge, which said betatron control, we don't know where it was. To make a statement that we can base everything on that one badge, absent the specific information, specific documentation, I don't think we can do that.

MR. ALLEN: Actually, that's irrelevant for your argument because your argument was: there was something subtracted from these badges, and it wasn't, because we have the control badge and that's the dose that would be subtracted.

DR. ANIGSTEIN: No, not the betatron control, the other one.

MR. ALLEN: Exactly. We have them both, Bob.

DR. ANIGSTEIN: No. The other --

MR. ALLEN: Bob, Badge Number 0 is control. Badge Number 1 is betatron control room.

DR. ANIGSTEIN: Okay.

MR. ALLEN: Badge Number 0 --

DR. ANIGSTEIN: Now, that was subtracted. Okay, I have to say you have a point. I cannot answer that at this moment. I don't want to go past where I'm comfortable. I can't answer that. That's a question that I don't have the answer to. I would have to

find out, and I don't think I can do it right this instant.

MR. ALLEN: Okay, well, my take of the situation is the control badge was recorded in every report. It was zero every time except for two occasions, both in 1971, where there was a recorded dose on them. So there was nothing subtracted from the film badges --

DR. ANIGSTEIN: Zero just means below the MDL. It does not mean there was no density. Everything has a density reading. The densities were subtracted.

I would request that we defer this until I can get more information. I'd like to be able to address this.

CHAIRMAN ZIEMER: Let me ask, though, I'm trying to account for the difference between the two numbers, between the NIOSH number and the SC&A number.

DR. ANIGSTEIN: The NIOSH number --

CHAIRMAN ZIEMER: The NIOSH number is 4.483?

MR. ALLEN: Yes.

CHAIRMAN ZIEMER: And the SC&A number is 9.2?

MR. ALLEN: Yes.

CHAIRMAN ZIEMER: So it's roughly double, and does this account for that?

DR. ANIGSTEIN: What accounts for the difference is using the Excel Solver to include shots done in the opposite direction, to include shots -- there were like 15 very arbitrarily chosen shooting geometries, and using Excel Solver to see which of the shooting geometries is consistent with this 10 mR per 168 hours in the control room, not to exceed that, and still maximize the dose to the layout worker.

And our position -- my position is that this was not valid and, you know, I have to say I have to answer Jim's comment, but I can't do it this moment. I'll confer with my

source and will write a memo shortly after this meeting, but I can't answer that now.

MEMBER BEACH: Your dose, 4.483, except for half the value of 1966, how much does that account for, that 1966, half that value?

MR. ALLEN: I'm not sure. The 1966, the contract period or whatever with the AEC ended in June, is twice -- half that value for the annual dose.

MEMBER BEACH: Yes, so it's a small percentage of -- it would be lower because of the small percentage? I guess I was trying to understand what you meant by that comment earlier today.

MR. ALLEN: We just meant that dose is an annual dose that's -- from what we decided today, would be 1/1/1963 through June 30 --

CHAIRMAN ZIEMER: So half a year.

MEMBER BEACH: So it's a small --

MR. ALLEN: It's a half a year.

CHAIRMAN ZIEMER: Yes, it's a half a year, yes. It's half of your value, but --

MR. ALLEN: The difference essentially in --

CHAIRMAN ZIEMER: The difference is really including some shots that were -- is it a weighted average or just an average, that number?

MR. ALLEN: It ends up being two shot scenarios in ours to get the utilization time, et cetera. The difference is primarily we normalize to 10 millirem per 168 hours in the control room, and Bob didn't on his.

CHAIRMAN ZIEMER: Okay, but that normalization factor is enough to account for this difference? That's what I'm asking.

MR. ALLEN: Yes, because if you take the shot that Bob used and you put a badge in the control room for 168 hours, you will get 20-some millirem on that badge.

CHAIRMAN ZIEMER: Okay, and that basically doubles --

MR. ALLEN: Right.

CHAIRMAN ZIEMER: -- what you calculate then. Yes, I see what you're saying. So what we need to do is have SC&A go back and either confirm their number or at least explain their number more definitively, and then, what do we need to do? I guess --

DR. ANIGSTEIN: I would just like to get more information and submit a memo explaining this normalization.

