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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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PUBLIC MEETING ON THE

POTENTIAL CHANGES TO THE

U.S. NUCLEAR REGULATORY COMMISSION'S

RADIATION PROTECTION REGULATIONS AND GUIDANCE

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Monday, November 8, 2010

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Salons A, B, and C

Marriott Hotel

255 North Sam Houston

Houston, Texas

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8:30 a.m.

BEFORE: DAN HODGKINS, Moderator

PRESENT:

Donald Cool

Gayle Staton

Tony Yunker

Susanne Savely

Mark Ledoux

Laurie McGowen

William Johnston

PRESENT (CONT.)

Toby Head

Ellen Anderson

Doris Bryan

Jean Staton

Wei-Hsung Wang

Ann Troxler

Steven Campbell

Alice Rogers

Eric Rohren

Leonard Earls

Don Sides

A G E N D A

P R O C E E D I N G S

MR. HODGKINS: My name's Dan Hodgkins. I am the facilitator for this meeting. The first thing I have to tell you, I've absolutely no background in this subject matter whatsoever. So anything that comes out of my mouth, as far as nuclear or nuclear or whatever, please accept as that of a novice. Okay?

This is the third of the NRC's two-day Stakeholder Workshop on the potential changes to NRC's Radiation Protection Regulations and Guidance in light of the International Commission on Radiological Protection 103. How did I do? Thank you very much.

Okay. So we'll go through and kind of talk about the process in a second. Housekeeping. Okay. We'll try and begin and end very promptly within reason as far as not to cut off a conversation in mid-sentence but definitely to keep time. We've got two days. Bathrooms outside the door. Lunch is on your own. Okay? Unfortunately, I think that means in the hotel because I'm not sure there's too many restaurants anywhere near here. So lunch is on your own. Then we'll resume and then --

Oh, my God, somebody's calling me. Just as a little reminder. Didn't I do that well? Uh-huh. Thank you.

As a reminder, please turn your cell phones off to vibrate as opposed to ring; vibrate doesn't interrupt as much. Appreciate that. And I think that's pretty much all the other housekeeping pieces for right now.

It is my pleasure, all right, to introduce Mark Thaggard, who will give us the introduction remarks for today's meeting.

Mark, take it away.

MR. THAGGARD: Okay. Good morning. My name is Mark Thaggard. I'm the Deputy Division Director for the Intergovernmental Liaison and Rulemaking Division at NRC. On behalf of the staff I'd like to welcome you to this workshop. As Dan mentioned, this is the third of three workshops that we're having on potential changes to our Radiation Protection Standards. We look forward to this meeting.

The purpose of this meeting is for us to get understanding and information from you on what -- the potential implications if we were to change our radiation protection standards. So we really look forward to a lot of feedback and open dialogue. We encourage not only the panel members, but also, the members of the audience to give us your input and your

feedback. We also encourage you to submit comments after the meeting if you think of something that could be helpful to us. We are soliciting comments through the end of January, January 31.

I will mention -- I should mention -- probably I should have mentioned at the beginning, we haven't made a definitive decision yet on whether or not we're going to change our Radiation Protection Standards. This is all part of the process that we need to go through. So any feedback you give us will be weighed into that.

So again, I'd like to welcome you. I look forward to open and active engagement from everybody. And with that, I'll turn it back over to Dan.

MR. HODGKINS: Thanks so much, Mark. Appreciate it.

Let me go ahead and kind of tell you what the process is going to be here today. First of all, you know, we didn't have enough room to have everybody a panelist. And please don't take that personally. It's just that, you know, we wanted to get a well-rounded group represented on the panel. And so as audience participation, hopefully you'll hear your point of view discussed by the panelists. Okay?

And so what we'll do is we're going to do

sort of a -- we're going to do it round robin, which means someone will start and then we'll go around the table to make sure that everybody's point of view gets heard. What that means is sometimes there's extroverts and sometimes there's introverts.

As a bunch of scientists, maybe you tend to be a little bit more introverted than extroverted. I don't know. We'll see here today. Huh? But the point is, if you find yourself talking too much or a lot, please, you know, let someone else have the opportunity. And often times for extroverts, if you just count to five you'll find an introvert might even step in and say exactly what you were thinking about. Okay?

So we'll go around the table. And what we'll try and do is get those points of view, then I'll open it up to the audience. Okay? And there are two mikes. And we have a couple roving mikes, too. Here's what's really important. These meetings are being transcribed.

So, panelists, as you say your comments you have to start with your name, because it's going to be transcribed, and our transcriptionist is over in the corner.

And I forgot your first name.

REPORTER: Leslie.

MR. HODGKINS: Leslie.

So Leslie will yell at me if you're not saying your name and then your comments.

Same thing with the audience. So if you're at the microphone you got to speak into the microphone and say your name and then your comment. Okay? And that gets to be real difficult.

For you guys on the panel, we don't need any kind of style in microphone of behavior here. So don't talk to the side, you know. Or, you know, grab it, put it right to your mouth and talk, because it's really hard for the transcriptionist not to see. Now, let's see. These have a push button. So you've got to push the button before you talk. All right? So we're going to have a practice round in just what we're going to do.

Now, here's the thing. We've got two days. I want the panelists to introduced themselves. There's about 20 panelists. That means if everybody takes a minute we've already chewed up 20 minutes. Okay? So we want it thorough yet succinct. Okay? And so let's just try it with introducing yourself first. And let's just say what do you want to get out of today's meeting. Okay?

Who's the brave soul that would like to start first? Or do you want me to do the random selection process?

Thank you, Laurie.

You know what? Pull the microphones to you, you guys. Because don't reach -- don't have you do the work. Let the microphone do the work. Okay?

Go for it.

MS. McGOWEN: Laurie McGowen.

MR. HODGKINS: Where you're from.

MS. McGOWEN: Houston. Lamco and Associates. And today I hope that -- hope to get out of this that we don't go to the two R, that we prove that we don't need to go that low.

MR. HODGKINS: Okay.

Mark?

MR. LEDOUX: Mark Ledoux with Energy Solutions out of their Salt Lake office.

MR. HODGKINS: And what would you like to get out of today's meeting?

MR. LEDOUX: Basically the same thing. We support this except for the 2 R/5 R thing.

MR. HODGKINS: Well, what do you all think about this, though? Okay. Let's be a little bit more general.

Susan -- Susanne?

MS. SAVELY: Susanne Savely, Baylor College of Medicine, Houston, Texas. And I'm just here to hear what everybody else has to say about this. Thank you.

MR. HODGKINS: An introvert.

John?

MR. YUNKER: My name is Tony Yunker. I can say it's John but it's Tony. I'm from Baker Hughes. I live in Lafayette, Louisiana. And I just want to hear some good things come out of this deal the next two days.

MR. HODGKINS: Thanks.

Gayle?

MS. G. STATON: Gayle Staton, Acuren Inspection here in Houston. And I, too, would like to find out some interesting things from this meeting. But I am also against the 2 R, so I'm hoping we can change that.

MR. SIDES: Don Sides, Stark Test in Houston. Here basically gathering information. I'm not also -- also, not in -- too much in favor of the 2 R. I don't see the need for it.

MR. HODGKINS: Should we just end the meeting now? See y'all.

MR. EARLS: Leonard Earls, South Texas Project Operating Company, the little nuclear plant down in the swamp.

MR. HODGKINS: Can you speak into the microphone? Move it. Don't you move. Let the microphone do the work. Okay. Push it right there.

MR. EARLS: There. Did anyone hear my name in the first place? Leonard Earls, technologically challenged, from the South Texas Project Nuclear Operating Company. And I want a better understanding of the motivations behind the proposed changes in the regulation.

MR. ROHREN: I'm Eric Rohren, the Chief of PET and Nuclear Medicine at M.D. Anderson Cancer Center here on behalf of the Society of Nuclear Medicine, listening and offering input from the physicians' side and running of a clinical practice and how these regulations would have an impact on that.

MS. ROGERS: Alice Rogers. I'm with the Department -- Texas Department of State Health Services. I'm here representing the Conference of Radiation Control Program Directors. And I'm here to find out what you guys are thinking about new rulemaking we're going to have to do.

MR. HODGKINS: Just for clarification, I am not them. So we're talking in general here.

MR. CAMPBELL: Steve Campbell, TC Inspection. Hope to listen and get some positive feedback from the industry and clarify the rules.

MR. HODGKINS: Thank you.

MS. ANDERSON: Ellen Anderson from the Nuclear Energy Institute. And I'm here to -- like others, just to collect information in preparation for our submittal for comments in January.

MR. HODGKINS: Here you -- Doris, do you know what? Let's move that microphone. And since the two of your are going to be sharing it, let's do it right here. Okay? Can you just move your foot just over a little bit? There. Now it's right. Speak into the microphone. Oh. Right here. Yes. Push that.

MS. BRYAN: Doris Bryan, Radiation Technology, Inc., out of Austin. There are some ideas in this proposal that I do like; however, reducing the annual exposure to two rem I definitely am against.

MR. HODGKINS: Thank you.

MS. J. STATON: Jean Staton from Metco, the Radiation Safety Officer, Health, Safety and Environmental, also. And I am very against changing

these down to 2 R, and I don't want us to be just because the IAEA does do this. We don't have to follow what they do.

MR. HODGKINS: And we'll get more opportunity to talk about that.

Go ahead.

MR. WANG: Wei-Hsung Wang with Louisiana State University. Here just to learn the rationale of these potential changes.

MR. HODGKINS: There you go. Again, make the microphone work for you. You don't have to work for it.

MS. TROXLER: I'm Ann Troxler. I come from the State of Louisiana. I work for the State of Louisiana. But I'm representing the Organization of Agreement States. And what I'd like to see accomplished is -- I know exactly how Louisiana feels, and I've heard from some of our Agreement States. But I would like to hear from all of them. And maybe we'll hear a positive but I doubt it.

MR. HODGKINS: John?

MR. MILLER: My name's John Miller. I'm with International Isotopes. We're a source manufacturer up in Idaho Falls, Idaho. And I'm interested to hear what other aspects of the industry

feel about the proposed rulemaking. And I'm interested to hear more, as far as the NRC goes, what technical basis they have to consider the proposed rulemaking.

MR. HEAD: Toby Head, H&H X-Ray Services. I'm like some of the other radiography companies here opposed to the 2-R limit and kind of want to know the reasoning behind the proposed rule.

MR. HODGKINS: Thank you, Toby.

So you guys got a handle on how we're going to operate for today? Name first, speak into the microphone, don't let the microphone, you know, control you, you control the microphone.

Couple things.

And, Ann, I think you kind of pointed to it.

We're really here to discuss and to listen to some other sides to see if there is some kind of logic or a point of view that you haven't heard before or another application and the impact on that application. So although we're in Texas here, obviously, and your votes are in, we really want a discussion.

And so it's not so much what you're going to vote but what's the rationale that brings you to

that point. And I think we'll be hearing lots of those rationales. But again, just like introverts and extroverts, there's going to be people for an against. And this is not a majority rules. This is not a vote. This is really discussion.

And so we're really going to attempt to have as much discussion as possible as it comes to this forum and in as controlled an environment as we can possibly be, given that this really is a public forum and everybody should have the right, does have the right to voice their opinion one way or the other. Okay?

Any other housekeeping information? Oh, you know, there is one more thing. Transcripts. Okay. So we've already had the D.C, session, the L.A. session. The transcripts for D.C. will be available November 15. The L.A. transcripts will be available November 22. And then these will be available November 29. Okay? So you can hear your words or see your words immortalized in the transcript on November 29 and then with all input necessary at the end of January. Okay? So there you got more of the process.

Are we ready to begin then? Any other questions, concerns, comments?

(No response.)

MR. HODGKINS: I'm going to turn it over to Don Cool.

Yes?

MR. THAGGARD: Yes. This is Mark Thaggard again for the NRC. I just want to re-emphasize that we haven't made a decision that we are going to actually develop a rule. I mean, we're in the stage of just gathering information. I think Don's going to point that out as part of his presentation. But I know a couple of the panel members alluded to the fact -- the concern as to why we're doing this rulemaking. Well, we haven't made a decision yet that we're going to actually do a -- undertake a rulemaking. I just wanted to make sure that was clear.

MR. HODGKINS: Thanks so much.

And so that's the -- really, the point of that input so that there's -- can be some decision made based on your input and the purpose for these three meetings.

With that, Don, do you think you're ready to start?

MR. COOL: Absolutely.

MR. HODGKINS: Anything I missed?

MR. COOL: Oh, we'll get it.

MR. HODGKINS: All right. Thank you.

MR. COOL: Good morning. Okay. There are a few people who are awake. That's okay. And I'm glad to see that everyone has got an opinion. That's good. As Mark said, as Dan has said, as you will hear me say any number of times over the next day, two days, however long it takes to work through these issues, this is an opportunity for you to help us develop the technical basis.

I'm going to describe a little bit of the background and history so that we all sort of are making sure that we start from the same basic set of information for the point of the discussions on the technical issues.

You're going, Okay, so who is Don Cool? A few of you know who Don Cool is, because he's been around a few years. Actually, I've worked for the NRC now for 28 years. Background is radiation protection, actually, radiation biology. University of Rochester. So I grew up where the snow flies. It's already snowing up there.

Have done uranium fuel licensing, materials program licensing, ran the group that did rulemaking for about six or seven years. And I was the Director of Industrial Medical Nuclear Safety and in charge of all of NRC's programs for byproduct

licensing inspection. And since 2003 I've been the Senior Advisor for Radiation Safety and International Liaison, which basically means that anything that somebody needs to have done they say, Get Don to do it. So I'm used to having a big red circle sort of right here. And if I lean down then it gets really loud, so I'll have to be careful with that a little bit. But's not a red tie. So you'll be able to tell when you've drawn blood. Okay? And that's fine.

And what I wanted to do here first is just to go through a little bit of the history on some of the background and information, both the international activities and things that are related to NRC regulations.

The International Commission on Radiological Protection, ICRP, actually, they've been around since the 1920s. They started in the medicine field when some of the early doctors working with the early x-ray tubes discovered that their hands were getting red as a result of doing the experiments and looking at things and said, Huh, maybe we should start to get together and figure out how to protect ourselves a little bit, because sunburning our hands isn't such a great idea.

Over the course of time the ICRP has put

out recommendations; actually, quite a large number of times. The ones that are of interest to us or at least some of us, depending on the kinds of uses that you have, go from 1959 ICRP Publication 2, 1977, Publication 26, 1990, Publication 60 and now 2007 ICRP Publication 103.

They get around to doing an update on their recommendations roughly once every 12 to 15, 16, 17 years, something like that. So this doesn't happen real frequently, but like all good processes, it takes a little while.

Now, why do I point out all of these different publications? Well, that's because if you look at the different regulations and guidance that's available both in the NRC and with other federal agencies, Environmental Protection Agency, Occupational Safety Health Administration, you will discover that there are three different generations of recommendations in scientific basis that are all operational at the same time. So, yes, there's opportunity for confusion, there's opportunity for frustration.

So some folks -- and I already see my friend over here from South Texas nodding his head up and down, because what they have to do to demonstrate

compliance with some of the requirements for their effluents coming from the reactor is they have to go all the way back to the methodology from 1959 and run the calculation with maximum permissible concentrations and those sorts of things.

And then there's the recommendations from 1977. That's actually where 10 CFR Part 20 is today. There's recommendations from 1990, some of which are in Part 20 and some of which are not because they came out as NRC was finishing up its rulemaking, and we decided that the better part of prudence was to actually try to get that in place rather than immediately start another rule. And now we have the new recommendations that have come out in 2007.

So what do those recommendations look like? What was ICRP trying to do? So I'm going to put on my ICRP hat for a moment. So don't shoot the messenger, just talking for ICRP.

They were attempting to consolidate everything that had happened since 1990. And they were very fond during that process of talking about all the different numbers they'd put out for special situations: all sorts of numbers in different medical areas, numbers for how to intervene in certain situations, in emergencies, lots and lots of different

numbers. So they were trying to consolidate that.

They were doing an update and a look at the science. There had been changes in the dosimetry system that was used to analyze the survivors and the exposures from Hiroshima and Nagasaki. There were lots of other data that were starting to come in from various and sundry other groups of folks that had been exposed, including those at Mayak in the former Soviet Union, where lots of the former Soviet Union activities took place, relatively high exposures over a long period of time; a bunch of those sorts of things.

They did -- their analysis; they looked at it; they were looking at how material moves through the body, looking at the how the body responds to radiation in different forms. So they updated some of the radiation-weighting factors and tissue-weighting factors. We'll talk about those in a few minutes. That's one of the first issues that we'll get to.

What they concluded was that the overall detriment, the overall risk-per-unit radiation is still about 5 percent per sievert. Now, most of you are going a sievert? Yes. The international people have gone to this SI units.

Somebody asked me in one of the other

meetings, So, Don, when is NRC going to just go to the SI units rather than rads and rems and curies and microcuries. And I said, Well, it would be sort of nice but I don't expect it to be in my lifetime, because that actually gets to the whole federal government's metrication policy. And when they change it from miles to kilometers as you go down I-10 then we'll be much more likely to be changing from rems to sieverts. So no time soon.

You will see that most of these slides have both units in place. Some of you who do international activities, all of the medical isotopes and things that you have to ship, are already in metric units, because that's what you need in order to do your commerce.

Okay. So 5 percent per sievert or five times 10^{-4} per rem of radiation. Now, I point that out to you. And they said it was still about that number. That reflects the judgment that was essentially the same in 1990.

Keep in mind that I told you a little bit earlier that the recommendations that are being used go back to 1977 and to 1959. Back in those days the risk per radiation was assumed to be a little over one times

10^{-4} per rem.

So, in fact, most of the basis for the regulations, including the occupational dose limits is an assumption that radiation is one times 10^{-4} per rem in terms of risk. That number changed. The dose limit didn't.

That's, in fact, one of the key reasons that ICRP in 1990 changed the dose limit. So people -- as we went around the room and everyone was talking about what they wanted to do with the dose limit -- I'm not surprised, heard that before; that's part of what was going on at that time.

So another thing. Went from a processed-based to a situation-based. For all of you, that probably makes not one whit bit of difference, because in the new situation-based everything that we're talking about here, all the activities that you do are planned exposure situations. You plan to do it. You plan to run the reactor, you plan to do nuclear medicine, you plan to do x-ray testing, you plan do all those things so you can have limits, you can do ALARA analysis, you can do radiation protection, because you plan to do it.

Two other situations that are typically out there. What they called existing-exposure

situation: that which already exists and you have to decide whether you want to do something. Classic example is radon. Radon in homes, those sorts of things that's out there. There are areas with much higher background radiation. There are places where there are residuals back from long ago before there were controls. People sort of forgot about them, people re-found them. You make decisions in terms of what you want to do.

And there are emergency exposure situations. Something bad has happened and you need to take an immediate action to try and bring it back under control. Those are the three exposure situations.

ICRP said that they wanted to try and maintain stability from their previous set of recommendations, as in the ones in 1990. So the fundamental principles haven't changed. You still have limits. You still have ALARA or what they call optimization, trying to reduce exposures as low as reasonably achievable, economic and social factors taken into account.

You still have justification. You really need to have a reason to be doing it. And the benefits should be greater than the impact. So the

three principles remain unchanged. The dose limits remained unchanged from 1990, unlike where Part 20 is today.

So the NRC regulations. Those of you who -- and most of you probably actually don't deal with the NRC regulations. The reactors do. Most of you are subject to one of the Agreement State regulations, Louisiana, Texas and the others, which have to be adequate and compatible. Notice I didn't say identical. Some of it has to be essentially identical. In other places there is more flexibility.

The state's going to be more restrictive, take slightly different approaches to achieving the same level of safety. They have definitions and radiation protection programs, occupational limits, public limits. All of those things are part of the regulations. In addition to that there are specific requirements for byproduct material uses, for source material, for reactors, for waste disposal, for fuel cycle, for all of those different things.

Some of those have requirements that were not changed when we did the revision of Part 20, which was completed in 1991. That little rulemaking took 12 years start to finish, more or less. Actually started in the late '70s when ICRP had put out their new

recommendations in '77; went through a process that was probably actually the first enhanced participatory rule. The group that did that went around and talked to lots of people about what the changes meant and otherwise.

Proposed rule came out in 1985, 1986. And then we finally got to a final rule in 1991 after spending some time with the Office of Federal Register about how to number it, since both rules would be in place for awhile, so that there could be a period of time for people to adopt the rules.

That's why in Part 20, if you ever look at it, you see that all the numbers start with 1,000. We were actually told we have to pick an entirely different set of numbers so that both rules can be on the books at the same time. So we went through that process primarily based on the recommendations from 1977.

Remember that I said a minute ago that there are other portions of the regulations. Some of those are cross-references and they were updated. Some of those contain their own explicit criteria, and some of them were not updated. For example, the requirements related to sources and some of the criteria and analysis that gets done for the sources

still go back to 1959 recommendations.

The requirements for ALARA effluents go back to the 1959 recommendations. If you've ever bumped into the folks from OSHA, their regulations are a copy of the NRC Part 20 from 1966, and they go back to the 1959 recommendations.

If you deal with most of the EPA requirements in 40 CFR 190 for the fuel cycle folks and some of those other things, they go back to the 1959 recommendations, as does the Federal Guidance for Public Exposure, which has never been updated since the time Eisenhower signed it. The occupational one was actually updated in 1987 and reflected the recommendations from 1977.

But in addition to that, because the science has changed over time, our understanding of how radioactive material moves through the body, there are licensees who by amendment are using the ICRP 60 methodology, the ICRP science.

Most every single fuel cycle facility working with uranium has moved to using these updated sets of numbers, because it's in fact beneficial for them to use those particular activities.

I don't think we've actually got anybody from one of the fuel cycle facilities here today, so

we're not going to dwell a lot on that.

So we finished it in 1991. The new recommendations had come out, but we didn't have time to incorporate them. We'd already been through public comment. In fact, at that point the Commission had agreed with what the final rule was going to look like, and we were just in that little dance around what the numbers were going to look like in the regulation. So we decided we would implement it. It had to be implemented by 1994. We gave three years as an implementation period so people would have time to make the transition.

In 2000, 2001 as the rest of the world was rapidly moving to adopt the recommendations from 1990, NRC was asked, Well, when are you going to update your regs, when are you going to make these changes. So we did a look around. And we went to our commissioners and said, You know, there are a bunch of issues that probably could use some updating but we know that ICRP is already starting to talk about what their new recommendations might look like.

And at that time some of the ideas floated by Roger Clarke from the United Kingdom, who was then the chairman of ICRP, were more than a bit radical. They were getting quite a lot of discussion.

And so what we actually suggested to our commissioners was, Rather than starting another rulemaking process and working through that process and getting done about the time ICRP decides that they have their new recommendations, let's wait and see what ICRP is going to do; once they get done, then we can move perhaps more swiftly. I said perhaps. You'll see in a little bit why I said that. Perhaps more swiftly in that process so we won't be behind the eight ball once again and have gone through all of that process only to have some things changed once you get there.

The Commission actually agreed. They said, Yes, that's probably a good idea, go interact with ICRP, provide them comments as they develop things, but, staff, don't go spend a lot of time or effort developing the technical basis and information for rulemaking since you don't know exactly what may have changed.

Makes a lot of sense. Of course, at that point we didn't realize that ICRP was going to take seven more years to get their recommendations done. Now, to their credit, that was in large measure because they actually engaged in a public process. There were two different drafts that were available on

their web site for comments. We and lots of other people gave them lots of comments. And things modified and changed over time until the point where they had the recommendations that came out in December of 2007.

Like good staff people, who always keep track of all the things on our to-do list, we went off and did an analysis of what changes had actually taken place.

We went to the Commission a year later in December of 2008 and said, Commission, yep, sure enough, there are still a number of issues that would seem to warrant an examination for whether or not there should be changes.

There are clearly some differences between how the U.S. does business and the rest of the world. There's clearly differences in the radiation risk that underlies different sets of regulations. There's a lot of frustration that we know is out there because of all these different sets of requirements. We think that we should start to work on what might be the basis for a propose rule and start talking with people about what the right things to do are.

Gave them a bunch of background. Suggested to them that we begin this process.

Recommended that we undertake a dialogue with the people who are involved in this and work on a technical basis. Keep in mind we hadn't spent any time and effort working on a technical basis up until that point. So with all the things that normally would have been done to support a rulemaking, nothing had started yet.

The Commission agreed. Thankfully, it was April 2, not April 1 of 2009. Sent us off on the process that we are still engaged in. They said -- and this is actually a quote from the Commission's Staff Requirements Memorandum; that's how the commissioners formally tell us, the staff, what we're supposed to do -- Explore the implications where it's appropriate, where it's scientifically justified. Greater alignment with the new ICRP recommendation.

That "greater alignment" word is key in our discussion. That does not say adopt. That does not say total. Seek greater alignment. Some things will make sense; some things probably won't make sense. This is reminder number two. This is what we're trying to do now, is what makes sense and why, given all of the different things that are going on.

We believe that the system of regulation in total is providing adequate protection. Nobody's

dying. Radiation protection programs, all the efforts to reduce exposure as low as reasonably achievable, all of that is working. So this is not a matter where I, we, the NRC staff, have an adequate protection issue where we need to go change something quickly because something bad is being allowed today. It's rather, a question of given where we are and that that system if functioning properly what are the benefits, what are the burdens, what are the implications, what are the pros and cons of making revisions to the framework.

Phase One? At least some of you I've had a chance to talk to at various and sundry times. We've talked to a lot of different organizations over the past year. Plus, if I tried to list them up there, even just the acronyms, you would tell me the font was too small on the slide, you wouldn't be able to read it. Because we've been out there quite a bit.

We had a Federal Register notice. We had a number of people comment with early information. We had a dedicated web address. By the way, that web -- that email address still works. It's still live. That's one of the ways that you can send us your thoughts and comments. It's in your slides. It's in the copy of the second Federal Register notice, which

was just published a couple months ago, where we're continuing to seek comments and inputs, where we have now asked a number of more specific questions that we're going to be going through over the next couple of days.

We're going to keep this open until January 31, 2011. If you're like me, when you leave, I climb on the airplane and then about halfway back I'll think, Oh, you know, it really would have been nice to have made this comment or Jean or Mark or Laurie or somebody said something and it triggers a thought. Write it down on a little sticky note, you know, put it in your iPad, whatever you're using, and send it to us afterward. That's the process that we're going to be working through.

These meetings are to try and hear from all of you. Unlike where we would stand up in front of a society meeting or otherwise and I would talk and there would be a few minutes for sort of nice questions and we would all go away and you've gotten a little bit of information, this is intended to be a dialogue. This is not Don talking to you and you talk to Don. This is all of you talk to each other, reflect on each other, help develop information that will be useful to us. Explore in details the

implications for the various kinds of uses.

And I'm incredibly pleased with the number of folks and the variety of folks that we have around here. You're the ones who are you using the material every day. I have to admit it's been a while since I've been out there. That's why I need you to help me know where the ground really is so that we can stand on it and understand what's going on, what the implications are, what will work, what won't work.

The operative question here for the next two days is, Why. I've already heard most everybody sort of lay down their vote for the occupational dose limit. Okay. Got that. Heard that. Why? Let's explore what's actually happening in the various groups, what's happening with the exposures of the folks that work for you and are doing it. What is the distribution of doses? Where are those sticky points? Why, why, why? Because we have to develop a technical basis.

I don't think my commissioners, our presidential appointees, would be too happy if we came back to them and said, Well, we've talked to the stakeholders and they've said no; so, okay, we'll say no. They're going to say, Why? They're going to be looking for the information. So we're asking you to

help us build the record of the implications and benefits.

What will come next? It's always nice to know what's going to happen after you walk out of these meetings after two days. We in the staff will continue to get the comments. We'll work on assembling all these viewpoints. Do I expect there to be a nice, unanimous little box that it all fits into? No. Why should I expect that? But we will work on trying to assemble the information, all those pros and cons.

We have to develop an issues paper for our commissioners, the background, what we did, what we talked about, what the issues were, what we heard, what the options are and seek their direction on some of these key issues. We are scheduled to do that about this time next year. So we're not moving really fast right now. That's okay. We want to take the time to try and understand where everyone is, not that I expect to make everybody happy, but to understand where everyone is.

When the Commission has given us some direction we can then complete the technical basis development and preparation for a proposed rule if there's going to be one and whatever that rule is

going to be. And I emphasize again, as Mark did before, I don't know what the rule's going to look like. I really don't.

I have some guesses now because I've heard what lots of people have said. And this is meeting three, but each meeting has had its own flavor. There have been some differences, there's been new information, and I'm very much in hopes that you're going to provide some additional information, some color, some depth to help us understand some of these things.

Once we've decided if and what we're going to do, we'll have to finish up that technical and regulatory basis before we can make a proposed rule, and then we're actually starting the rulemaking process with a proposed rule. There will be additional notice and comment. Finally it will get to a final rule.

So if you start to add all those things out, you'll discover that if there's going to be a new regulation or whatever that might be you're looking at 14, 15, 16, as in 2000-and. So it's going to be a few years before we get to that stage, simply because it's going to take a while to generate some of the information. And we're going to talk about that a

little bit more in the next issue.

But that gives you a brief synopsis of the background. Hopefully, what I have said here is essentially what you could have gotten from reading the Federal Register notice, which I know you all love to read. You get up every morning just looking for your copy of the Federal Register to read it for today. Right?

And so at this point I think perhaps it would be good to see if there are questions on the background and information and a discussion on that.

Dan?

MR. HODGKINS: Thanks, Don.

Just a couple things as far as, again, housekeeping before we go to the historical perspective. One is there may be a topic that's brought up, like, even as we go around to look at historical perspective, that's not necessarily on target for what we're discussing. So we're creating a parking lot, and that piece of discussion can go in the parking lot. And if you'll look on day two there's a point called Issue 5. And Issue 5 is actually the compilation of that parking lot in case there's some things that you want to talk about that haven't been addressed in the format that's been

presented. Okay? So that's how we're going to take care of issues that may not be cogent to the discussion but are important to you. And that will be Issue 5.

Web address; don't forget it. It will be available to you. But we will send everybody here the panelists' names, numbers and contact list later on. Okay. So that you'll receive that in case there's any follow-up you want to do with each other so that that network is formed and there's some conversation that you want to follow up on. Okay? And then, as Don said, you know, we're going to ask why five times. It's not yes or no. It's no, why, why, why, why, why. Okay?

Now, in this audience I bet you we have thousands of years of experience and a perspective on the history. And so what we really want to do is -- Don did a great job of presenting overall a perspective. But I want to go around the panelists to see if you have any historical perspective that you would like to add to this conversation that maybe Don didn't clearly identify or whatever. Okay? So easier topic to talk about, historical perspective from your point.

And so, Don, do you mind if we start with

you as far as --

MR. COOL: And all of the questions where I wasn't clear.

MR. HODGKINS: Pardon me?

MR. COOL: And all of the questions where I wasn't clear or I tripped up.

MR. HODGKINS: Yes.

MR. COOL: What did he mean by that? Or, Why, Don? You can ask why back. I may not be able to answer.

MR. SIDES: Don Sides, Stark Testing. I've been in this business a long time. And actually, I started before there was such a thing as tungsten collimators. By the way, those of you don't know, I'm in the industrial end of it. And for years we went on the assumption, Hey, I get 5 R a year, and I want them all, because that's we all work. There was just -- some of the safety precautions we have now did not exist back then.

But as things progressed and equipment quality gets better, I'm not so sure that the technical people that we use get any better, but -- I'm losing my train of thought here -- but I've never known anybody that's ever had a sufficiently serious overexposure to be really concerned about.

But 40 years of background does not necessarily tell you how much possible genetic issues we have four, five, six generations down, because I'm just starting on my first set of grandkids, so you really don't know what the effect of the radiation's going to be. And I think we all should be -- err to the cautious side, but let's not get carried away with it.

MR. HODGKINS: Leonard, historical perspective or clarification questions.

MR. EARLS: Leonard Earls. No comment at this time.

MR. HODGKINS: Beautiful. So no comment or pass is a great way of doing that.

Eric?

MR. ROHREN: Eric Rohren. I don't have any comments at this time, either.

MR. HODGKINS: Make the microphone work for you. Pull it to you so you don't have to bend.

Okay. Alice?

MS. ROGERS: Pass.

MR. HODGKINS: Steven?

MR. CAMPBELL: Steve Campbell with TC Inspection. Don. Right?

MR. COOL: Uh-huh.

MR. CAMPBELL: Just to clarify one thing. You're saying that by getting this input from the stakeholder it's possibly going to be in 2015 of '16 or '17 or '18 before a rule is written and signed off? Is this correct?

MR. COOL: That's a possibility. I can't even exactly predict the time yet.

MR. CAMPBELL: To follow up with that, in the meantime our U.S. government and your PhDs and your rocket scientists are going to be doing more research. And will you be gathering that information in the next six, seven, eight years to go along with this proposed rule that's going to probably be proposed again in 2018? Okay.

MR. COOL: And the short answer to that is yes. To at least what I think the question was, Will be continuing to follow what happens with the science. Yes, absolutely.

MR. HODGKINS: Ellen?

MS. ANDERSON: Ellen Anderson. Pass.

MS. BRYAN: Doris Bryan. Is that working?

MR. HODGKINS: Oh, you know what? Put the microphone to you.

MS. BRYAN: Okay. Doris Bryan. I've been around a long time, too. And I hope to gosh that I'll

be retired before all this really happens. But looking back, in 1994 when the methodology for calculating exposures changed from the five times N minus 18, I think that restricted us quite a bit when we went to the straight five rem a year. And I can address later multiple things in industry; however, I think lowering that even more would be a detriment to a lot of industries.

MR. HODGKINS: Jean?

MS. J. STATON: Pass for now.

MR. WANG: Weui-Hsung Wang. No comment.

MS. TRAXLER: Ann Traxler. No comment.

MR. MILLER: Yes. This is John Miller with International Isotopes. Don, you made a comment that the NRC reviewed the current regulations and the current limits and found that they were safe. And your comment was what, nobody was dying. If you really look at it, the nuclear industry as a whole has a very healthy workforce and explain the new science that comes out in the ICRPs. But at the same time there have been a lot of studies, as far as how -- you know, how occupational workers and the cancer risk associated with those workers compares with the general public. And I think that information is equally important as the ICRP science when the NRC

goes to make its decision.

MR. HODGKINS: Anybody else?

Toby.

MR. HEAD: Toby Head. No comment.

MS. McGOWEN: Laurie McGowen. No comment.

MR. LEDOUX: Mark Ledoux. Just one comment on perspective. And, Don, you brought this up about different federal agencies having different regulations. And I would think that would be very helpful if we could all -- all the agencies could be somewhat on the same page, specifically the Department of Energy and the NRC.

Our company deals a lot with both sides of the house. And if we've got two different regulations it makes it difficult for workers to work in between. So -- thank you.

MR. COOL: Thank you. And let me make an observation to that. Separate from what the staff is doing interacting with all of you, we are in an ongoing dialogue with DOE, with OSHA, with EPA and the other federal agencies that are involved in radiation protection.

There's actually a Steering Committee. It's called the Interagency Steering Committee on Radiation Standards; ISCORS is the acronym, I-C-S-O-R-

S. One of their quarterly meetings is actually happening tomorrow back up in D.C. I've managed to be out of town for it. But we are looking very hard at what things need to perhaps be moved in all of the agencies to try and see if we can get things re-established on a similar benchmark.

I can tell you the Department of Energy, as you know but others probably don't, just completed their effort to update some of their occupation requirements. They're still in the process of updating some of their public requirements for ICRP Publication 60. They went ahead and did the process over the last seven or eight years and are just completing a rulemaking effort. They are thinking about the similarities and differences to ICRP 103.