CHAIRMAN ZIEMER: Yes, right. I guess you'll either end up saying, yes, we stand by our number or, no, we think NIOSH is okay, right? I guess that's the way it'll come out.

DR. ANIGSTEIN: Something like that.

CHAIRMAN ZIEMER: But either way, if you're apart, we may have to have further discussions on that issue. It looks like it revolves around, in part, whether or not that 001 badge -- is that the control room badge?

MR. ALLEN: Zero badge.

MEMBER BEACH: Zero.

CHAIRMAN ZIEMER: The zero badge. Well, now, the one in the control room's 01, isn't it?

MR. ALLEN: That's the control room badge that was there for some of the time.

CHAIRMAN ZIEMER: Right, right.

MR. ALLEN: But there was --

CHAIRMAN ZIEMER: The others, the --

MR. ALLEN: Control badge itself.

CHAIRMAN ZIEMER: Control badge itself, okay. So we'll have to close that one then. Well, Bob, you'll let us know what --

DR. ANIGSTEIN: Yes, I will.

CHAIRMAN ZIEMER: You can distribute your findings on that so that we can reach final agreement. Does that cover all the open issues?

MR. ALLEN: That covers everything

that I think we need to reach some sort of agreement on in order to come up with the whole --

CHAIRMAN ZIEMER: Right.

MEMBER BEACH: One question I have, I know you've discussed it, but the triangle. The high number is going to start with --

CHAIRMAN ZIEMER: The high number is still the limits, 12 and 15.

MEMBER BEACH: Well, okay, so --

MR. ALLEN: It'll be slightly different for different years.

MEMBER BEACH: It's not going to be 9. Okay, perfect.

CHAIRMAN ZIEMER: Right. The 9, I think, is the median.

MEMBER BEACH: And then the 5 --

CHAIRMAN ZIEMER: The low was the 5 or something like that.

DR. NETON: It's not really the median. It's the central value.

CHAIRMAN ZIEMER: The central value, right, right. Well, once we have clarification on that and have an agreement on what the approaches will be on bounding, because you have the other question on the second group as well, then we need to go back specifically to the matrix and go through all the matrix issues and see if there's -- I mean, in principle, the matrix issues deal with what we've been talking about.

MEMBER BEACH: So do we need an update to the matrix? The last one we have was in --

CHAIRMAN ZIEMER: The last distribution is the matrix.

MEMBER BEACH: It's the most correct. November 26th.

CHAIRMAN ZIEMER: Right. We haven't done any matrix issues since then, because we focused on the SEC which was acted on at the last meeting and now we're pretty close to closing the issues on the approaches

here.

Well, we agreed on the timeline. We've agreed on the use of the triangular distribution. We need a little more from NIOSH on how they will do the second sort of --

MR. KATZ: Category.

CHAIRMAN ZIEMER: The second category, the outside-the-envelope category. And then we need an update from SC&A on this issue of the layout man value, is what it turned out to be for the cobalt era. And I think it was pointed out here in this, but was not discussed, was the handling of the uranium in the residual period, although you pretty well outlined that before, but we need --

DR. NETON: Well, I think there are still some differences of opinion between us and SC&A, though, on how that goes. I believe we agreed it wasn't an SEC issue but I think there were still some differences on --

CHAIRMAN ZIEMER: Right. I'd like

to have you go back on that and make sure --

MR. ALLEN: Open it up or whatever.

CHAIRMAN ZIEMER: Go back and check yours against the SC&A comments. We agreed that it could be done. Remember, we eliminated the use of that vacuum cleaner value --

DR. ANIGSTEIN: What issue are we on?

CHAIRMAN ZIEMER: The inhalation of the uranium during the residual period.

DR. ANIGSTEIN: Yes.

CHAIRMAN ZIEMER: It's a small contribution as well to this period but it also --

DR. ANIGSTEIN: Yes. We simply agreed on the source term but we never agreed on the model.

CHAIRMAN ZIEMER: Right, right. I just want to get closure on that as well. Now, thank you, everybody. We have a half

hour left. We're not going to get through this full agenda. I do want to move into the Baker Brothers. Let's see --

DR. MAURO: Paul?

CHAIRMAN ZIEMER: Yes, hang on.

DR. MAURO: If it helps any, I know we only have a half hour, we put together those talking points. There's a whole long list of them there.

CHAIRMAN ZIEMER: Yes, we have your talking points.

DR. MAURO: Right, but what I was going to say is there's only one that really matters and the rest of them are just what we would call standard Site Profile issues that we will resolve those.

CHAIRMAN ZIEMER: Right. I want --

DR. MAURO: The only one that really is -- the one that is Number 7. So just to alert everyone there, the degree to which you want to get into Baker Brothers, I

would recommend that the one that's by far the dominant, most important issue is Number 7 because it has SEC implications in regard to where the boundaries were set for the SEC.

The others are just Site Profile type issues which, of course, I think are certainly solvable and, you know, don't impact the SEC boundary.

CHAIRMAN ZIEMER: Right. Well, you remember that at the last meeting of the Board, the Board took action on Baker Brothers for the --

DR. MAURO: Yes. The only reason I bring this up is that --

CHAIRMAN ZIEMER: But not on the residual period.

DR. MAURO: Right. The issue has to do with the residual period and, you know, the reality is the approach taken for the residual period, there's a fundamental assumption that was made. That is the rock they stand on, and there are certain

weaknesses in it.

And the reason I say it can be an SEC issue is that if you really can't assign a bounding number for the beginning of the residual period, you've got a serious problem.

And I'd raise the question -- and it may have an easy answer because, remember, we only looked at this for a day before yesterday and came up with this list.

And I realized we were going to run out of time and I gave some thought, if there's anything I wanted to point the Work Group to, it's Issue Number 7 because it's the rock upon which the whole residual period is standing on.

CHAIRMAN ZIEMER: Okay. We all got your comments. I don't know that NIOSH has had a chance to even look at these because --

DR. NETON: We've looked at it.

CHAIRMAN ZIEMER: -- they've only been out a day or two, right?

MEMBER BEACH: A day, yes.

CHAIRMAN ZIEMER: Yes.

DR. NETON: We've looked at them. I mean, and we understand --

CHAIRMAN ZIEMER: The concern on this one.

So are you comfortable that that's the main thing as well or did you --

DR. NETON: Well, I'm having trouble bringing up the report. What is Issue Number 6 then?

DR. MAURO: Number 7 is --

CHAIRMAN ZIEMER: I gave him my copy here. Jim's looking at it.

DR. MAURO: It's a conceptually easy one to -- you've picked an airborne dust loading and we like that airborne dust loading as being a plausible upper bound for the dust loading that might have been experienced during the operations period.

And then you use that airborne dust loading, which is 5480 dpm per cubic

meter, to calculate the amount that settled out onto a surface and that became the starting point, that dpm per square meter.

Turn outs to be about a million dpm per meter squared of gross alpha on the surface at the beginning of the residual period which is January 1st, 1945.

Everything about that is fine, except there's one fly in the ointment. It has to do with the fact that apparently there were a large number of uranium fires that occurred in the building in 1943/44 perhaps. Not sure exactly. You know, there was a number of them.

And what that puts you in a situation is that if there wasn't cleanup after these fires, the residual activity that might be on surfaces might not be well represented by the model and assumptions you made.

I would fully agree that the way you approach the problem is perfectly fine if

we didn't have all these fires.

But with these fires, it left me in a place where I was not comfortable that the 5480 -- I'm sorry, that the activity on the surface that you derived, which is a large number, don't get me wrong, which is 1 million dpm per meter squared, that's based on the mechanics of assuming there was a certain dust loading during operation.

I would like to see some evidence that there was some cleanup of the uranium during operations. Otherwise, that leaves you with a place where it's hard to defend the number that you use as your starting point.

DR. NETON: Right.

DR. MAURO: That's it. I mean, it's a simple concept and now I have to say we did not go back to the SRDB and review. We just didn't have the time.

There may be some information in there that says when the fires occurred and whether or not there was cleanup after the

fires.

If that information is out there, this major issue, that I consider to be a major issue, goes away, because everything else about this, the rock you're standing on, as far as I'm concerned is solid.

DR. NETON: Yes. Well, Tom Tomes is our lead on this and I think he's looked into this fire issue a little bit. Maybe, Tom, you can comment a bit?

MR. TOMES: I haven't had time to go back and look at the specific issue since I got your talking points. But I have looked back at in general what their requirements were for closing out the contract and returning all the materials to the government.