OSHA, as I suspect more of you remember, a couple of years ago they had their request for information. They had a couple of public meetings on whether or not they should be updating those requirements, should they be lowering a dose limit. They got a lot of data. They're sharing that with us. We're talking with them. That action with them at the moment is not active. The Obama administration, when it came in several years ago and all of the regulatory agendas were reset is not actually funded

at this moment. But they are interested and perhaps will pick the ball back up again in the process. And EPA is looking at possible changes to several of theirs.

MR. HODGKINS: Thank you, Don.

Susanne, we stopped at you.

MS. SAVELY: Susanne Savely. No comment.

MR. YUNKER: Toby Yunker. No comment.

MS. G. STATON: Gayle Staton. No comment at this time.

MR. HODGKINS: Thank you.

Okay. So, audience, this is where we're going to practice with you now. So what we're looking at is historical perspective. If you can bring some more information to the audience here, as far as your historical perspective or any clarification questions, you got to come up to the microphone and speak clearly into the microphone. Again, this is the audience participation. Anybody want to just practice?

Come on up to the microphone. Thanks for being brave. Show them how it's done.

MR. KIRK: Yes. Thank you very much. I'm Scott Kirk. I'm vice president of Licensing and Corporate Compliance for Waste Control Specialists. We're located in Andrews, Texas. And I'm also the

Site Radiation Safety Officer. I would say that the NRC should be encouraged to base any changes to the occupational limits -- it should be based on the science, not just to come into harmonization with international recommendations.

I do agree that optimization is key. And I think that when you look at historically the dose reductions that have occurred over the past two years, most all of industry is less than 2 rem per year. So I think we're already there, but we have to self-impose that as under the concept of ALARA optimization.

I think there is also a need, though, as -- Don, as you had mentioned, for harmonization between NRC, DOE, EPA and OSHA, because our workers at our site, they cross over, they come from DOE and they come from NRC-licensed facility. And with that said, I think there's a real need to harmonize how the DAC and ALIs are calculated, because a lot of industry still uses ICRP 30 methodologies, but there's newer ICRPs out there.

There has been an exemption that NRC does allow licensees, especially like fuel cycle facilities, to use the new ICRPs when they calculate the DAC and ALIs. And that's not only needed for, you

know, optimization -- I'm sorry -- harmonization between NRC, DOE, EPA and OSHA, but it's also needed for emergency response purposes.

And again, I would say, leave the limits alone unless the detriment based on the science shows that the hazard is greater than what we had previously thought. Those are my comments.

MR. HODGKINS: Thank you, Scott. I think we might be hearing more from you later on.

But anybody else want to amplify, echo, give comment from the audience?

(No response.)

MR. HODGKINS: Come on. Left-hand side. Anybody over here? You're right-hand side?

(No response.)

MR. HODGKINS: Nobody? Okay. That's how it's going to work today. Okay. We'll give the panelists a chance, then the audience to have an opportunity to amplify, echo, add, subtract, you know. And hopefully, we'll get through each one of those issues in a reasonable time and with everybody's input included. All right. With that, I'm going to turn it back over to Don.

Oh, do we -- is it time for a break already?

MR. COOL: Well, it's a little bit early.

MR. HODGKINS: But we don't want to --

MR. COOL: But I think maybe it would be better to take a break now rather than start the discussion on those coefficients and have me talk and then --

MR. HODGKINS: Sounds good.

And I'm just requesting nobody get caffeinated coffee. We don't need anybody all excited here. But seriously, so -- we don't have a coffee for you. A break, bathrooms are out there. Fifteen minutes? It is -- what time do you have? Let's synchronize. 9:27. Let's call it 9:30. 9:45 we'll be back in the room. Thank you very much.

(Whereupon, a short recess was taken.)

MR. HODGKINS: -- through this if you want. That would be fun. The best shot will be pretty bad. You all had your first morning exercise here with how the whole thing operates.

So we're going to take the first issue, which is Effective Dose and Numerical Values, and I'll turn it back over to Don.

MR. COOL: Okay. Thank you very much.

The first thing that we wanted to talk about is some of the technical underlying things that

go throughout the regulations. And several people have already mentioned -- at least one person already mentioned ALIs, DACs, Annual Limits of Intake, Derived Air Concentrations.

Those of you who work well logging radiography and things pray that you never have to deal with those because it's a nice, sealed source. And as long as it stays in there and it stays in your camera you don't have to worry about those. Some of the rest of us have to deal with another side of the world where the stuff isn't so neatly contained. And that does make it a bit more complicated.

So first thing I want to talk about briefly is what is Effective Dose or Total Effective Dose. Actually, had someone ask me as we were starting to get ready for these meetings, Don, can you help me make sure I understand what the differences are. So I thought maybe it would be useful to do a little bit of an explanation. If I see you all drop off I'll know that I'm taking too long on this.

But once upon a time the ICRP in 1977 said that the dose limit should apply to the sum of the dose from external exposures and the committed dose from internal exposures, the committed dose being the dose that your body gets over the next 50 years as a

result of an intake of radioactive material.

Now, if it's a long-lived material that's in your body there for a long period of time, that integral just keeps going. If it's a very short-lived isotope -- most of the things used in medicine -- long ago gone. So a 50-year integral is actually like the four-day integral or whatever it is for technetium. But that was the idea.

Now, when ICRP wrote out what their limits applied to, each time in the recommendation they said that the limit applies to the effective dose from external exposures and the committed effective dose from internal exposures. They wrote that whole sentence out every time. And when we started to look in the last Part 20 at applying that we said, You know, writing that out gets to be very long, very complicated, the lawyers always try to figure out if you spell all the words exactly the same and does it mean exactly the same.

So we decided -- we, NRC -- decided to create a term. All good regulators, you have to have lots of acronyms and terms. Right? We created Total Effective Dose Equivalent. That's not ICRP's term; that's the NRC term implementing ICRP's concept. The Total Effective Dose Equivalent. The sum of -- at

that time it was the deep dose equivalent from external exposures, measured at the point on the collar, the highest exposure, and the committed effective dose equivalent from internal exposures, so TEDE.

There was also Total Organ Dose Equivalent and some of the other things that went along with that. Lots of acronyms. And, no, I don't mean little fuzzy bears and amphibians and all that sort of stuff. Although people have nicely or perhaps not so nicely made fun of the terms over the years. Okay. All well and good.

Back now several years ago the NRC formally moved in rulemaking to recognize effective dose from external exposures and to recognize a number of the standing formulas that are out there for multiple badges or assumptions when lead aprons are being worn in interventional radiology suites and other situations that the body doesn't receive a uniform exposure. So no longer does it have to be the deep dose equivalent on the collar. It can be the actual effective dose. That's in the NRC regulations.

There's actually now one of our regulatory guide that has the number of different formulas that are available for calculating effective dose. I think

the states are still in their three-year window for considering adoption of those requirements, so there is some variability. And, of course, you could always default to the deep dose equivalent because that's clearly the most conservative, clearly overestimating what the effective dose to an individual might be.

Well, in 1990 and continuing in 2007 ICRP changed the calculation a little bit. And I'm not going to try and get into the details of exactly what happened in the calculation when it went from effective dose equivalent to effective dose. It had to do with the use of the biological factors and just formalizing the tissue-weighting factors. Not as important for most of you, but they changed the terminology. They just called it effective dose. And it was still effective dose from external exposures and the committed effective dose from internal exposure.

So now everyone internationally talks about effective dose, not effective dose equivalent. They talk still about the summation of the two. So that's exactly the same. ICRP in some of their publications actually refers to total effective dose when they want to make sure that people remember that it's the sum of both components. So this time total

effective dose as a phraseology actually appears in the ICRP recommendations, although most of the time you just hear as effective dose.

For those of you who really want to do the calculation you can look at this slide. I'm not going to dwell on it here. Nowadays we know enough about the human anatomy and physiology with very detailed phantoms of how the body behaves and looks.

It's all what they call a voxel phantom. A voxel is a 3-D version of a pixel developed from all sorts of MRIs and CTs and things, and they do lots of detailed calculation. Doesn't necessarily mean that the uncertainty is any smaller now. But they can do lots of detailed calculation. You do it for males, you do it for females. You come through and eventually you end up with an effective dose that's the average for males and females.

Radiation weighting. This is the factor that allows you to modify the calculation from a basic absorbed energy in your tissue to the effect that it has in terms of inducing potential for cancers, fatal cancers and things like that. For gammas and most things it's one; it's unity. Alpha particles, 20; much more effective in inducing effects. Nothing surprising there.

The changes that happened from 1990 to 2007 basically had to do with neutrons where they now have a continuous function curve for calculating that effect rather than a simpler step change over time. Not really important for most of the things that you're doing. Your ambient sources for well logs and gauges and stuff are not putting out huge quantities of this; much more interesting for some of the DOE folks and some of the other people. But you have the set of weighting factors.

And now is the time to talk for a moment about the continuing change in science, because someone already asked are we going to be following the ongoing science. The answer is yes.

One of the things going on at EPA, the Environmental Protection Agency, is an update of their calculations of radiation risks for different radionuclides. That's published in Federal Guidance Report 13, another document that I'm sure you all religiously have and thumb through every day say on your desktops.

But of note with that is that EPA, following up on information that has come out since the BEIR 7 report, Biological Effects of Ionizing Radiation Report put out by the National Academy of

Sciences, following up on continued information there, EPA is looking at changing that 1 to something like maybe 1.7 or 2 for low energy betas and very low energy x-ray, less than roughly 30 KEVs. So even most of the stuff that you do in interventional has a stronger x-ray than that.

But it picks up tritium with the beta. Because there is increasing evidence of a higher effect of those very soft energies which deposit all of their energy very close to the source of disintegration and therefore slightly more effective if radiation is actually there.

So keep that in mind sort of in the back of your head. It's not part of the scientific basis we have at the moment, but one of the things the NRC will need to do is look at consistency with what EPA puts out for the United States. And so that's one of the things that is still coming in process.

Tissue weighting. The relative rate at which different organs in the body are susceptible to radiation and causing cancer. Now, from 1990 to 2007 there was a big change the weighting factor for the gonads -- male, female combined together -- but for gonads went from 20 percent of the total to 8 percent of the total based on information that had been

developed since 1977, 1990, all the revised asymmetry indicating that the potential for hereditary infects -- my grandkids, too -- is not as great as had been previously rather conservatively estimated.

Now, the other thing that changed -- and it isn't highlighted here -- female breast was raised from 5 percent to 12 percent, indicating an increased awareness of the sensitivity of female breast to radiation-induced issues. And that should not surprise you, either.

The sum still has to be to one. We've decided that a human being is still an entity, 1.0 and you can't have the tissues add up to more than a person or less than a person. So things moved around a little bit. They picked some standard numbers. But these are revised numbers.

Tissue-weighting factors and radiation-weighting factors are defined today in the NRC regulations as part of the definitions. So one of the considerations is do we update the tissue-weighting factors and the radiation-weighting factors to the new information, the new science that's available.

All of those informations come together in what ICRP terms the dose coefficient. That's the representation of the effective dose from a unit of

exposure, a unit concentration of radioactive material into the body. It's based on the tissue-weighting factor, radiation-weighting factor, type of radiation, the disintegrations, nuclear decay data for various radionuclides, all of that sort of stuff.

The dose coefficient is what gets used to calculate the annual limits of intake and derived air concentrations, the ALIs and DACs, that are presently in Part 20. You don't actually see dose coefficients. The ALI actually calculates it so that you have the total intake over the course of a year that would get you to the dose limit. The derived air concentration, the amount that you can inhale in a given period of time that will keep you below the dose limit.

So they're used to help demonstrate compliance with the requirements. Why they're in an appendix, they're not in the regulation. Unfortunately or fortunately, depending on how you look at it, those numbers in Appendix B get used in various places besides Part 20. And some of them are used as triggering values for when certain actions have to happen.

So at the moment my lawyer friends tell me that they have to stay in the rule because if they're used a trigger for a regulatory requirement, they need

to be in the regulation. One of the open questions is should we be trying to chase down all of those tentacles and see if we can change them in such a way that all of this scientific information, which does change over time -- information comes in -- becomes part of the guidance on the way to demonstrate compliance rather than being part of the rule and therefore tied up in the 12-year or whatever kind of process that's involved. So that's one of the things that we're looking at.

Now, ICRP is updating their dose coefficients. They already have the new weighting factors for radiation and tissue. So they are now in the process of going through and calculating the new dose coefficients. That is a rather grinding, detailed process when you do all of the QA and the checking.

Keith Eckerman at Oak Ridge is the individual who does most of this work for the ICRP and for us here in the United States. When he gets the system going for one of those, he's got this whole array of computers all linked together cranking it through, because it's actually done on a multiple-iteration Monte-Carlo type calculation basis to find what the dose coefficient should be.

Why is that important? Well, the first set of numbers for the most commonly used radionuclides will be available this time next year. That's why, in fact, we told the Commission we weren't going to bother coming back with any recommendations on the key issues, because we knew that the first of the scientific information for this would not be available until 2011. The full set will not be available until 2014.

That's why I, when I talked a little bit earlier about when there might be a proposed rule, one of the things that we as a federal agency has to do is we have to have everything available for public comment.

Unlike some of our counterparts in Europe and other places, it's not acceptable to write in a U.S. regulation, Use the latest set of numbers from ICRP, literally what the European Union does. They say, Whatever the latest set of numbers from ICRP is, that's what we expect to use. We have to go through and propose them. So we have to have those numbers available for our notice and comment process.

Now, just in case it wasn't complicated enough, remember I mentioned that EPA is looking at updating their factor. They are doing the calculation

for U.S. specific population and cancer rates. So there will be a set of numbers which is the international numbers based on an average population and cancer incidence and mortality of all the different kinds of populations in the world. And there will be a set that's generated by the Environmental Protection Agency which is more specific for the United States.

Now, because the United States is the wonderful melting pot in diversity that we are we have a lot of those differences in the population. But there will be some slight differences in the sets of numbers. So another one of the issues that we will eventually have to deal with is consistency with the U.S. set of numbers that the EPA has or consistency with the international set of numbers that ICRP puts out. For the record, Part 20 today is based on ICRP numbers. The EPA didn't even have numbers back when we did those. The numbers that EPA generated came on well after Part 20 was put in place in 1990.

So to start this discussion, some of the options that we wanted to look at: First of all, you always have the option to not change anything. That's the base line. We just don't change anything. We could stay with the old weighting factors, the old

ALIs and DACs, the old term TEDE. Just leave everything alone.

Second possible option. To change the current regulation to align with the newer terminology. Go ahead and leapfrog and bring in the new tissue-weighting factors and radiation-weighting factors from Publication 103. Go through the process and the weight that would be necessary to update Appendix B or whatever we're going to do with the new annual limits of intake and derived air concentrations. Move to saying effective dose instead of effective dose equivalent.

Or a possibility that has been suggested for purposes of helping to implement. Change the terminology but allow either permanently or some extended period of time the use of either term. And this refers more specifically to the question of whether we say we're talking an effective dose or a total effective dose equivalent.

Because as you might suspect, when you write all these things down in your records and your procedures and your science there's a cost associated with changing all of that stuff. There's a cost associated with your people going, Now, what was it and why did you do that. There's the training and all

of those other factors. So there are some pros and cons with updating the terminology. So that's what we would like to explore with you over the next few minutes.

And, Dan, I think we will start it here and then we will go to the questions. All of you have these slides so you can see that on the slides that I haven't put up on the screen yet there are some questions. We'll use those after we've engaged in some discussion just to make sure that we've touched on some of the things the staff is particularly interested in.

MR. HODGKINS: Thanks, Don. So we'll go ahead and poll the panelists. And for panelists just to know, if I put you on the spot you can pass for now, you know. And then as folks -- as we go through, we'll go one round and we can discuss as we go. And in the end I'll give you another opportunity. So it's not that when I call on you that's your last chance to say anything. It is going to be a discussion. So we'll try and facilitate as best as possible.

So, Gayle, if you don't mind, can I start with you, as far as your reactions to the options?

MS. G. STATON: Gayle Staton with -- I really don't see a need to make the change at all in

the terminology. But if you did make the change I don't think it would be that big a deal, either. So I think that just staying with what you got is probably the best thing.

MR. HODGKINS: Thank you.

Tony?

MR. YUNKER: Tony Yunker. No comment.

MR. HODGKINS: Susanne?

MS. SAVELY: Susanne Savely. I'm actually in favor of a change, keeping up with the science and coming into alignment with the rest of the world on this.

MR. HODGKINS: Okay. Let me just say that -- so Gayle and Susanne might be considered opposite on what they've already said. Does any panelist want to add to that at all at this point? Or do you want to still just go around the room? Let's go around the room.

Mark?

MR. LEDOUX: Yes. Well, I will support with what Susanne just said. And also, with Gayle, too. It doesn't really matter. But it seems to make more sense to keep up with the science, with the new terminology. Are we also talking about tissue-weighting factors and dose kind of things now, also?

MR. HODGKINS: Yes.

MR. LEDOUX: Okay. And we would agree with that, too. That makes sense to do that. We at the company are an international company, so we deal with all kinds of different races. And so that makes sense for us to support moving anywhere any which way we want to go there.

Also, at our Clive disposal facility right now, we have authorization from the State of Utah to use the ICRP 6872 dose conversion factors for ALIs and DACs and effluent concentration limits. So we're already kind of going that way, and it's a better science and actually gives us more flexibility.

MR. HODGKINS: And, Mark, just to react a little bit, it seems like you answered the question why a few times there, as far as giving some significant, you know, reasons for why you're saying one or the other.

And so I challenge the panelists to, you know, come up with some more of those so that the audience at the end doesn't have to add anything because you guys all did such a great job with your rationale.

Laurie?

MS. McGOWEN: Laurie McGowen. Well, I

agree that we should keep up with the science. But I think we should use either one because some of it doesn't even pertain to some of the people that you're telling to regulate.