They had a routine where they collected all their turnings and all their solid metal scrap that they generated as well as their fines and their sweeping. They specifically had a label, material sweeping.

So they did have a program of

removing all bulk materials, sweeping the area and segregating it and drumming it and returning it to the AEC. As a matter of fact --

DR. MAURO: If those materials, though, on occasion that caught fire that they were collecting -- and the main thing I'd like to see is some discussion about what was done after those fires because I'm picturing this smoke and fires and uranium becoming airborne and then settling out, which is a scenario that is not embraced anywhere in the Petition Evaluation Report.

But there may be material in the SRDB which says, yes, that's what they did. I didn't look for that.

If we can find that, if it turns out a case can be made that either the amount of dust settling from the fires was minimal, compared to the settling from operations, or that when there was a fire there was something done to clean it up, I think Number 7 goes

away.

MR. TOMES: There may be information to do that and posit one or more angles. We do have information that they had one large fire that consumed 100 pounds of uranium. Then there were several much smaller fires. So we do have an idea of what the maximum loss would have been at any one time and --

MEMBER BEACH: Well, this says from several pounds to several hundred pounds, in addition to the 100-pound one you were talking about.

MR. TOMES: I don't recall a several hundred. I recall the 100 but I have to go back and check that.

CHAIRMAN ZIEMER: Well, I think it would be appropriate to ask NIOSH to go back and clarify that issue.

DR. NETON: Yes, we need to look at it. I would still say 5400 dpm per cubic meter is still a pretty high --

DR. MAURO: Yes, I would say that, without the fires, the number that you use for the deposited activity, the 1 million dpm per square meter that's starting January 1st, 1945, that's probably conservative by at least a factor of 5 to 10.

MEMBER MUNN: Yes, it's pretty high.

DR. MAURO: I agree with that completely.

MEMBER MUNN: Absolutely.

MEMBER BEACH: One of the questions I had too in reading through this is: what went on from '45 to '89 or when they first started doing this survey? I think the earliest one you have started in '81. But there's nothing in the ER that says what happened in those facilities --

CHAIRMAN ZIEMER: In between.

MEMBER BEACH: -- in between. There's nothing. Was the area, you know, locked up and nobody was in it? Were there

people working another job? So that's something that I had a question on.

MR. TOMES: Well, Baker Brothers was dissolved and sold to another company. We don't really have details on what happened in this post-period.

MEMBER BEACH: So everybody from Baker was gone, because that's more information than I had earlier. That was this question.

CHAIRMAN ZIEMER: So all you have is who would be exposed during this cleanup period then?

DR. NETON: Right. But on those fires, I don't recall. There weren't like dozens of fires, were there? I thought there were some fires, several fires, but not -- and when you start talking about several spot fires in the context of higher period, acute little injections when you deposit 5480 dpm per cubic meter 24 hours a day, 7 days a week for 30 days --

MEMBER MUNN: That's a lot.

DR. MAURO: Jim, you show that and this problem goes away.

DR. NETON: We'll go back and look at it.

DR. MAURO: Yes, and you could see why once you have this number, this rock you're standing on, which is the dpm per meter squared on January 1st, 1945, if we agree with that number, you know, everything else that we talk about, well, just about everything else, goes toward, you know, how you model the resuspension factor and the rate at which it deposited out.

I mean, there's a whole bunch of other things that are brought up here. I don't know how many comments we have. You know, these weren't in order. We have a total of, I don't know, 16.

But I'm trying to keep it brief. You know, I know we have a little time. But I think that all those others are tractable,

okay? This one, though, is the one that everything hangs on.

DR. NETON: Well, I could tell you, if it was 10 million dpm per square meter, I think you guys had a slight error in your calculation.

DR. MAURO: No, it's 1 million. It's your number. It's actually on Page 36 of the PER.

DR. NETON: It's 10 million, John. Your calculations said a million but it's 10 million.

CHAIRMAN ZIEMER: Maybe you have the wrong number in your report, John.

DR. NETON: Yes, I think you might have made a --

DR. MAURO: I may have made a mistake. I'm the first to admit. Notwithstanding what the number is --

DR. NETON: I know, but if you look at that, you end up with about 6.7 grams per square meter of uranium, which is --

DR. MAURO: Now you're saying that your number in the --

DR. NETON: It's 10 million.

DR. MAURO: My calculation is wrong here.

DR. NETON: Yes.

DR. MAURO: Okay, I believe you.

DR. NETON: Yes, anyway, so it's 10 million dpm per square meter which ends up being, I think, 6.7 grams of uranium per square meter. That's a pretty high number.

CHAIRMAN ZIEMER: Pretty high loading. Let me make a suggestion here. Keep in mind that when the Board referred this residual period back to the Work Group to look at, they basically asked us to determine whether we were ready to make a recommendation on it or whether we wanted SC&A to further review it.

So SC&A didn't really do an in-depth review. They weren't actually tasked to do anything, but we did suggest they read

through it and be prepared to discuss it, so this is based on a cursory read-through.

DR. NETON: I do agree that John's identified --

CHAIRMAN ZIEMER: And I think it's appropriate to ask NIOSH to go back and address this point. John, if you guys would go back and double-check your calculation --

DR. MAURO: Sure.

CHAIRMAN ZIEMER: -- to make sure you're okay there. You may say, you know, this loading is so high, we withdraw it all too.

Either way, yes, notwithstanding. And then I think at this point we would report to the Board that there's just one issue we're still looking at and we would not have a recommendation.

And I think we're all right on that for now with the Board. I don't think there's a demand that we come back this time with the specific recommendation.

And the other part of it is: I think, and let me ask Josie and Wanda and John if you're on the phone, do you wish, outside of having John and the SC&A folks and Tom taking another look at that issue together with NIOSH, is there any need to ask SC&A to do any further in-depth work on this?

MEMBER BEACH: Well, I still have a question because our time period is through 1996, so I guess I want it clear if anybody was still working in those facilities or if, at the end of the first period that we voted in the SEC that everybody was out of there until later on.

MR. TOMES: The facility was still occupied.

MEMBER BEACH: Okay, so who occupied it? Baker Brothers?

MR. TOMES: Baker Brothers continued to operate. They eventually -- I can't recall a year, I don't know if I even have information on the exact year, but it was

eventually bought out by a property. It was actually bought by a different company. There were two companies who split the property.

CHAIRMAN ZIEMER: Okay, any presence of activity, though, during that period? Does it count or not?

DR. NETON: Yes, it's covered.

CHAIRMAN ZIEMER: Covered.

DR. NETON: It's a residual period, so.

MEMBER BEACH: It's a covered time period.

CHAIRMAN ZIEMER: Right.

MR. TOMES: I mean, again, there was exposures during that period.

CHAIRMAN ZIEMER: If they're still Baker Brothers?

MR. TOMES: No. They would have to have covered employment.

CHAIRMAN ZIEMER: The contractor.

MR. ALLEN: The contractor or its successors, I think, is how it's written in

the law or something. It's anybody that buys that property --

DR. NETON: It's the facility.

CHAIRMAN ZIEMER: It's everybody who was there after --

DR. NETON: It's the facility itself, not the owner of the facility.

CHAIRMAN ZIEMER: So I think the question is: can we get clarification on that? Who can clarify that?

DR. NETON: I'm not sure what you --

MEMBER BEACH: Well, I guess I'm looking for what was happening in that facility during that. Were people working in there? Were they --

DR. NETON: So once DOE leaves, we don't really have much information.

MEMBER BEACH: But we're asked to look at those years, though.

MR. TOMES: We have a little bit of information in here on that. We have the

name of the company that operated it. Some of the areas were used for storing electrical equipment and motors, and I'd have to --

DR. NETON: We could flesh that out a little bit, I guess. I don't think they were doing any radiological work, if that's what you're asking, and it doesn't sound like they were doing any real --

CHAIRMAN ZIEMER: Basically, the source terms are gone, is what --

DR. NETON: The source terms are there. They're being depleted over time.

CHAIRMAN ZIEMER: No, no, no. I mean --

DR. NETON: Oh, yes, the production.

CHAIRMAN ZIEMER: The production source terms, not the residual activity.

MEMBER BEACH: Right.

DR. NETON: So it's our standard TIB-70 model that we've used a number of different places.

MEMBER BEACH: Okay.