MR. HODGKINS: For example?

MS. McGOWEN: We don't have internal dose in industrial unless we have a major accident. And if we do, we probably don't care what their total effective dose is.

MR. HODGKINS: Toby, pass it on to you.

MR. HEAD: Toby Head, H&H X-Ray. No comment.

MR. HODGKINS: John?

MR. MILLER: John Miller, International Isotopes. As far as terminology, I'd go either way on that one. Weighting factors, I would recommend using the most recent and up-to-date weighting factors.

MR. HODGKINS: Thank you.

Ann?

MS. TROXLER: Ann Troxler, OAS. My opinion is that because -- I want to wait for EPA to come out with their numbers, because that represents U.S. population. And we don't regulate anyone but the U.S. population. I think that gives us a better understanding of what's going on in our own country.

Thank you.

MR. HODGKINS: Thank you.

Wei-Hsung?

MR. WANG: Okay. Wei-Hsung Wang. In terms of the terminology, I'm against the change. The reason is the new system is not logical. When we talk about the TEDE, that's a sum of the deep dose equivalent and the committed effective dose equivalent. So we're starting with a dose multiplied by quality factor. You get the dose equivalent. And you multiply by the tissue-weighting factor. You get equivalent dose -- effective dose equivalent. Right now you have the effective dose, you have the equivalent dose, and you have the total effective dose. It's just confusing.

In terms of the tissue-weighting factor, quality factor, I think we should use the most updated one, because with the new scientific findings and the radiosensitivity, I think that's a good move.

The thing I'm concerned is about EPA's study right now, which is talking about the tritium and the low-end x-rays, probably a 30 KEV range. And the problem I have with that is because the TEDE is defined as for the deep dose equivalent and committed effective dose equivalent, so we don't worry about any

dose reaching one centimeter below the skin. So I'm not sure with tritium and low-end x-ray it can reach one centimeter below the skin and the deep dose equivalent. I don't know if Don can give me an answer on that or not.

MR. COOL: Well, I'd like to -- and you'll hear me say this many times. I'm going to hold up a mirror a little bit.

With tritium if it's just on the surface of the skin, you're right, it doesn't penetrate. But tritium is rapidly absorbed, so it moves throughout the body. So you have exposure of all of the organs and tissues as a result of the tritium. The low-energy x-ray -- I'm actually not sure that that has any impact on any of the activities that we regulate. But we're watching that.

I will note that EPA has -- or rather, is in the process of putting together their methodology. They have already worked this through their Science Advisory Board. And some of the information on those meetings and the results of those meetings are on EPA's web site. I can't quote you the URL off the top of my head. But it is something that I would encourage you to watch, because I think it will have a possible impact for tritium because of internal

exposures.

MR. HODGKINS: So as Don says, holding up the mirror to the panelists, is there any further discussion the panelists want to have on that particular topic?

(No response.)

MR. HODGKINS: Any follow-up from your part?

(No response.)

MR. HODGKINS: Okay.

Jean.

MS. J. STATON: Jean Staton from Metco. I go along with Laurie and Gayle. I don't believe a change is necessary. It's for the reason there are three different areas in our business. We have the medical, the nuclear and the industrial. The industrial is not going to have internal radiation, not unless there was a significant accident where the pill was crushed and the person inhaled it, which that hasn't happened in many years.

MR. HODGKINS: Doris?

MS. BRYAN: Doris Bryan, Radiation Technology. I don't have any strong feeling about changing the terminology. I do think we should go with the latest science on the weighting factors. I

think that also it should be based on U.S. data, although I'm not real confident with EPA numbers.

I would like to mention one thing. Early on, Don, you mentioned that there should never be a problem with a sealed source. And I know this is another publication that we're going to comment on later. But you might want to put it in the parking lot. There is a proposal out to look at cesium 137 -- I mean, cesium chloride sealed sources. And I do know from experience that that has been a problem in the past and that there has been uptake from those sources that have ruptured.

MR. HODGKINS: Ellen?

MS. ANDERSON: Ellen Anderson from the Nuclear Energy Institute. We support the change to total effective dose for a couple of reasons. One is again, the whole issue of update -- this updated science. We believe that we should be updated from a scientific perspective. We also know that from an international perspective for those of you who are working with international companies or those of you who are international companies that using the same terminology would be to your advantage, easier to understand. You're all speaking the same language.

When it comes to the dose coefficients we

believe that we need to make a scientifically-informed decision about what those dose coefficients should be. So prior to making any decision we believe that we need to have the EPA numbers representing the U.S. information and the ICRP numbers, that we put them side-by-side, we take a look at them to see how different they are, if, in fact, they are that different. Again, making a scientifically informed decision. Whatever that number is, if we need to go to ICRP 103, fine. We go to those numbers.

But again, making a scientific decision. Not just saying, Oh, we don't worry about EPA, we don't worry about ICRP. Let's look at the big picture here.

And we also believe that we should take that information and place it in some type of regulatory guide, not in the regulation. Therefore, every time -- because here we go again. Scientists -- we were just talking about this -- as the science changes or whatever, that science now is going to be in a regulation. We got to go through this whole rulemaking process again. Let's look at putting it somewhere such as a regulatory guide where we can actually pull those tables and modify them; obviously, still using stakeholder involvement but not the

rulemaking process that we have to use for this.

MR. HODGKINS: Thank you, Ellen.

Any response from the panelists, echo, amplifications?

Yes, Mark.

MR. LEDOUX: Just a question. I just want to -- that's taking the tissue-weight factor and WT and WR and putting those in guidance and not in the rules? Is that what you're saying?

MS. ANDERSON: Some type of -- something other than putting it in the actual rule. I mean, we believe that a rule should tell -- should be the regulation, what we do, not how it's done, how the calculations are made.

MR. LEDOUX: And how would you -- then any licensee then, when they're going to calculate those, would just justify why they use whichever table they wanted to use? Is that what you're saying?

MS. ANDERSON: As now, if, in fact, you're using the regulatory guide and you use a methodology other than what's in the regulatory guide you have to justify that. If, in fact, it's wrong the Commission will tell you you can't do it. But the bottom line is again, why put all these numbers into a regulation when, in fact, they can change based on changed

science.

MR. HODGKINS: Any other comments, reactions, amplifications with Ellen's comments?

MR. COOL: I want to clarify a little bit. Don Cool. I believe you're suggesting tissue-weighting factors, radiation-weighting factors, all of the things in Appendix B, all of that gets moved into a guidance document and references changed. I just thought maybe you should elaborate a little bit. I know many don't necessarily have to deal with that. But it's a rather significant organizational issue.

MS. ANDERSON: I agree, Don, yes. That's what I'm asking.

MR. COOL: How do some of the other folks feel about that? And I'm particularly interested how the states and the suggested state regs would react to taking some of those numbers and changing the location. Not to put it in -- not always on the point. But --

MS. ANDERSON: I think from a regulatory perspective that it would be difficult to enforce unless it's actually in rule. And we can't do prospective rules. The legal term is finality. We would get in a lot of trouble for trying to do that and then trying to enforce them.

MR. HODGKINS: Mark, did you want to add to that at all? Your hand was on the microphone.

MR. LED0UX: Well, Don, you said Appendix B. You're not talking all ALIs, DACs, ECLs, those, also, are you?

MR. COOL: That was my understanding of the proposal.

MR. LEDOUX: Okay.

Is that what you were talking about, also?

MS. ANDERSON: Yes.

MR. HODGKINS: Reactions?

Ann?

MS. TROXLER: Ann Troxler. I have to agree that if it's not a regulation it's just like saying -- what we use now is ALARA. There's no definition. It's just how you think about it. So if it's only in a reg guide that's not a regulation. That's not enforceable. It just gives guidance.

MR. HODGKINS: Okay.

Any other?

MR. MILLER: Yes. I mean, I agree with that. But the regulation could and it does say what -- you know, the dose is the regulation. You know, how does a licensee demonstrate that they have achieved -- you know, have met or are in compliance

with the regulation? And so, you know, having DACs and ALIs and weighting factors in a reg guide, to me, would be fine. You know, it's going to be up to the licensee to be able to justify, you know, their model and their calculations to show that they're in compliance with the regulation. And if the model doesn't demonstrate that they're in compliance well then, you know, they're not in compliance.

MR. HODGKINS: Okay.

Anybody else?

Steven?

MR. CAMPBELL: Steve Campbell, TC Inspection. No comment at this time.

MR. HODGKINS: Alice?

MS. ROGERS: Alice Rogers, Department of State Health Services. I have nothing to add.

MR. HODGKINS: Eric?

MR. ROHREN: Eric Rohren. I don't feel too strongly about the changes in terminology since that's something we can adapt to. But the change in the science, obviously from the medical perspective, would be critical. And we've already seen a change in that as we've come to understand more about the impact of radiation exposure to developing breast tissue and breast tissue in younger women.

You know, all of these things that we do to our patients are done on a voluntary basis so we plan ahead of thumb that we're going to do a procedure that results in exposure to the patient. And that decision is based on a risk-to-benefit weighting. You know, we need to understand the forefront of science, as far as what the risk is in order to have that discussion. And we've certainly seen procedures in the medical community that basically have been -- had to be abandoned because the radiation risk is too high to justify the information that's coming out of that procedure.

And there are things that we can do to modify our procedures to try to minimize that exposure. So I would support adoption of the most up-to-date science from that aspect and don't feel as strongly about the terminology.

MR. HODGKINS: Leonard?

MR. EARLS: Leonard Earls. Just because things are in a regulatory guide, if that is the method that is eventually chosen, does not mean that you can ignore them if your license requires you to use that methodology. I'm thinking back to -- well, Don's favorite, I think, Reg Guide 1.109 that we have to deal with, which is based on 1959 recommendations

of the ICRP. But it's in our license. That's the way we have to do business.

MR. HODGKINS: Any comments regarding that issue?

Don, to you.

MR. SIDES: Don Sides, Stark Testing. No comment at this time.

MR. HODGKINS: Okay. Anybody from the panel want to add some fact, echo, amplify before we open it up to the audience?

MR. COOL: Let's chase just another minute or two this question of the rule versus guidance. Because it's one of the things the staff has debated internally quite a bit actually. Because there is a fair bit of -- I don't share a -- concern's the right word. But fair bit of discussion amongst ourselves that it would be really nice to not have those numbers locked into the regulation. And since we are allow licensees to propose to use a specific set and we can adopt it -- and so --

But we went to our lawyers back awhile ago. They said, Well, if it was just Part 20 you could probably pull it off because in Part 20 Appendix B is a method of demonstrating compliance with the dose limit. But it gets used in other places.

And so what I'd like to sort of do some additional checking on is what your licenses specifically tie you to or not and how the regulations -- whether they're tying you to the ALIs and DACs or other numeric values or to the dose limits using the ALIs and DACs for demonstrating compliance.

MR. HODGKINS: Anybody want to field that?

Doris, your head was nodding. Your head was nodding a little bit.

MS. BRYAN: I like the idea of taking that out of the regulation. And I don't think in most programs it would be hard to bring about. When you're submitting for your license you have to submit everything you're going to do. It comes back in license conditions. And you could make that regulatory guide a part of the submission and a license requirement. And then I think regulations should tell you what you need to do, but not how to do it.

MR. HODGKINS: Anyone else?

MR. COOL: Can I ask you one question just so that we are sure of the perspective? You work with some unsealed materials. So ALIs and DACs are something that you use in your program. Yes or no?

MS. BRYAN: Not in my program.

MR. COOL: Not in your program.

MS. BRYAN: But in some of my client's programs. So I have to keep up with not only the NRC regulations but all of the Agreement States and some of the international.

MR. HODGKINS: Anybody?

MR. HODGKINS: Ellen, was that a nod?

MS. ANDERSON: No, it wasn't.

MR. COOL: By the way, folks, nods don't show up too well on the transcript. We can do some rather interesting gyrations and the record that our transcriber gets won't reflect it unless we sort of put them into words one way or another. I'm looking at Ann and Ann is shaking her head no and grimacing.

So can you help the record understand what's behind that maybe?

MS. TROXLER: No.

MR. COOL: No?

MS. TROXLER: This is Ann. No.

MR. HODGKINS: Okay.

Mark?

MR. LEDOUX: Mark Ledoux. I'm just curious. Don, were you saying the lawyers were saying that for instance, Appendix B in 10 CFR 20 you do not have to follow those ALIs and DACs, they can -- you

can -- I know the rules right now say you follow them and if you want to do something different and it's the same way for most Agreement States you've got to propose, you know, why you're going to use a different ALI or DAC or whatever the case is. I was a little confused by it. The way we understand it is the -- whichever state or whichever NRC license we have you follow that applicable appendix unless you get permission to do something different than what's in the rule.

MR. COOL: That is correct. But having said that, that's -- the regulation -- the limited occupational exposure diagram, limit on public exposure 100 millirem and then it's a different paragraph says, To demonstrate compliant licensing da-da-da-da. The presumption is that you're using Appendix B unless you have applied otherwise. But it is using and demonstrating compliance.

So the NRC viewpoint is the dose limit is the regulation. And so there is some opportunity for the calculation when you're going through the process of that demonstration of compliance. And that's part of what the discussion here is, is how rigid or prescriptive the demonstration should be versus -- Doris mentioned it -- having the reg say what the

limit is and being perhaps more flexible in the way people demonstrate compliance.

No, no change says that we leave everything in Part 20 just as it is, so just the state regs in the state regs would be the same way. And it's not only presumptive, it's more than that I suspect.

MR. HODGKINS: Okay.

Panelists?

(No response.)

MR. HODGKINS: No other comment?

If the audience then would just start lining up by the microphones? We'll open it up to the audience, as far as participation, reaction, amplification, yes, no.

Yes, come on up to the microphone.

MR. HOLLIER: Name's Gave Hollier with the National Inspection Services. When it comes to change, why change the current terminology and weighting factors when throughout the last 50 years or so the training, preparation, equipment and programs current regulations utilized have provided adequate safety factors?

And they've provided more than enough. And this is growing more and more and more and we're

understanding more and more how to be safer and how to work safer, how to train our guys better, how to get them to understand the things and calculations and, you know, all of the different factors that we have to deal with today. And it's becoming more and more with the IC controls and with everything else. And it's adding up to a lot more stuff.

And you go in and you start changing all this stuff now. Well, now you got to go back and retrain guys that have been in the industry for 20, 30 years and that have a good understanding of how ALARA works, you know, how the buddy system works, how all these different things work. So why start changing all these programs just to align with the rest of the world when we defined a lot of that stuff to begin with?

The weight factors? I think there should be a public meeting held and given to us whenever the scientific data is given and it comes out and it says, Okay, well this is the data we came up with for the United States. That's when we should -- everybody, the stakeholders should be brought back and said, Hey, this is the data that we came up with, now we want to show you why we want to make these changes or why it's necessary. But no changes should be made without

scientific proof and data for -- you know, to be taken into consideration.

Rules versus guidance? Only problem with that is guidance can be changed at any time, you know. You can go ahead and, you know, the scientific data comes out and you can change it. Well, then the industry's still trying to catch up to it. And to me, a rule in a book that you look up and you look at you know. You can say, Okay, this is how we have to do this. This is how everybody in the industry has to do it. And versus guidance that by the time you learn how to do it and you've presented it, well, the next thing you know, next year it's changed without stakeholder approval or without everybody's input, such as a rule is. A rule takes as long as it takes because it takes everybody's input and a decision has to be made on that. So I say keep the rules. Keep things as they are. We don't need any more changes.

MR. HODGKINS: Don't go anywhere. Stay by the microphone. You're part of the conversation.

Does anybody from the panel want to react to that? Have any comments?

Ellen?

MS. ANDERSON: Changes to regulatory guides aren't just something someone does. They

actually are noticed in the Federal Register. Comments are solicited. You have that opportunity to make comments. I do it actually on a monthly basis. I have a couple out there right now. So we do solicit comments based on the changes to regulatory guides and we do provide that feedback to the NRC. And they do take that feedback very seriously.

MR. HOLLIER: That's understood. But the way it works is, you know, the federal government has -- it gives more power to the federal government to impose more onto the public. And that's not the way this country is defined to work. This country is defined to work where the people in all the companies and businesses and entrepreneurship has a right to tell the government what we want.

Now, scientific data to make it safer for everybody? Absolutely. 100 percent. But if we say no to -- if there's no scientific data saying that we need to change this from 5 MR to 2 MR because it's going to kill a lot of people in 100 years from now, why do it? We don't need it. And it's the people's opinions and the people's right to say, No, we don't want to go with international numbers and figures; we want to go with ours.

And with rules and all that, I think there

just should be a standard to say, Everybody's in unison, this is what we go by, this is what's written, this is how it's done. And everybody has the opportunity to weigh in on those standards rather than to be a change.

MR. HODGKINS: And, Gabriel, just as far as points of clarification, as far as do you see this as the avenue for input?

MR. HOLLIER: I think it is a good avenue for input.

MR. HODGKINS: Okay.

And so, Ellen, is there any clarification you want to ask Gabriel as far as his response to you?

MS. ANDERSON: Not at this time.

MR. HODGKINS: Okay.

Gabriel, you have any specific questions for the panelists then?

MR. HOLLIER: No. I'm fine.

MR. HODGKINS: All right. Thank you --

MR. HOLLIER: Thank you.

MR. HODGKINS: -- so much for being the first person at the microphone in the second round.

Let's go. And if you'll just line up that will give us a sense of how many questions, comments, amplifications there are. Name first.

MR. HART: Tim Hart. I'm with the United States Navy.

MR. HODGKINS: You know what? You're going to need to speak directly into the microphone. You might want to raise it.

MR. HART: Tim Hart with the United States Navy. I think the changing on the weighting factors needs to wait until we get the final scientific data. The regulatory guidance is entertaining at best. I have played party to rewriting the new regs for 1556 and been involved in that process.

And I've watched the NRC over the last 20 years issue regulatory guides that have draft on them. They had draft on them 15 years ago and they still got draft on them today but we're supposed to use them. And I'm not real sure whether that means that they're drafting a suggestion, they're drafting a requirement, they're drafts. So the regulatory guidance I'm not a big fan of unless the NRC finally gets around to saying, This is the guidance that we've got, and then says, If you don't accept this you have to give us an alternate level of safety.

Now, I know that those words have been said many times. Problem is it's not codified. And so when you -- on the rare occasion that you might get

a different regulator tomorrow than you had today and their opinion of what's what varies, it's pretty difficult sometimes to get it right.

MR. HODGKINS: And, Jean, you were nodding a lot. You agree with it. Okay.

Anything else from the panelists?

Any clarifying points for our panelists? Okay. Next.

MS. JOHNSON: Jan Johnson with Tetratech. But I'm speaking strictly for myself, not for any company or any other organization. I would like to have you guys clarify dose coefficients versus risk coefficients. The NRC obviously bases regulations on dose. EPA bases regulations on risk generally or enforcement actions on risk. And if EPA is actually using cancer incident statistics then they're probably looking at risk coefficients. Is this correct? As opposed to dose coefficients?

MR. COOL: They're actually looking at both.

MS. JOHNSON: Okay.

MR. COOL: They are currently looking at updating the risk coefficients that they were using in certain circumstances and they are in parallel updating the set of dose coefficients which is another

one of the Federal Guidance Reports. They're working on both in parallel is my understanding.

MS. JOHNSON: Okay. The other comment that I'd like to make is about terminology in general. I'm working on an NRCP document recommendations. And I just got through scrubbing my chapter of all the regulatory terminology, and we're going entirely to the ICRP terminology.

And if these documents are going to be useful for people in industry to actually rely on then, it seems to me that we've got to have some similar terminology rather than having to question, Well, what do we mean, TED or TEDE?

MR. HODGKINS: Panelists?

Yes. Come on. Yes. Come on up. You can come up. The panelists were not participating, so come on and ask a question.

MR. KONG: Okay. Thank you. My name is Tan Kong from South Korea. I'm working at Korea Electric Power Research Institute, KEPRI. Actually, I'm involved in the research project about application of ICRP 103 to Korean nuclear infrastructure. And actually, I don't have a right to say which one is better to the United States, but actually, in Korea in my case, we do some field tests and some experiments

about which one is -- would be better for nuclear operators and nuclear industry and nuclear -- some medical subsection.

So I'm not talking about some -- the radiation impacts on a list. We are talking -- I'm talking about the cost and benefits to nuclear operators and some industries. So we do have some -- a lot of field tests, and we have some data. But I can't say that the result right now, but I think it will be better to do some field tests to which one would be better to select those options and and maybe provide some information to the audience who are the stakeholders. That's it. Thank you.

MR. HODGKINS: Thank you.

Anybody? Reaction, action? Panelists? Audience?

Yes?

MR. WANG: I think I'm going to repeat this interpretation a lot. Will a change in terminology or change the dose limit make us as radiation workers for general public or for environment safer? I'm going to keep asking these questions to the panel, to the other people here or even to the regular agency: Will a change make us safer?

MR. HODGKINS: And are you really asking the panelists to react to that right now? We can wait. Okay. All right.

So -- well, you want to do that, Don?

MR. COOL: Yes.

MR. HODGKINS: So let's go around the room and just discuss what you're saying, as far as amplification or whatever. Does it make it safer?

Gayle, pass if you want.

MS. G. STATON: Well, no. I think that's a question that the NRC needs to answer. Because -- I'm not sure I understood his question -- but he's saying if we make a change to the terminology, will that make us safer?

Am I correct? Yeah.

I don't see where it will, but, you know, if there's a reason that I'm not catching on to that would make it safer -- but I don't see a reason right now. But again, I'll reiterate, it doesn't matter to me which way we go. I don't think it's going to make that big of difference.

MR. HODGKINS: Tony?

MR. YUNKER: I agree with Gayle on that point.

MS. SAVELY: Susanne. No comment right

now.

MR. HODGKINS: Mark?

MR. LEDOUX: Mark Ledoux. Not only I don't think it's going to make it safer, but again, where the world's going and global economies and so forth, we get everybody more or less on the same page using the same terminology makes sense to me.

MR. HODGKINS: Laurie?

MS. McGOWEN: I don't think it will make us any safer, but I agree with Mark that it would make it better if you were worldwide; everybody could have the same ones. But I don't think half the people that work in the industry know what a TEDE or a total effective dose is anyway. Just the management does. And we don't really work with it.

MR. HODGKINS: Toby?

MR. HEAD: Toby Head, H&H. I got to agree with Laurie on that. In our industry it really doesn't make any difference.

MR. HODGKINS: Thank you.

John?

MR. MILLER: This is John Miller with International Isotopes. I think that's a little bit of a loaded question, you know. If we're talking about reducing risk and if you assume, you know,

you're reducing risk-to-dose using the linear no-threshold model then obviously, the lower you go the safer or less risk you have. But do I think we need to change the way we operate today to keep our employees safe? The answer to that is no.

MR. HODGKINS: Ann?

MS. TROXLER: Ann Troxler. I agree with John.

MR. HODGKINS: You're going to pass?

Jean?

MS. J. STATON: Well, like Laurie said, management is more concerned with this than the employees. The employees don't know what TEDE. They know what they're supposed to know for the test and that's about it.

MR. HODGKINS: Okay.

Doris?

MS. BRYAN: I don't think it will make us any safer. I don't -- I also don't think there's any need for us to try to agree with the rest of the world. Because right now, for instance, as I understand, Canada is on the 2 rem a year. We're still at the 5 rem a year. We're the United States. Why not work from what -- for what we need to do our business here?

MR. HODGKINS: Ellen?

MS. ANDERSON: I'm going to pass.

MR. HODGKINS: Steve?

MR. CAMPBELL: This is Steve with TC Inspection. I pass.

MS. ROGERS: Alice Rogers. Nothing to add.

MR. ROHREN: Eric Rohren. I have no additional comment.

MR. EARLS: Leonard Earls. As far as making the worker population safer, I think the NRC acknowledges right now that the current regulations provide adequate safety for the work force. What we're talking about here is adopting the latest terminology and scientific information from an international committee.

With respect to risk, I would like to -- maybe this goes on the parking lot. I don't know. Are we talking here about risk for cancer incidence or are we talking about risk from cancer mortality? Because it makes a world of difference. Our friends in the medical community have done a very good job in the last several years of being able to treat a lot of cancers. So just the fact that you get it does not indicate that you are going to die from it anymore.

So that's something that's way back in the scientific data. It's something, though, that we do need to think about.

MR. HODGKINS: Okay.

Don?

MR. SIDES: Don Sides, Stark. No comment.

MR. HODGKINS: Okay. So let me just throw it out to the audience again. Have you heard your perspective then from the panelists? This is yes. This is no. There you go. You got it. And that's the point here. We're trying to get your input. All right? So that you leave here feeling like, Well, this was a discussion that was good that we've had that my perspective was represented in this community forum. Okay?

With that said, let's go on to Number 2.

MR. COOL: Well, we'll go on to the questions.

MR. HODGKINS: Questions. Oh, yes.

MR. COOL: Just to sort of check where things are. These were the questions that we had in our notice that were -- at least some of the questions that we wanted to check and make sure we heard. And the first one that we had on there were potential impacts of using the updated terminology.

A number of you have talked about your view. I'd like to see if anyone would like to volunteer some additional information. And I know this might be speculative. But we've heard so far the majority of folks thinking we should go -- be doing updated science, that using updated science is a good thing to do. There's sort of a mixed bag in terms of people and using a new term, not such a new term, the old term.

Questions that that might raise that are in this are one, is it useful if we update the science to -- updated the terms so that you know which set of science applied to it. Is there any rationale with that? And two, can you speculate more specifically, more deeply on the impacts that you would see over time if we changed to using effective dose in terms instead of total effective dose equivalent.

And I know in this forum, unlike a couple of the other sessions that we've had, that many of you do not need to worry about the whole internal exposure component of this demonstration. For you it's actually every simple. It's the external exposure. You've got pretty strong gammas. There isn't any such thing as shielding. It's your badge. It's your badges to your badge. And sort of recognizing that,

what implications you'd have associated with moving to a change in terminology which I'm going to speculate at least, would seem to be more helpful from the people who are having to deal with all of the types of exposure rather than just the external.

So if we could explore that a little bit more? If there's anyone who'd like to add to that.

MR. HODGKINS: Panelists, it's your turn?

Yes, Mark?

MR. LEDOUX: The ability to use DDE now that there's a reg guide and so forth, I know with our facilities and license and projects no one yet has used that although I'm trying to encourage them to do that because I think it will bring the whole-body dose or TEDE down. So I think that's just going to take a little bit -- a little while to get people on board. It's a little bit cumbersome to do because they're not used to doing it that way. You've always just take the deep dose and most -- and that's the way it goes.

As far as impacts on updated terminology, the general procedures, computer programs and so forth? So there is a clash there. I don't think it would be significant. Certainly -- and it's just the way the things go. There's changes going on with regulations all the time. And I don't think that

would be a real big deal.

MR. HODGKINS: Susanne, let's go around your way.

MS. SAVELY: I kind of echo what he says. And I think that the costs involved wouldn't be a deal breaker for us to keep up with the changing times.

MR. HODGKINS: Tony?

MR. YUNKER: I don't really see where it would have any kind of effect on us at all.

MR. HODGKINS: Gayle?

MS. G. STATON: I agree with Tony. It's not going to make a big difference to us.

MR. HODGKINS: Don?

MR. SIDES: Don Sides, Stark. Terminology's just terminology. It's not going to affect anything we do. We don't have any internal doses. So it's not a factor to us and the cost to change any of the programs because of the terminology is negligible.

MR. EARLS: Leonard Earls, South Texas. We don't have intakes, either at the nuclear plant that amount to a hill of beans. But it will cause us to change our general employee training program. It will cause us to change our calculation methodology

for calculating dose. It will cause us to change some procedures. The -- it's not a large financial impact. As far as the general plant worker is concerned, it will -- I don't think it would make a lot of difference in his life.

MR. HODGKINS: Eric?

MR. ROHREN: No comment.

MS. ROGERS: Alice Rogers. Nothing to add.

MS. CAMPBELL: Steve Campbell. Nothing at this time.

MS. ANDERSON: Ellen Anderson, NEI. I agree with Leonard Earls that, you know, with the training and those types of things. But if you look at the big picture of all the proposed changes in the Federal Register this would probably be the least costly for us as an industry.

MR. HODGKINS: Doris?

MS. BRYAN: Doris Bryan. It would have minimal effect directly to my company because we're small. However, I would have to revise all of my training materials because we would have to incorporate this into courses that we present to other people.

MR. HODGKINS: Jean?

MS. J. STATON: No comment now.

MR. HODGKINS: Wei-Hsung?

MR. WANG: Wei-Hsung Wang. No comment.

MR. HODGKINS: Ann?

MS. TROXLER: Ann Troxler. No comment.

MR. HODGKINS: John?

MR. MILLER: Again, to me, as far as what terms we agree on, that's rather arbitrary. What I'm more concerned with is having clear definitions of what those eventual terms are.

MR. HODGKINS: Toby?

MR. HEAD: Toby Head. It hasn't been more impact on us.

MR. HODGKINS: Anybody from the audience? Comments?

Okay. Yes.

MS. J. STATON: Jean Staton, Edco. Employees. My reason being -- okay. The management has to keep up with all --

MR. HODGKINS: Can you start over again because I don't think everybody heard the first part of your question.

MS. J. STATON: How is -- this will affect the employees? Its' going to affect the managers more than it will the employees because we have to do the

figuring. But we are a very transient force. And we go from company to company. We go from film batch company so we've got results from one place to another. Who's going to keep up all of this information? How is it going to be known if it's accurate or not? I have a hard time getting information from other NDE companies. So I have problems there. I'm going to have problems on this keeping it accurate.

MR. HODGKINS: Okay. Comments?

Leonard, did you want to say something?

Good swig to the next question. Don, next question, please.

MR. COOL: Okay. Well, the next question was, in fact, on records and reports, things that you have to write down and keep. So this is another time to hold up the mirror. Because Jean has pointed out quite correctly that you have to keep records, you have to make some reports. The records would need to be kept in the units that are in force. It's not clear to me that if you changed -- if you made this change to say effective dose -- used that terminology -- and simply replaced that that it would necessary change at all the issue that you were addressing. Because we're not actually at the moment talking about

the question of making sure that you have the information for each of your workers in a transient organization.

But I'd be interested in anyone else's views on that and elaborate a little bit more. Because we've got a group of people here who I think have a lot of folks who move job to job, certainly a lot of location to location to location. What I don't know is the extent to which you may have individuals who are moving between jurisdictions, including between the U.S. and other countries. For example, Mexico, the Canadians, folks from France and other places. I very much welcome that we have someone here from Korea. That's fantastic.

MR. HODGKINS: Susanne, you were just reaching for your candy bar, weren't you?

Anybody else? John?

MR. MILLER: Yes. I'll start this one. I mean, the question seems like it's, you know, Boy, this should be a no never mind. But I'm wondering, you know, how -- you know, what depth are we looking at, as far as the records and reports. Because if you're talking about changing weighting factors, you know, it's not the final report or the final record that is where I see the problem is going to occur, you

know. A lot of modeling software is used to, you know, produce the records and reports to demonstrate compliance.

And if there's a change in weighting factors, if there's a change in, you know, other of the ICRP 103 changes that go into effect and they're not captured in all the models that are out there that are currently used by a licensee there could be a huge impact on the records and reports. Because you may not know whether or not your report is generating a reliable record anymore, you know. Like -- and I'm thinking of some of the EPA models, CAP 88 and Comply, NRC's rascal models.

MR. HODGKINS: Panelists?

(No response.)

MR. HODGKINS: With that, can we open up to the audience members? Anybody from the audience want to react, amplify?

(No response.)

MR. COOL: Okay. I had already verbally talked about the options. So let's just check some of the questions on the numerical values. Most of you have talked in general terms that it's probably a good idea to update the science. I'm assuming from what you have said -- because several of you have talked

about, Let's have the EPA numbers and the ICRP numbers, set them side by side, and hit those values. But you have a group that there's no push to get this done earlier rather than later.

So the sub-question that was on here was whether or not there should be an effort to try and move forward to put the new system in place sooner or wait until all of the information was available. And I'd open that back up to do some checking to see if we heard this correctly.

MR. HODGKINS: Did we hear that correctly, panelists?

Leonard?

MR. EARLS: Leonard Earls. I would rather wait to see all of the numbers rather than dealing with a few -- a limited set of radionuclides. I know there are -- I mentioned reg guide 1.109. There's some mistakes that are still in that particular regulatory guide that haven't been corrected, even based on the ICRP 2 model. So I would like to take a look at the numbers before I agreed to go ahead and support this or make a -- I think you have to look at all of the information so you can make a rational decision.

MR. HODGKINS: Don, anything?

(No response.)

MS. G. STATON: Well, I just echo what Leonard says. I think we should wait till we get all the information in.

MR. HODGKINS: Tony?

MR. YUNKER: I agree with them.

MS. SAVELY: Susanne. I agree with Leonard, as well.

MR. LEDOUX: Mark Ledoux. That makes sense to wait and then do it all at one time, because you still have the option generally, even with NRC or tech specs and/or Agreement State -- you can always go to your regulator and say you want to use something different if you want to, and they can justify it or not.

MR. HODGKINS: Laurie?

MS. McGOWEN: Laurie McGowen. I think we should wait, too, instead of hashing it out again when it changes again. We should wait till we get it all in.

MR. HODGKINS: Toby?

MR. HEAD: Toby Head. I think we should wait till we get some final numbers.

MR. HODGKINS: John?

MR. MILLER: Yes, I would wait, as well.

MS. TROXLER: Ann Troxler. I believe we should wait.

MR. WANG: Wei-Hsung Wang. I concur with Leonard.

MS. J. STATON: Jean Staton. Yes, we should wait till we have all the information gathered.

MS. BRYAN: Doris Bryan. Wait for all the information.

MS. ANDERSON: Ellen Anderson. I believe I said that in my initial discussion that we should wait. Because again, we want a scientifically-informed decision.

MR. CAMPBELL: Steve Campbell, TC Inspection. I opt to wait. Just because science is an evergreen. By the time 2014, '15, '16 come around it's going to change again. We'll be sitting here again.

MS. ROGERS: Alice Rogers, Texas Department State Health Services. I agree we should wait. The NRC's rulemaking takes at best about three years. And then each of the 37 Agreement States also take at best about three years. So we need to have one package to go together to make this actually work.

MR. ROHREN: I agree with that, as well. Eric Rohren.

MR. HODGKINS: Okay. Let me ask you guys this question just because again, from the outside -- because I don't mean to step on toes or whatever -- but here we've just done this whole thing, Let's wait. Yet what I hear all the time is, We're leading. So how are you leading by waiting? Have I any concerns?

MR. CAMPBELL: Clarify your lead. What do you mean by leading?

MR. HODGKINS: The panelists have said the U.S. leads -- yes? -- in science research, whatever you said. And yet now all of you are saying let's wait. And I was just wondering how is your waiting leading. It's just an observation from your language that, you know, you guys want to lead but my gosh, now it's all waiting.

MR. LEDOUX: A little confusing that -- well, they don't have the numbers yet so that's why we have to wait. So I'm a little --

MR. HODGKINS: And who's they?

MR. LEDOUX: The NRC and EPA. The way I understand it, anyway.

MR. HODGKINS: Okay. All right. Just --

MR. EARLS: This is Leonard Earls. The numerical values that we're talking about here, I believe, have to do with the annual limits of intake

and the derived air concentration values, sometimes called DACs. With respect to the weighting factors I don't have a problem with those per se. They do reflect the latest information. It's how you utilize the intake that you determine and the weighting factors associated with it to come up with a dose value.