CHAIRMAN ZIEMER: Any further questions on that? Okay, let me just comment before we close on Simonds Saw and Steel. We received NIOSH's draft responses a couple weeks ago on the matrix.

And then SC&A distributed, within the last couple days, what they called preliminary responses. I think I just got those yesterday, and I've not had a chance to look at them and I don't know that you folks have, but --

DR. NETON: I have not.

CHAIRMAN ZIEMER: But I think we'll defer Simonds Steel and Saw until our next meeting and give us a chance to digest the materials, both the NIOSH responses and the preliminary responses. Let me ask who's SC&A's -- Bob Barton, are you?

MR. BARTON: Yes.

CHAIRMAN ZIEMER: These preliminary responses, are they pretty close

to the finals or are you guys still developing --

MR. BARTON: I think basically why we put those in there was to kind of facilitate discussion today if we could get into it.

CHAIRMAN ZIEMER: Right, if we got into it. But you will have a more formalized, polished --

MR. BARTON: Most of them pretty much state what our original finding was, so I think we're in a position --

CHAIRMAN ZIEMER: Well, if there are any changes --

MR. BARTON: Yes, I'll update it today.

CHAIRMAN ZIEMER: Just distribute them, once you have those changes, so that we have the latest thing.

MR. BARTON: Sure.

CHAIRMAN ZIEMER: Certainly before our next meeting.

MEMBER BEACH: Okay. I thought when I read through them they were waiting for NIOSH's response or --

CHAIRMAN ZIEMER: No, they have NIOSH's response and then they have -- do you have the latest one?

MEMBER BEACH: Yes, and the preliminary -- most of those were waiting for more responses from NIOSH, or that's what I thought.

MR. BARTON: Well, many NIOSH responses were that they were going to continue to look at the bioassays to look at the issue if it was bounding.

CHAIRMAN ZIEMER: Right.

MR. BARTON: So essentially a lot of the preliminary responses are: we agree that -- you know.

MEMBER BEACH: They need more work.

MEMBER MUNN: Just keep looking.

DR. NETON: We'll keep working on

our response.

CHAIRMAN ZIEMER: Okay.

DR. MAURO: Paul, this is John.

CHAIRMAN ZIEMER: Yes, John.

DR. MAURO: I made a mistake. That is not 1 million. It is 10 million in Number 7. The question still remains, but of course, this places the number a lot higher.

CHAIRMAN ZIEMER: Right.

DR. MAURO: But I just wanted to confirm for the record, yes, we made a mistake in that and the correct number is 10 million, not 1 million, dpm per square meter.

MEMBER MUNN: The big question still is what happens with and after the fires?

DR. MAURO: Yes but, you know, I think that the key point would be to demonstrate that the fires really were not that important in terms of, given the size of this number.

Perhaps that could be demonstrated

in terms of contributing to deposited activity or they may have cleaned up after each fire or the big fires. So, I mean, if that case could be made, then this what I would call a fundamental issue goes away.

MR. KATZ: Thanks, John.

CHAIRMAN ZIEMER: Thank you very much. Let me ask Ted, in terms of the upcoming Board meeting, do you just want to report on where we stand on these three --

MR. KATZ: Yes, updates. We have a session set aside for this, thinking that we might have had --

CHAIRMAN ZIEMER: For what?

MR. KATZ: For Baker Brothers.

CHAIRMAN ZIEMER: Baker Brothers.

MR. KATZ: That we might have had a report out, but at this point it's just an update.

CHAIRMAN ZIEMER: Right. Well, I think at this point, we can update all three as part of the Work Group reports, I suppose.

MR. KATZ: Yes, right.

CHAIRMAN ZIEMER: And don't set aside a session for Baker Brothers yet.

MR. KATZ: Yes, there's no reason to set aside a special session for Baker Brothers --

CHAIRMAN ZIEMER: And with this report, there's one issue we're still looking at.

MR. KATZ: -- because there's not enough to say.

CHAIRMAN ZIEMER: Right, right.

MR. KATZ: You don't have 30 minutes to talk.

CHAIRMAN ZIEMER: I can talk slow, right? Okay.

MR. KATZ: So the agenda will be revised accordingly.

CHAIRMAN ZIEMER: Okay. Do you want to look at dates for next Work Group?