What we're saying is the weighting factors are probably all right, the new ones out of ICRP 103. But we could use those weighting factors with the existing set of ALI and DAC values and that sort of thing that are from -- I guess it's ICRP 26 and 30.

MR. HODGKINS: Audience, any reaction, amplification?

Don?

Oh, wait a second. We got someone? There's a live one out there.

MR. HART: Not really on this particular topic. But I had kind of a revelation while one of the -- the previous topic about logs and records and things of that nature. We in the Navy have gone, not surprisingly, automated everything. And so when you start changing things like values and you start changing wording we're going to have to go back in and reprogram some computer programs to update. So that's

something. I don't know whether many folks here have got that. Because our program's a little bit bigger we do have that to consider. Just from across the standpoint.

MR. HODGKINS: Okay. Thank you.

Don?

MR. COOL: The other question that was out there, I believe you have already given a pretty clear view on, which if I heard you correctly was, Let's let ICRP and EPA get their numbers together and set them side by side and make a decision at that point. So you didn't actually come down on a side yet.

I don't know whether anyone has any thoughts about the similarities and differences between the two since obviously you can't see what they are at the moment. Or the implications of being aligned within the U.S. and being different from the world or being aligned with the rest of the world. Which for most of you it sounds like isn't terribly important for your activities.

MR. EARLS: This is Leonard Earls. I believe Ellen's already addressed this. It's a matter of looking at the data and seeing which one makes more sense. We are entering an ear which is more global, as far as workers moving from one country to another

to do work. We've had workers at our facility from Slovenia, from Mexico, from various countries to support our outages. So it's not just a matter of the U.S. population.

This sort of goes back to my question about risk. Because depending upon the quality of medical care in a given country the -- contracting a cancer of a certain type may have a risk of mortality in the U.S. that's different from say, the risk of mortality in some other countries.

China is in -- right now in a -- building many nuclear reactors. The building is going on in Asia. So we have to figure out whether we're talking about the risk of contracting cancer or the risk of mortality from cancer, as far as how these numbers are going to flesh out. That may be a little bit too geeky for everybody, but that's just part of it.

MR. COOL: Well, let's go ahead and address that for the moment just briefly, because I think we have enough time to --

MR. HODGKINS: Yes.

MR. COOL: -- sort of pick that one up here at the moment, because from my recollection it used to be that risk coefficients were based on cancer fatalities. That's what people were measuring early

on. That's what the data from Hiroshima and Nagasaki were looking at, cancer mortality.

In fact, ICRP, as well as the National Academy of Sciences in the BEIR report, have now moved to looking at both fatalities -- the mortality issue and the morbidity -- the actual incidence data -- for at least one of the reasons that I think you've cited. That, in fact, our ability to detect and treat cancer is changing over time so the mortality, the number of deaths per certain cancers, is changing.

And so the science that underlies these latest set of numbers has both mortality and morbidity to the cancer incidence now built into it. But even with that I think people would argue that the rate of cancers, cancer induction varies from country to country. And that's part of what is being examined now, U.S. cancer rates versus cancer rates in China, cancer rates in Japan, cancer rates in the former Soviet Union.

So let's open that up for any discussion. There may not necessarily be a lot that people want to add to that. But the current is now building incidence rates into the system.

MR. HODGKINS: John?

MR. MILLER: Yes. This is John Miller. I

would just say that I think that makes sense because, you know, if you step outside of the, you know, radiation protection block and you consider, you know, other industrial hazards, you know, you don't want to argue that, you know, we could easily treat somebody's broken arm, you know. So rate is very important, you know. You don't want to -- you know, you wouldn't want a worker to break their arm just because you know that it can be treated. That's my personal feelings.

MR. HODGKINS: Audience participation? Come on up front.

MR. HORACE: Eddie Horace with University of Texas Health Science Center here in Houston. Just wanted to come across with the -- about the calculations portion of this. I just wanted to say if we do go to a 2 rem per year to align with the rest of the world, will our calculations be determined the same as the rest of the world?

What I mean by that is just because we're reporting -- the reporting factor is 2 rem, how will each union reach this number? Their number may be different. What we're talking about is population here in the U.S. versus the rest of the world. So has the NRC even thought about that? Do you not -- you're kind of looking kind of hazed at my question.

MR. COOL: Well, I can imagine a couple directions in that question. The NRC is certainly thinking about the question.

The world in general has already moved to using effective dose, and most countries and the international Basic Safety Standards that the International Atomic Energy Agency has put out, the European Union and the European Directives direct the use of effective dose, and they report it out in millisieverts, the BSI units.

So I think my answer back to you would be most everyone except in the United States is using the terminology effective dose. Most everyone is reporting it out as effective dose and currently using the calculation using the ICRP 60 weighting factors.

The world is at this moment -- I'm just going to talk about that a little bit to start the next section, so this in one sense is a bit of a segue.

The rest of the world is currently looking at moving to update their requirements to the latest ICRP recommendations. So, in fact, that's an ongoing discussion about incorporating the scientific information.

For most of them, interestingly, one, they

don't have the public comment input discussion process that we have here in the United States. And so for most of them it is almost a presumption that since new numbers are being brought up, that they will be used. And so that has certain implications because the rest of the world, I expect, will move to these numbers over the next few years. Does that help answer your question?

MR. HORACE: For now.

MR. COOL: For now.

MR. HODGKINS: Thank you.

Come on up.

MR. KIRK: Scott Kirk, Waste Control Specialists. I'm a little confused when you talk about the values used by the EPA, because Federal Guidance Reports 11 and 12, as you had mentioned, were being updated, are dose based. And so there are those conversion factors, whereas Federal Guidance Report 13, which you also said was being updated, is risk based.

And I could understand if it's risk based why you'd need to understand the cancer rates in the U.S., but if it's a dose base I don't understand that part. So maybe you could clarify. Does my question make sense to you?

MR. COOL: Yes. And I'll try to clarify and then we can see who else might want to add. EPA is looking at both, and the dose coefficient that they calculate will in turn be based on their underlying risk coefficient, and they will translate it back to dose. So they will try to keep those two in alignment.

So there will be slight differences in the dose coefficients with the U.S. population, U.S. cancer incident rates and things, just as there are differences in the risk coefficient. And EPA is the only one that calculates that direct to risk calculation which they use in some of their programs.

MR. HODGKINS: That help?

MR. COOL: That help or --

MR. KIRK: Well, a little bit. I could see --

MR. COOL: -- you have some more questions?

MR. KIRK: I could see so if it was with the tissue-weighting factors that that would be dependent upon cancer rates in a particular country. But I'm still a little bit confused about how they would derive dose conversion factors, but we can talk about that offline. Thank you.

MR. HODGKINS: Do you want to talk about it offline or online?

MR. COOL: We can do either. Unfortunately, I don't have one of my colleagues here from EPA to explain in detail what they refer to as their blue book, their methodology for calculation which will underlie both of these things, which is what they're currently getting ready to put out, I think, by the end of this year.

MR. HODGKINS: Ann, did you want to --

MS. TROXLER: This is Ann Troxler. You all have been talking about most everyone in the world is doing this and all the other countries are doing this. I have a few questions on how they enforce this. Are they structured the way we are? Do they have an NRC that goes around with inspectors to verify that all of these are being complied with? Are they as industrialized as this country is? Is their medicine as good as ours is?

You were asking about why are we the leaders, why are we staying, not doing -- coming forward here. Well, we haven't decided this is the best way yet. What I would like to see is a list of these countries and the statistics on them. I read ICRP three times. This version. And I couldn't find

a list telling me which country has this dose limit and this is their regulatory history. I would like to see that before I make a informed, scientific decision. Thank you.

MR. HODGKINS: Ann, in follow up do you have any answers to your own questions, though, as far as do you have some speculation maybe, observations as far as what you think is going on? Okay.

Anybody else?

(No response.)

MR. HODGKINS: I hate to pick on the guy from Korea, but to Ann's point, can you talk specifically about what you're doing in Korea?

MR. KONG: Okay. Let me explain the situation in Korea. We already adopted ICRP 60 to nuclear infrastructure, and we are planning to adopt ICRP 103 to Korean nuclear infrastructure in 2015 approximately. But actually, the -- we are very exciting about to adopt ICRP 103 to Korean nuclear system, because Korean people are very active to change their rule to a new one. They are very active to adopt this new system. So the old one is -- most Korean people very susceptive; old one is kind of outdated, so we have to -- we have adopt new one.

New one is better than the older ones,

maybe the more precise and more accurate. So we are doing some research about adopting application of ICRP 103 to Korean nuclear industry, not just for nuclear power generation. We are doing some medical section and nuclear industry, like including the radioisotopes. And we don't -- we believe the ICRP and the IAEA is have some powerful technical points, because we don't argue about this some -- argue about some of those coefficients, the number is correct or not.

We are considering that if after application of the ICRP 103 to Korean nuclear system is there any -- the further cost or some burden will be imposed on nuclear industry.

So we did -- we are doing some research for preparation of the ICRP 103 and especially in terms of the numerical values. We do some field tests using the radiation and tissue-weighting test of ICRP 60 and those of ICRP 103, and we get some result.

Even if we apply the ICRP 103 to nuclear industry I think -- we think there is no significant problem or difference, so we are very positive to -- yes, to adopt.

MR. HODGKINS: So the other question was compliance. So do you have an NRC-like organization

that helps with compliance?

Did I say that right, Ann? Okay.

MR. KONG: Yes. We have -- actually, can you ask it --

MR. HODGKINS: The question again?

MR. KONG: Yes, we have a regulatory body, the Korea Institute of -- Korea Nuclear Institute -- Korean Institute of Nuclear Safety, KINS. And actually I came to hear to -- we already adopt ICRP 60, but we use some criteria for licensing using the 10 CFR 50 and Appendix I, so just I want to know the -- what's going on with the regulation. Okay.

MR. HODGKINS: Any other clarification then?

Yes, go ahead.

MR. HUBER: Yes. I'm David Huber. I'm with Baker Hughes. And we are an international well-logging, company so I may be able to answer some of these questions. Any of the countries that are a signatory of the IAEA --

MR. HODGKINS: Just ask you to adjust the microphone, yes.

And can we turn up the microphone? How's the sound for everybody? Should we turn it up a little bit?

Yes, turn it up a little bit because I think some people are having -- I see some people going like this, which I think means, I'd like to hear a little bit better. All right. Go ahead.

MR. HUBER: All right. Any of the countries that are signatories with the IAEA will have an equivalent of the NRC in country. Most of those countries around the world are signatories. You know, off the top of my head I know Trinidad, Iceland, Mauritania are not, but most of them are. And most of their bodies are surprisingly good. Some of them are outstanding. Some of them very much follow the ICRP recommendations. Most of them do. Some of the exceptions I see -- South America is moving towards more risk-based dose assessments. We've got one country that now has a annual dose limit set at 600 millirem. Lot of fun to work in.

MR. HODGKINS: Thank you.

Any comments, questions then for our participant here?

Yes. Come on. Now we're getting the hang of it.

MR. ANDERSON: I'm Jay Poston from M.D. Anderson. Back when I worked for a medical device company we saw all kinds of different requirements in

different countries as far as the regulations. In Europe, once we got our CE mark we could pretty much go anywhere we wanted. Australia was a little more difficult. New Zealand, we didn't have to do anything, really. The doctor asked for it, he got it. So there are a lot of followers in Europe. You know, they follow ICRP, they follow the CE. All we had to do to get our CE mark was go through our own ISO certification with -- I forget who it was. But once we got our ISO certification and our CE mark we could go anywhere in Europe.

And so they are pretty much a following group there. They are kind of all over the place with the control of medical devices all over the world. Some are real difficult. Some are real hard. We never worry about getting to Japan because they're very strict. There is one other country -- I forget which one -- where we had to make a submittal like we would to the NRC for our device before we could go into that device country. And like I said, New Zealand, the doctor wanted it, he got it no questions asked. Pretty straightforward.

MR. HODGKINS: Thank you.

Any other points of clarification questions?

Thanks for your question, Ann. It generated some stuff.

MR. COOL: To elaborate perhaps a little bit more from the perspective that we've had thus far, people have mentioned the International Atomic Energy Agency. There are 163, I think, member states of the International Atomic Energy Agency. The IAEA has a safety requirements document which they call their Basic Safety Standards. It is their Part 20, Part 30 and a few other things all sort of wrapped up in one, the document that has requirements that they believe should be met for controlling radiation and dealing with sources of radiation.

The IAEA updated those Basic Safety Standards and they were published in 1996. They reflected ICRP Publication 60. The IAEA is now in the process of updating their Basic Safety Standards to adopt ICRP Publication 103.

They have, in fact, had a draft that has gone through several rounds of comments by the member states of the IAEA as in the different countries. The U.S. has actively commented on that through our Interagency Steering Committee on Radiation Standards. So it just wasn't NRC comments. There were NRC comments, EPA comments DOE comments and otherwise. In

fact, we reached out and the CRCPD and the OAS contributed to the comments that the U.S. submitted on those drafts.

It's not final yet. But it's in the process of moving to finalization. There's another meeting that will happen in about four weeks in Vienna where that draft may be -- may receive its first of several steps of endorsement.

Now, those standards are mandatory on any country that accepts assistance from the IAEA in their program. The U.S. is not one of those countries. So it's not mandatory on the U.S. that we follow the IAEA standards. But there are a lot of countries that you may deal with if they're in your area that do essentially adopt verbatim the IAEA's requirements. Many of the smaller countries in Latin America, South America and other places will take the IAEA's Basic Safety Standards and draft them essentially verbatim as their national requirements.

In parallel with that the European Union -- the gentleman back here a minute ago mentioned the CE mark -- the European Commission has for quite a number of years had their Directive, which they also call their Basic Safety Standards -- it gets to be a bit confusing sometimes whose Basic Safety Standards

or BSS that you're referring to at any given moment -- and they're in the process of updating their Directive at this moment, also.

In fact, the European Union as an organization has a series of objectives that cover most everything. Now, if a country is a member state of the European Union -- that includes England and France and Germany and I'm not going to try and list just all of them -- they are under an obligation to adopt and transpose -- the word the use -- the European Directive into their national legislation and requirements.

So all of them will be in the process over the next couple of years of transposing into their regulations whatever the updated European Directive is. That's also in draft. Both of those documents are available on web sites in the draft version that they are right now.

Most countries do, in fact, have a regulatory body of some type. For a lot of the very small countries it's a much more simple and small organization than the NRC. It may be one or two people. I'm reflecting on the fact that just a few weeks ago we had the Minister of Hope from Panama and the individual who was a consultant who was trying to

re-establish their radiation protection program in Panama. Those two people were it. And they spent a couple of days with us going over the pieces of the regulatory structure and the process because they wanted to re-establish their organization.

So you have everything from that very simplistic approach to countries -- Germany, France and others -- that have every bit the organization and perhaps then some, depending on how you look at it, that the U.S. has with the NRC. Now, each country will have, I think, its own flavor in the degree to which they are aggressive in their enforcement and specific requirements. But all of them have that regulatory body that's in place.

And when we move to the dose limits discussion in a few minutes I get into where the different countries are. I don't actually have a slide that you'll see there. But I think I can tell you pretty much where different organizations are on the occupational dose limits and the public dose limits.

And I hope perhaps that explanation helps. And I would be glad to answer -- try and answer some other questions on that now if you have them.

MR. HODGKINS: Any other questions,

comments, concerns, amplifications or rhetoric that you'd like to --

Roger?

MR. PEDERSON: Roger Pederson. I work at the Nuclear Regulatory Commission in the Office of Nuclear Reactor Regulation. In partial answer to the gentleman from Korea he mentioned 10 CFR 50 Appendix I. For those of you that aren't familiar with reactor licensing, 10 CFR 50 is the reactor licensing regulation and Appendix I is the effluent design criteria for effluent waste systems.

Appendix I has been identified as one of those areas where we would like to have any conforming changes, if we, in fact, do make changes to Part 20. Two weeks ago in the meeting in Silver Spring there was a third day that was just devoted to talking about a Appendix I. I don't believe this meeting there is a formal discussion scheduled about the potential changes to Appendix I. I'd be happy to talk to you offline about those. And if there's any issues that we need to get on the record I'm sure that we could do that. Any other --

MR. HODGKINS: Thank you.

Any other comments, concerns or questions, amplifications or otherwise?

(No response.)

MR. HODGKINS: Okay. Here's the deal. Occupational dose limits is probably going to be a robust conversation. And we've got about a half-hour to do it. So the question is do we break for lunch now or do we start with the occupational dose limits and then go to lunch. So those are your two choices. Do we start now or we break? Break. All right.

Here's the deal with lunch, though. Couple things. If you go to the hotel the hotel restaurant has a buffet today. So you can get through pretty easily we hope. The last time we gave an hour break it got real difficult because we're sending a mass of people to places that may not be as readily ready to deal with all of you but they need to be. So the other thing is there's some dine-in restaurants, fast foods around here.

There is a list that I can give to folks in the front and they have it at the front desk, too. So if you do have a car and want to travel closely to go to a restaurant here is the list and you're more than welcome to it. What we will do is an hour and a half or an hour and 15.

MR. COOL: Hour and a half.

MR. HODGKINS: Hour and a half. So it's

11:30. So we'll be back in the room at 1:00 to give you time to be able to prepare your questions, your comments, your amplifications and be well fed. Okay? So thank you very much. And we'll break.

(Whereupon, at 11:31 a.m., the meeting was adjourned, to reconvene this same day, 11/8/10 at 1:00 p.m.)

AFTERNOON SESSION

MR. HODGKINS: We ready? As I heard somebody say, You ready for some football. And it's Monday night and the Bengals are playing. So that will be a real treat.

Couple things. Not that this would apply to this group, I'm sure. But the other thing is, you know, if you don't want to stand up on the microphone and talk if you fill out your Marriott cards that are right there and ask your question I'll read it out loud myself, you know, to make it as anonymous or whatever as possible.

Kim, will you get them?

So Kim will collect them. But if you'd rather in a discreet way want to write your question down and have someone reading that's absolutely no problem whatsoever. And, in fact, on our first Washington, D.C. we had a webinar and that's pretty much how we managed that information so as to be as, you know, discreet -- if you want to use that word -- as possible. But by no means am I forcing you to get up on the microphone. Feel free to sit where you are and just ask, because I bet you you all are quite shy, as witnessed by this morning's conversation.

So with that being said, occupational dose

limits.

Don, you want to take it away?

MR. COOL: Okay. So welcome back, everyone. I hope you had a very good lunch, enjoyed the salad and everything, had some of the dessert. What I hope that does mean is that you enjoyed the dessert so much that you're now all going to drift off on me, because the first session of the afternoon is always that dangerous time when people's blood sugar levels have changed a little bit and all that sort of stuff. But we put a topic on here that no one cares about. Ah, they are awake. Okay.

So we're going to talk a little bit about the occupational dose limits, the item which most everyone, I suppose, looks at when they look at what's happened internationally and they look at the United States and they say, Why the difference?

So as we have done with the other sessions, going to give a little bit of background. I'll try to answer a couple of the questions if I can remember them from early on.

And then we can start to engage in the dialogue that gets beyond the just leave it at that. I've already heard that message. Now we can explore it a little bit more deeply, because as I said, my

commissioners are probably not going to be very happy if I write them a staff paper and analysis that says, Everyone said just say no.

So just in case you haven't paid attention to the limits any time lately the occupational exposure limits for NRC set at 5 rem 50 millisievert per year, straight, flat, single number. Those values coming from the recommendations of ICRP in 1977 are based on a radiation risk of one times 10^{-4} per rem: fatal cancer. At that time that's pretty much all that was looked at.

Now, as we talked about earlier, the radiation risk number has changed. It's now five times 10^{-4}. It includes both cancer incidence, as well as mortality. So in one sense the underlying scientific basis has changed, but it changed so long ago that we've all sort of forgotten when the change happened.

But you could argue or it can be argued that the underlying scientific basis changed. The radiation risk went from one times 10^{-4} -- 1.25 technically speaking -- we all know the only significant figure is really in the exponent so I said one -- to five times seven minus four. The dose limit internationally has changed a little bit, and we'll

talk about that in a moment.

Okay. So you have that basic dose. You also have the provision for planned special exposures, which means that you can go in and apply for permission to have an additional five rem of dose per unique circumstance up to a lifetime cap of 25 rem. That has been used very, very, very rarely. And, in fact, I think until I talked with Doris a few weeks ago in Austin, I'd never heard of one that had actually had to have been used. But I found one, so that helped me understand a little bit more that it's out there.

All right. The limit is in total effective dose equivalent from all sources under control of a licensee. All right. Now, I know that there are some specifics here we've played a little bit with because this isn't an exact quote of regulation. But it basically applies to all of the sources. And that would include for the meds and otherwise dose that gets accumulated on your x-ray side of the house for people who are doing both materials uses and x-ray uses. For many of you in the industrial sector, you're using the gamma cameras, and none of that really has any particular concern for you.

Certain kinds of licensees have to report their dose to us a single year: the reactors, radiography. If you're in an Agreement State you're, reporting your information to the Agreement State. Those who are in NRC states report to the NRC.

Hence one of the little issues that the staff has in developing its technical basis, trying to look at what's the experience, what's the distribution of doses, since only about 13 percent of the licensees in the United States in the byproduct materials programs are actually NRCs, we ave a very small database.

We're working with the states to get some understanding, but then there's a whole group of folks who don't actually have to provide their dose records to the regulatory authority. That includes all of the medicals. So there are places within the regulated community where we don't have a lot of information.

So part of what I'm going to be doing today is asking you -- this is the first time I'm asking -- is if you have information I don't want personally-identifiable information but dose distributions: number of individuals in this job category in each of these kinds of dose ranges so we can understand what the dose distribution looks like.

That helps us in developing our technical basis.

So what's all the fuss about? Well, the ICRP recommendation is 10 rem over five years, maximum of five in only one year.

How did they get there? Well, they made the change in 1990. The change was based on a couple of factors. I'm only going to touch a couple of high points. This certainly doesn't have all of the detail.

If you want some nice light reading to help with your insomnia tonight, you could go to ICRP Publication 60, because one of the appendices is about a 30-page long treatise on all of the rationale that was involved in them deciding to change the dose limits.

But first piece of that puzzle was the understanding of radiation risk going from one to five. And they felt like there needed to be some reduction. On the public exposure side it went from 500 millirem to 100 millirem. Now, we're not talking about that at this moment because the NRC knew about that change in recommendation in time to include it in our rulemaking. So we did it.

We didn't know about the change in the recommendation on the occupational side. We were

already done and through the process before that change in recommendation came up. So we couldn't look at it in that previous rulemaking.

Second piece of the puzzle was that in looking at occupational exposure one of the factors that ICRP had in its mind was that it wanted to limit, if you will, the total occupational dose over a working lifetime to about 100 rem. And they were using that risk, 5 percent, in comparison to some of the other industries and things and trying not to be too far out of line in terms of induced risk or accepted risk for working population for some of those other industries.

Now we know that the whole industrial risk profile has changed over time. Being a farmer is much more dangerous than doing some of the other things. That whole profile has changed over time, but that was where some of the underlying basis was, trying to keep occupational exposure over the course of an individual's lifetime -- say they worked for 50 years -- to less than a sievert, or 100 rem. That's how you get to 2 rem per year on average.

ICRP said, Well, there's nothing magical about 2 rem; nothing makes or breaks 1.99 versus 2.00 versus 2.01. So, in fact, to allow some flexibility,

they said the average ought to be that, you can have an averaging period of five years or so, a maximum of 5 in any one year, which was the previous recommendation.

ICRP 103 did not change the recommended occupational dose limit. They didn't change the underlying basis. They said the underlying radiation risk is still about 5 percent per sievert, we're going to leave the limit exactly where it is.

So one of the questions that was raised earlier was, Okay, who's made the change, who has not. The simple answer to the question is the only country that still maintains a single 5 rem limit is the United States. Last I knew, the Mexicans were looking at it. I don't know if they have finalized it. The Canadians have a 10 rem over five years. The International Atomic Energy Agency Basic Safety Standards -- remember I said that that's adopted more or less verbatim by many countries -- 10 rem over five years, maximum of 5 in a year.

The European Union Directives applicable in all of the European countries has been 10 rem over five years, maximum of 5 in any year. The revisions they are doing now, while still offering the opportunity for a bit of flexibility actually hardens

what they would want each country to do to a straight 2 rem, no more averaging.

So if you look around the world you'll see three principal variations on the theme. You see 10 rem over five years where the five years is a rolling average, maximum of five in any year. So one year drops off, one year comes on, keeps rolling around. Some countries have chosen to do 10 rem over five years with a discreet five-year period. 2010, 2014. Started dealing with the next five-year block. Everything starts fresh. A little bit simpler for some of the averaging calculations. Of course, that has different ramifications perhaps to how you would manage some of your people. And some countries have said, The heck with all of this record keeping and everything else, it's just going to be 2 rem per year.

Now, for any of those that have the averaging in place most of them still do have the 5 rem, 50 millisievert per year maximum. So they have some of that flexibility. So if you wanted to list them out by countries that's how you would see them. And I can't tell you exactly which ones. For example, the French are now going to a straight 2 rem limit. So that gives you a bit of idea of what folks are doing out there.

So with that little bit of background, options. Well, first option. No change. I think that's what most of you have sort of started with. And, of course, you can argue very simply, I suppose, Well, it says 10 rem over five years, maximum of 5 in any one year, our limit is set at the maximum that we'd be allowed in one year, five equals five QED. Those who write the equations say, Done. And voila. It's all completed.

Or you could make some modification. You could go to the 10 rem over five years with a maximum of 5 in a year. You could have rolling averages. You could have fixed averages. You could simply have 2 rem per year as a fixed number. Many of you who have been around for a little while remember the time period when it was 5 rem minus 18 and there were NRC Form 4s that went along with NRC Form 5s and you had to have the dose histories and you needed to go back and see where everybody was over the course of time.

And, of course, we all know that everyone was very good in providing all the updated records so that you never had to make the assumption about what somebody had when they came to your facility. There are a few snickers. Okay. I understand that.

That's sort of what you buy into if you go

back to the question of averaging over some period of time. That's why from what I've been told by some of my colleagues in other countries, that's why people went to the straight 2 rem because it was mathematically much simpler and the regulatory organization could grant some exemptions and otherwise if they needed to have some individuals in the transition period.

I think the experience of the French is actually quite interesting, because what I am told that they did was that they started back in '99 or 2000 and said, We want to move to implement just a few recommendations. And so rather than putting it in the regulation they said, Regulatory community, we want you to not have anybody over four. And a year or two later they said over three. And a little while later they said over two. So they didn't actually put the 2 rem per year number in until about three years ago, when it actually was ensconced in the regulation as a requirement.

So they built an extended period of time where there was a lot of the arm twisting to bring down the exposures without it being formally part of regulatory structure. Now, that actually works fairly well when you have a single regulatory organization

and the reactor community is another entity of the French government. So there are some lessons that we can learn from that and there are some things that perhaps don't translate exactly well to the U.S. model of activities. But it indicates how they went an extended period of time looking to an outcome which was having a single limit.

And with that, those are the options. Again, I think we go to the questions afterwards to see if we've covered the points. And I don't expect anyone has anything that they want to add to the discussion. Go for it, folks. Let's go.

MR. HODGKINS: Let's go. Okay. So I'm going to open it up to the panelists first. Audience, just be patient. Once we get through the panelist participation part we'll open it up.

And, Don, as you're pouring your glass of water to take a pause and think, would you mind being first?

MR. SIDES: Don Sides, Stark Testing. One of the questions -- and I've been discussing this with my people for awhile, especially the radiographers -- is this something that they're looking at implementing say, January 1, 2015 or whatever, you're no longer allowed to get more than 2? Or is this something we

can phase in?

MR. HODGKINS: And I think --

MR. COOL: Let's hold up the mirror.

MR. HODGKINS: Yes.

MR. COOL: Because I think we've already talked about the fact that there likely wouldn't be any rule change until at least `14 or '15. The last time NRC revised a regulation there was a several-year implementation period. So the questions are not only should we do it and what should it be and why, but how do you provide for an appropriate transition if you're going to do whatever it is that you're going to do.

And I know that that means that I'm asking you to speculate on the possibilities. But that's, in fact, what we need in order to build a basis for describing the different options. So the answer back is, Okay, what would be an appropriate period of time and could it be done and what would the impacts be if you wanted to do that.

MR. HODGKINS: Back to you, Don.

MR. SIDES: Well, as an industrial licensee our operation's a little bit different than a lot of the local labs in Houston. We don't do chemical plant work, we don't do refineries, we don't chase pipelines. Probably 80 percent of our work's

in-house. A large portion of it's with x-ray tube. Some of it's with selenium. We do have field jobs where people work. But most of these -- our customers actually providing some shielding.

So, yes, it will affect us to some extent because radiographers being what they are, they're radiographers. The big issue's going to be -- and, you know, I hate to bring this up, but, you know, all the old RSOs know this -- you get to a point where the radiographers feel that you're trying to put them out of a job. The film badges are going to get -- they're going to start stashing badges. They're not going to wear them. And there's not a thing we can do about it unless we catch them not wearing their badges. And that's something the regulatory authorities need to think about, because you get to the point where you're getting in these guys' back pocket, they're going to take evasive actions, so to speak.

MR. HODGKINS: So did you kind of vote for your option in that conversation?

MR. SIDES: My personal option is to leave it alone. Just because the Europeans are doing it doesn't necessarily mean we need to do it. We really need to compare apples --

(Applause)

MR. SIDES: We need to compare apples to apples. And currently, as I understand it, most of the European countries have limits on quantities.

Is this not correct, Don?

MR. COOL: I don't know the details. What I have heard is that the activity of many of the sources they use is not the same level of activity that we typically use here in a lot of the portable cameras, the iridiums.

MR. SIDES: We don't buy sources in tens of curies; we buy sources in hundreds of curies. So you have to -- again, you have to compare apples to apples. What works for them in Europe does not necessarily work for the American industry.

MR. HODGKINS: Now, should I open it up a little bit? Or let's just go around first.

Leonard?

Let's go around.

MR. EARLS: This is Leonard Earls. I'm going to pass until we talk about constraints.

MR. HODGKINS: Okay.

Eric?

MR. ROHREN: So I could talk now about the medical perspective or we could leave it at the industry level for now, whatever you prefer.

MR. HODGKINS: Let's go.

MR. ROHREN: So, you know, our situation again is a little bit different, because as far as the occupational exposure, it's our technologists working with the patients who are getting the highest exposure. Radiography, the x-ray technologists generally don't get that high of an exposure because like anything else, they can shield themselves. They can step behind the wall, push the button. You know, they can be very careful and minimize their dose.

The major exposure comes from our nuclear medicine technologists, who are faced with a radioactive patient in front of them and patients don't always obey the rules. They have chest pain. They have nausea. You know, they need somebody to take care of them and our technologists need to be the ones to go in there and interface with that patient. And depending on the intensity of that encounter, it can result in a fairly substantial exposure to that technologist.

You know, I overall don't have a problem with the 2 rem per year as we look at our numbers and our radiation safety officers here. You know, we're generally below that limit except under extenuating circumstances. But as with industry, you know, once

you start making that a hard cap you're going to run into all sorts of problems, because occasionally you will have people that are pushing up on that for legitimate reasons.

And what that will involve is hiring more technologists, distributing the dose amongst the people. And it makes the work place less efficient. It increases costs per medical procedure, which is not really what we're going for in today's society.

So I don't see a direct dramatic impact. But it certainly leaves us susceptible and in a much more precarious position down the road again, because we can't predict in a systematic fashion how that exposure is going to stack up over a year's time.

MR. HODGKINS: Thank you, Eric.

Alice?

MS. ROGERS: Alice Rogers. I don't have anything to add right now.

MR. CAMPBELL: Steve Campbell, TC Inspection. 2A, please.

MR. HODGKINS: Why? Go D.

MR. CAMPBELL: Questions will follow, if I'm not mistaken.

MR. HODGKINS: All right.

MS. ANDERSON: Ellen Anderson, Nuclear

Energy Institute. We believe that no change is necessary at this time. We believe, as the NRC does, that 5 rem per year provides adequate protection to the workers. And there is no scientific reason to go from 5 rem per year to 2 rem per year. There is no scientific basis behind that. So at this point we vote for no change.

MR. HODGKINS: Doris?

MS. BRYAN: Doris Bryan. I have a preference to leave it as it is. I have a question and then an impact. The question -- if you did go with the 5 rem per year, 10 rem over five years where would you start your ten year? Would you have to go backwards and look at employee exposures? Or would you start your ten years from the effective date of the rule? And you can answer that later.

My impact would be in working with a lot of my clients they have a problem getting workers to work around these gauges and in radiation areas anyway, particularly -- and a lot of my clients are union. If you go into a union plant and you change something like this then they're going to have a lot of grief about, Well, why were you exposing me at 5 rem, now you've taken it to 2 rem, you know, am I going to get cancer. It just -- it really becomes

disastrous.

MR. HODGKINS: Hey, Doris, with your question can I turn it around and ask you the same question in kind of the format of what do you think the ten year should be, how would you want to count it?

MS. BRYAN: I would want it counted from the effective date of the rulemaking, because I would have a problem if I had to go back five or six years.

MR. HODGKINS: Okay. And why would you have that problem going back five or six years?

MS. BRYAN: Because I am the person that Don mentioned that has had to institute some planned special exposures, and some of my people did exceed the 5 rem a year.

MR. HODGKINS: Okay. But you see how asking why a few times really helps clarify the position for the audience and for the transcript? So if we can try and do that a little bit more, I appreciate it, Doris.

MR. WANG: Wei-Hsung Wang with COSU. I support no change. Reason is we don't have a sound, solid scientific findings in radiation biology. Also, with 5 rem a year or 2 rem a year in many countries their background is about 1.5 to 2 rem a year. And

the sad thing their country have to evaluate all the people and apply the same rules. And also, with that dose is radiation harmful, harmless or even beneficial? We don't even know. So it's just with the current standard, with 5 rem, I think NRC provide adequate protection to our workers.

MR. HODGKINS: Thank you.

Ann?

MS. TROXLER: Ann Troxler. I totally agree with Dr. Wang.

MR. HODGKINS: John?

MR. MILLER: John Miller. And I would definitely vote for 2A. And the primary reason would be is to one, be able to justify the cost that would be necessary to adhere to a 2 rem per year or a 10 rem over five year regulation.

You know, you mentioned other countries, especially in the EU that are implementing the 2 rem per year. Well, industry gets a little bit more help, especially in France, when it comes to their radiation protection programs. The cost of implementing this type of change is going to fall directly onto industry. And there's -- you know, cost is going to be staggering.

The other reason is that, you know, 5 rem

per year -- we're not talking about changing the doses to the general public here. We're talking about an occupational worker. That worker is trained. They understand the risks associated with their job. They accept those risks. And they're happy to accept those risks because they draw a very good paycheck, you know. And people trying to be pushed out of a job, if it's at 2 rem, I mean, that's going to be a concern.

And then the other comment I wanted to make -- and, Don, you mentioned that, you know, the U.S. is the only country that has a limit at 5 rem per year. I'd be curious to know -- and I'm sure the IAEA has studies or statistics out there -- but I'd like to see what the average occupational worker dose is amongst countries.

Just because we have a 5 rem per year dose as our limit doesn't mean that our workers get more exposure than a country that has 2 rem per year. We run a very, very tight radiation protection program. We are very good at understanding what a worker's going to get in a year based on their job. And we do whatever we can to make sure that we stay within that goal. And we keep our goals below 2 rem. Sometimes a person might get, you know, 2.1 rem in a year. Is that bad? You know, I would argue that it's not.

That's all I have.

MR. HODGKINS: Thank you.

Toby?