MR. KATZ: Yes, I think that's a good idea. We need a sense of what is

adequate time to circle the wagons.

CHAIRMAN ZIEMER: Well, again, probably -- I'm going to guess the Baker Brothers thing's not going to be a big time and effort thing.

MR. TOMES: I wouldn't expect it to be.

CHAIRMAN ZIEMER: And probably Simonds Saw and Steel's not going to be -- well, you got some ongoing work there and I guess, Bob, you'll still work on that.

And so I think for GSI, we need to focus on getting closure on those models so that'll be our priority items for our next meeting. It'll still be GSI.

MR. BARTON: Dr. Ziemer, just a point of clarification. I think where we are with Simonds is that, you know, SC&A is kind of laying out their position. NIOSH has responded to that and I don't think that more work from our end necessarily would benefit at this point. I think we're in a position where

we just need to discuss the issues and come to some conclusions.

CHAIRMAN ZIEMER: Right, okay. Okay, okay, that's good.

MR. KATZ: That's what I meant. You're off the hook.

CHAIRMAN ZIEMER: Yes, the only thing was: since this was sort of preliminary I thought maybe they had some final wording or something but the issues are scattered out.

That's fine, okay. So let's look at dates and let's see.

MR. KATZ: Let's get a sense of how much time we need, because the sooner the better, but that just depends on what's practical.

DR. NETON: Dave's schedule is sort of a limiting factor for us.

MR. ALLEN: Yes, I'm sitting here trying to think. This is something we would want to get out at least a few weeks before the meeting, wouldn't we?

DR. NETON: Oh, yes.

MR. ALLEN: We're going to need at least a couple weeks.

CHAIRMAN ZIEMER: Give us a window at least.

MR. ALLEN: Well, yes, at least a couple weeks. Let's say a month to do this and at least a couple weeks for somebody to see it after that or look at it, if not a month or a couple months.

CHAIRMAN ZIEMER: So you're talking about April? Let's see, we have a Board teleconference.

MEMBER MUNN: Not in April.

CHAIRMAN ZIEMER: Well, I don't think that's so critical. We'll meet when we meet.

MR. KATZ: Yes, yes. I think we just do it when it's --

MEMBER BEACH: So we have a Procedures meeting on the 25th. Since all three of us are on that group, I don't know if

that helps.

CHAIRMAN ZIEMER: 25th of?

MR. KATZ: That's actually a terrible week because I have a NIOSH lead team meeting two days that week too in another location, so it would kill me to have another meeting.

MEMBER BEACH: I'm not available the 15th, that whole week of the 15th.

MEMBER MUNN: What about the first week in April?

MR. KATZ: Well, the week of the 8th, you mean?

MEMBER MUNN: No, right after Easter.

MR. TOMES: We're not leaving much time.

MEMBER MUNN: Well, that's a month and a week, five weeks, six weeks.

MR. TOMES: Yes, well, those first two weeks of April are both fine on my schedule. Again, it's what --

MEMBER MUNN: Yes, that would be six weeks out. Thursday the 4th would be six weeks.

MR. KATZ: How is everyone on --

MEMBER BEACH: I can do the 4th.

MR. KATZ: The 4th of April?

MEMBER BEACH: Yes.

MR. KATZ: Does that work for you, Dave?

MR. ALLEN: The fourth of April?

MEMBER BEACH: Too soon?

MR. KATZ: Is that too soon?

MEMBER BEACH: That's six weeks from now.

CHAIRMAN ZIEMER: That's six weeks from now.

MR. ALLEN: I don't know if I can guarantee you you'd get it two weeks before then. We can try.

MEMBER BEACH: How about the first couple days in the next week, 8, 9, 10?

MEMBER MUNN: No, no. That's a

rough one.

CHAIRMAN ZIEMER: How about week of the 15th?

MEMBER MUNN: Oh, yes.

MEMBER BEACH: I'm gone on that one week.

CHAIRMAN ZIEMER: You're gone.

MEMBER MUNN: The whole week?

MEMBER BEACH: Yes.

CHAIRMAN ZIEMER: And the week of the 22nd is bad for you, Ted?

MR. KATZ: It's terrible for me, but, well, I'm going to just destroy my life. The 26th I could do it. It's just a bad week.

CHAIRMAN ZIEMER: Who's out the week of the 29th?

MR. KATZ: The 29th is fine.

CHAIRMAN ZIEMER: 29th, 30th?

MR. KATZ: The week of the 29th is fine for me.

CHAIRMAN ZIEMER: 30th?

MEMBER BEACH: I'm tied up the

29th and 30th, but we have a work call on the 2nd.

CHAIRMAN ZIEMER: What about the 1st?

MEMBER MUNN: If we go on the 1st, then those of us who travel have a problem with the teleconference on this day.

CHAIRMAN ZIEMER: Yes, with the phone call, yes.

MR. KATZ: Well, what about the 3rd?

MEMBER MUNN: The week of the 6th.

MEMBER BEACH: The 3rd's good.

MR. KATZ: How about the 3rd? It's a Friday.

CHAIRMAN ZIEMER: Third of what?

MR. KATZ: Of May.

MEMBER BEACH: Well, except for travel after the call.

MR. KATZ: Oh, does that not work?

CHAIRMAN ZIEMER: I'm out that whole week.

MEMBER BEACH: How about the week of the 6th?

CHAIRMAN ZIEMER: Of May?

MEMBER BEACH: Yes.

MEMBER MUNN: That's way out there, though.

MR. KATZ: That's fine. I can deal with my misery on April 26, if that works for you guys.

MEMBER BEACH: That works for me.

CHAIRMAN ZIEMER: We got the Procedures Review the day before.

MR. KATZ: So, I mean, at least it's efficient in terms of your travel, Paul and Wanda and --

MEMBER MUNN: Sure is.

MEMBER BEACH: Yes, absolutely.

MEMBER POSTON: Ted, you're talking about April 26th?

MR. KATZ: And you, Josie, too.

CHAIRMAN ZIEMER: Yes.

MR. KATZ: April 26.

MEMBER POSTON: Yes, I can do that.

MR. KATZ: Okay, it's a done deal, April 26.

MEMBER MUNN: Great.

CHAIRMAN ZIEMER: Okay, thank you.

DR. MAURO: Paul, this is John. Does SC&A have any action items in regard to Baker Brothers?

CHAIRMAN ZIEMER: No.

MR. KATZ: No.

DR. MAURO: Okay.

CHAIRMAN ZIEMER: Well, only in the idea that if that number --

DR. MAURO: Yes, it's wrong and Jim is correct.

CHAIRMAN ZIEMER: No. If you go back and look at what that means dust loading-wise, and you decide that it's so great anyway it's --

DR. MAURO: Okay, no, no. That's a good idea. We'll just focus in on that.

The other findings are what they are. Certainly NIOSH could look at them.

What we'll do is our own homework. We'll do the same thing NIOSH is doing, taking a look to see if there could be a situation where this number may have been underestimated.

CHAIRMAN ZIEMER: Okay, thank you.

DR. MAURO: Very good.

CHAIRMAN ZIEMER: Any other comments?

MR. KATZ: Right, and just to be clear, John, I guess NIOSH will be looking at the question of what was done after fires and so on, so you don't need to go digging on that necessarily, right?

DR. MAURO: Oh, I misunderstood. I thought that's what we were going to do so that we may come to the same place.

MR. KATZ: No, no.

CHAIRMAN ZIEMER: No. Well, I was just saying if you look at, you know, you had

miscalculated that one number.

DR. MAURO: I did miscalculate it.

CHAIRMAN ZIEMER: So your air loading is ten times what you thought it was. You might --

DR. MAURO: Not the air loading. Just my arithmetic was wrong.

CHAIRMAN ZIEMER: Oh, okay.

DR. MAURO: No, the air loading is fine. It's whether the fires somehow undermine the ability to use this approach.

CHAIRMAN ZIEMER: Yes, got you.

DR. MAURO: Now, if you'd like us to look at it or not, let us know.

CHAIRMAN ZIEMER: I think the ball's in NIOSH's court on that.

DR. MAURO: That's fine.

CHAIRMAN ZIEMER: Yes, okay, thank you. Okay, everyone. Thank you very much. Thanks, folks on the phone. We're adjourned for the day.

(Whereupon, the meeting in the above-

entitled matter was concluded at 2:57 p.m.)