MR. HEAD: Toby Head, H&H X-Ray. I agree with John. Also, I think some of the problems that you're going to run into as far as expenses also is going to be training. You're going to have, especially if you go with 2C, to a 2 R limit per year. If these guys like Don said, don't go to stashing film badges you're going to have an increase in the number of people that you're going to have to hire.

Not only is the training cost going to be effected on that, also you have to worry about your increased controls, as far as TNR, make sure these guys are trustworthy and reliable. That just adds that much more liability, I guess you could say. And -- well, for that reason I vote for no change.

MR. HODGKINS: Thank you, Toby.

Laurie?

MS. McGOWEN: Yes. I want to change it. Laurie McGowen. I vote that we don't change it. One reason is because most of your companies, even though you have 5R -- that's the rule -- most of your companies having R programs, they're keeping them below that, anyway. And they have 3,600, 4,200,

whatever it is. And so when their people start getting close to that then try to change things and do more than they -- whatever they can do to keep them below that. So very few people even reach a 5R per year. But if you put it at 2 R that's 166 MR a month.

And as a old-school radiographer, when they start getting close to that 2 R the badges are coming off. So you spent all these years training them to be safe and why to be safe and ensuring them that 5R a year was a safe working level, just to tell them now that, Oh, now we need to go to 2.

MR. HODGKINS: Mark?

MR. LEDOUX: I'm not going to repeat. But what John Miller and Laurie McGowen -- I agree 100 percent with what they said. I will add, though that a little bit more on to the -- we have -- our admin limit, our corporate admin limit is 50 percent of the legal limits across all the limits. So if you do that and you go to 2 rem then you're -- and you're going to have 1,000 -- or 1,000 millirem that's -- it's going to be pretty tight.

And with the decommissioning and with our processing facilities they take a lot of the waste and a lot of the work from a lot of the nuclear utilities. When we take an process that work that is dose

intensive. That's going to put us in a pretty -- in a bind. And we usually get up around 1,500 millirem, in that range. Little -- we would feel uncomfortable that we're only 500 millirem from the legal limit. So that really puts us in a tough spot. So thank you.

MR. HODGKINS: Susanne?

MS. SAVELY: Susanne Savely from Baylor College of Medicine. We are actually located inside the Texas Medical Center. And we're primarily a research and academic institution. However, we do have some doctors out in the field performing fluoroscopy procedures and things like that. And those are the ones that are up around 2 on occasion. Not a lot of the time. But I don't what we would do if we implemented the 2 rem, although I'm not opposed to it personally. But what sort of administrative controls would we have to put into place to protect them?

And I agree with Laurie and Don in that they would probably, as they approached the limit they would, you know, cease wearing their badges, which would be a real issue, too. So I don't know. What would you do with them? Do you still continue to pay them even though they're not allowed to work? And like you said, I think at some point if you've got the

government involved and they're paying for part of these people's salaries. In other countries that's a little different from how do we handle this administratively here in the United States.

MR. HODGKINS: Okay. Thank you, Susanne.

Tony?

MR. YUNKER: Tony Yunker, Baker Hughes. I'm king of remaining kind of neutral on this because in my experience over the last seven or eight years I have never seen 1 rem per year. So it really makes no difference to us in my division either way.

MR. HODGKINS: Gayle?

MS. G. STATON: Gayle Staton, Acuren Inspection. Well, it definitely makes a difference to us in our industry and the inspection industry, because our guys traditionally get between 2 and 3 rem per year, usually around 2 to 2.5 is the average. And that could go higher if certain situations exist.

For instance, in the busy years when we were rocking and rolling -- and everybody in this industry knows what I'm talking about -- why, those numbers went up considerably. We have never had anyone in our company ever go over 5R in a year's time. I think if you were to tell the radiographers right now that we need to drop it to 2 they're going

to say, Why, all these years I was at 5, am I going to die of cancer now. You know, that's going to create a scare that I don't know if you've even thought about.

Secondly, just to, you know, echo everybody else that has said it, they will take their badge off. Unfortunately, they will. You're talking about their livelihood, the way they support their family. These are people that don't have college degrees. These are people that are blue collar workers. They can go into this industry and with a minimum amount of education can actually make a very, very decent living. And they're not going to give this up for your change.

MR. HODGKINS: Okay. So we went around the table once. How about can now the panelists react to each other's statements. Is there anything you want to amplify, clarify?

Jean, you didn't get a chance.

MS. J. STATON: I apologize for being late. I got warm and fell asleep.

(Laughter)

MS. J. STATON: I am adamantly against going below 5R. I see these guys out there and I can go -- we've got 15 trucks. Actually, more than that counting Houston. But for us to go to every job site

24 hours a day to monitor these people is impossible. So we have to depend on the training, we have to depend on the integrity of the personnel that's out there.

If I'm told -- I go back and tell these guys, Well, it's 2 R a year -- when our guys start getting close we take them out of radiation. If they are working in another field, if they got ultrasonics or Mag or something then we'll put them to work. Or we can put them outside of the 2MR boundary rule, put them to work. But if we don't have that -- and some companies just do radiography -- these guys are out of work. They're not going to wear their film badges. So I'm concerned about their safety.

So then you'll say, Okay, well, that's up to the RSO. We are one person. We cannot be out there. We would have to increase the payroll. We would have to give more people out there more -- give the -- more monitoring out there. We'd have to have much more restrictions, much more paperwork. You --

With the paperwork that we have now it's almost impossible for me to get out there in the field and see what's going on, because when I do, when I'm gone I come back and I'm faced with miles of paperwork, whether it's just calibrations or whatever.

So we really need to leave it where it is so that we can keep our guys working, because if -- the guys are the ones who get out there and do the job. If they don't -- I don't know about everybody else here -- but I'm getting too old to get out there and climb towers. That's it.

MR. HODGKINS: Okay.

Don?

MR. SIDES: Don Sides, Stark Testing. I'm not completely sure of my data but there was a article in Materials Evaluation recently discussing the future of NDE. And they're projecting by 2015 somewhere around 200, 250,000 people short of what we need to do -- need to have now. And that's before any of the major projects come on line like the nukes or anything, because those plants -- those projects swallow up a lot of NDE people. So the answer to, Well, we'll just put more people on, that's not going to work because there's not people out there.

MR. HODGKINS: Yes, Steve?

MR. CAMPBELL: Steve with TC Inspection. On the heels of Don with the anticipated shortage in the industry, believe our government's headed supposedly -- keep hearing on the news -- in a recovery of a recession. And to limit this 2 R,

difficult for small companies to hire, for one. And we're trying to put people back to work in this country. And an interesting stat on Sunday morning's Good Morning America, we could fulfill 200,000 jobs a month for the next ten years and not put a dent in that unemployment rate.

MR. HODGKINS: Okay. Now, we've heard -- well, we haven't heard from the medical industry, as far as, you know, the sense that this would get people out of work. Is there more that the medical folk want to talk about as far as getting folks out of work, if you will, because of this regulation? Just to give another industry's perspective.

Eric?

MR. ROHREN: Yes. I might actually have my colleagues, if they're in the audience, can step up and maybe talk a little bit more about some of the specifics, as far as what our limits are.

MR. HODGKINS: Breaking our rule, huh?

Opening it up to audience discussion.

MR. ROHREN: With permission.

MR. HODGKINS: Okay. We'll be flexible.

MR. POSTON: Okay. I'm Jay Poston from M.D. Anderson Cancer Center. The radiographers aren't the only ones that will quit wearing their badges.

Most of our interventional radiologists would quit wearing their badges. They're always bumping up against the 2 rem or higher. So that's going to be a problem.

It's going to be a problem for patient care. It's going to be a problem with them not wearing their badges. I have enough trouble keeping track of the 2,400 badges I give out every quarter. I can't chase these people. So it is a problem for the radiologists. Could be a problem for the technologists in nuclear medicine PET.

And to jump ahead, you know, if we do this and then we change the pregnancy limits we're really going to be bumping up into some problems there in the PET nuclear medicine areas.

MR. HODGKINS: You did jump ahead, too.

MR. POSTON: I'm sorry.

MR. HODGKINS: It's okay. No, you're not.

Okay. Panelists, any other reaction, comments?

Oh, Mark?

MR. LEDOUX: Mark Ledoux. Another thing to consider is as far as dose goes around, at least being a health physicist, a lot of the dose is the health physics technicians or a lot of the health

physics technicians. Right now there's a really big shortage on HP techs in the nuclear power industry and in the Department of Energy. So if you have less people to spread the dose around, it means the dose has got to go up. I mean -- and it's well within the regulations now. But this is another area where you don't really have the people to -- that need to do those kind of jobs. So --

MR. HODGKINS: Okay.

John and then Jean.

MR. MILLER: Yes. I don't disagree that there would be occupational workers that may not wear their badges to maintain their positions. But, you know, that's not the right argument to use to justify, you know, maintaining the limit at 5 rem per year. I mean, we just have to step back and think how much is this going to cost and what is it going to gain, you know. I mean, to say that somebody's not going to wear their badge or regulator would just pound on the licensee to make sure that their radiation program's more robust. So to me that's a poor argument to convince the regulator to maintain 5 rem per year.

MR. HODGKINS: Jean?

MS. J. STATON: I think if going about saying that they're not going to wear the film badge

it's going to affect their health, because they're not going to care how much they pick up because they're not wearing their badge. I might catch a couple every once in awhile. Mine now are so scared of me they do -- they call me at 2:00 in the morning if there's a problem. That's what I want. That's exactly what I want.

But if it gets -- if they start leaving their badge knowing that, you know, Hey, she's over in Beaumont, I can do this up in Kingsville, okay, well, it's not going to hurt anything, you know, you can't feel it, see it, touch it, that's a bunch of bull, that's government policy, they just regulate us to death -- I'm afraid lowering it is not just going to take them from not using their film badge, but they're just not going to care anymore.

Because then they're going to have to get out of the business if they receive an over exposure if they do wear their badge. And if they receive over a 2 -- say they pick up 2,500 MR, okay, then they're out of the business. If you're a small company, you don't have anything else but radiography, we have to lay that person off. Lay that person off. All right. Who pays for unemployment insurance? So it's going to affect everybody money-wise. It's going to affect

the individual. I just think it's the wrong step to go to.

MR. HODGKINS: Thanks, Jean.

John Head kind of pointed out -- and one of the phrases we use -- or Don had spent a lot of time the last time saying, So you're writing this recommendation.

And, John, you were saying that, Well, gee, I wouldn't open the paragraph off with nobody will wear their badges.

Do you guys feel like or can you as panelists start writing that letter for Don to justify one of those three areas that you just heard? So what he should say is or what he should write is? One?

MR. MILLER: I'd say you have no technical or safety basis to incur the cost to change the regulation. It's bottom line.

MR. HODGKINS: Anybody else want to add to that?

Yes, Don.

MR. SIDES: Don Sides, Stark. In deference to John, he is right that the guys are not going to wear their film badges, it's not a legitimate argument. It's never meant to be a legitimate argument. It's a statement of fact. You know, I've

been a radiographer 40 years. I know some guys been in here a long time. But again, there is no technical, there's no scientific basis to justify lowering the limit to 2 rem. I mean, just because somebody else does it is no real reason why we should.

MR. HODGKINS: Okay. Anybody else want to help write?

Yes, Ann.

MS. TROXLER: My question is -- oh, Ann Troxler. My question is nobody has mentioned so far risk versus benefit. I've seen risk up there a lot. But what is the benefit as opposed to this risk? I think that has to be the licensee's decision because they're the one funding all of this.

MR. HODGKINS: So, Ann, can we ask the licensee does anybody see any benefit in this? As a licensee, do you see a benefit?

MS. TROXLER: Please ask them.

MR. HODGKINS: Right. Ask them.

MS. TROXLER: Okay.

Does anyone see a benefit in anything other than 2A?

MR. SIDES: Don Sides, Stark. Absolutely no benefit. Our licensing costs have increased tremendously over the last 20 years. Sources -- the

prices of sources have quadrupled probably in the last ten or 12 years. There is no financial incentive to get into this business to start with. If you have the money that it takes to get into the NDE business and you actually spend that money getting into this business I suggest you see a psychologist.

(Laughter)

MR. HODGKINS: Is that the answer you were looking for, See a psychologist, Ann?

Anybody else?

(No response.)

MR. HODGKINS: Anybody else?

(No response.)

MR. HODGKINS: Okay. You getting the drift? I mean, let's go deep here. Let's really talk --

Leonard?

MR. EARLS: This is Leonard Earls. I will make a comment. The hypothetical benefit is not for any company. It's the benefit of the worker and his overall health, assuming that the objective here is to maintain his working lifetime dose below 100 rem total.

That assumes, I guess, you start at age 20 and retire or quit or whatever at age 70. Very few

people do that in the same occupation, first of all. Yearly we change workforces quite a bit in this country. And it's becoming more and more prevalent.

The -- there will be no financial benefit to anyone that I can think of by changing the limit. There -- financial -- if you're talking benefit and you see dollar signs that will not happen with the change to this regulation.

MR. MILLER: Shielding manufacturers might do pretty good.

MR. HODGKINS: Say again?

MR. MILLER: I said your shielding manufacturers might do pretty good. Consultants to help you get your dose down.

MR. HODGKINS: Anybody else then?

(No response.)

MR. HODGKINS: How about can we now open it up the audience?

If you haven't heard your perspective said or you want to amplify, magnify, change please feel free to speak up at this point.

Excellent. Use both microphones, you guys so you can follow.

MR. HUBER: Again, I'm speaking from a well logging perspective. But after 35 --

MR. HODGKINS: Wait. You got to say your name first.

MR. HUBER: Oh. I'm sorry. David Huber, Baker Hughes. Speaking from a well logging perspective and 35 years in the business, I can remember 15 years ago when 3, 4, 5 rem per year was not uncommon.

In the past 15 years we've increased the size of our sources, increased our activity. And we have reduced our dose significantly to the point now we're doing ALARA investigations at 200 millirem per quarter. So it says a lot about just policing, dinging on people about work habits, you know, some engineering improvements. But, you know, we did it. It can be done.

MR. HODGKINS: Okay. Thank you.

Let's go over to this microphone next.

MR,. HEYER: My name is Ralph Heyer with Thermo Fisher Scientific, formerly Texas Nuclear. We tend to look at this 5 rem as a terrible number for some reason, a number that needs to be attacked and either reduced. I look at the perspective that I would say 90 percent of our customers aren't even getting anywhere near a fraction of that. I dare say, 20 millirem as industrial gauge users.

We, as a manufacturer distributor, have technicians, health physics technicians, again, occupationally exposed workers who received this quote unquote training. We tend to forget they're trained. They're -- and they're getting close to 3, 4 rem. And it's not because of lack of policy procedural, it's business is good. There's a lot of work that's out there. So now you want to drop that number. So what's the recourse? We hire new people? Hey, that's great, the economy is going up. But where's the cost savings and that aspect?

So I'm inclined to say really, no change. It ain't broke. Let's look at it from the perspective of the applications. I mean, we have, you know, source of special nuclear and byproduct material licenses. Each cannot be treated alike. Each are unique in their way. And yet the regulations are written for all radioactive material users. Let's use this thing called training and definitely let's go back to risk-based analysis. I mean, this was the basic principles for a lot of things that we've dealt with in the rule changes in the 70s back when I was with the NRC. So, you know, just food for thought.

MR. HODGKINS: Thank you very much.

We move to this microphone.

MR. BANFIELD: Earl Banfield with Team Industrial Services. I guess the first place I'd like to start is with a question. Has the ALARA regulation achieved the expected results? And it's really a question of the regulatory community.

MR. HODGKINS: Can you turn the question --

MR. BANFIELD: Dr. Cool?

MR. HODGKINS: -- around on yourself? Has it worked for you?

MR. BANFIELD: Yes. I believe it has. But statistically, the big picture is has it worked for everybody. In the big picture. Have we reduced the exposures to the workers.

MR. HODGKINS: Ellen would like to take that.

MS. ANDERSON: From the power reactor section, definitely, yes.

MR. HODGKINS: Anybody else want to talk about that?

MS. J. STATON: In industrial radiography the ALARA concept has really helped the extra training, the extra observation. Yes, the ALARA concept is very well received.

MR. HODGKINS: Anybody else want to add to

that?

(No response.)

MR. HODGKINS: Medical?

MR. ROHREN: Eric Rohren. Absolutely. That is a fundamental part of what we do in the medical field, as well.

MR. BANFIELD: So that's actually where we should be driving, to a lower exposure. And we have a regulation and a process in place now that achieves that result. Do we need anything more? We're going in the direction we need to go. With that said, I think the option 2A no change, is appropriate. We're doing -- you know, we're doing what we need to do to get the exposures lower.

MR. HODGKINS: Your turn.

MR. ANDERSON: Lloyd Anderson, High Tech Testing. I also go with 2A as my choice. Several reasons that we've already talked about. One of them is it's not -- hasn't been shown that it's even justifiable to go less than 5 rem a year for health reasons or any other benefit. And also, I don't believe that we should reduce ALARA from 5 rem a year to 2 rem a year just to align ourselves with the international community.

I have some figures that I took from

basically our company here over a five-year period. In 2004 we had ten radiographers. These are full-time radiographers that worked for the full year. And the average dose to those ten was 1.694 rem. But three of those ten were over 2. So we had some that were fairly high. The highest one was 4.242 and the lowest .733 rem. So you can see there's a big variation. Depends on what job you're doing, where you're at, who you're working for, how -- you know, how many hours you're working. There's a lot of factors that go into this that determine what your dose is going to be.

The -- I don't think that you can make one fit work for every industry in the country. Ours is industrial radiography. And industrial radiographers, like it's already been said, once we get to approaching 2 rem a year then they won't wear their badges. So you're not going to get a true assessment of what their actual dose was. So you won't know if it's below 2 rem or not for the year. That's -- you know, that's -- it just won't work.

Already this year -- I'm going to just jump ahead to 2010 -- for the eight months that we have accounted for this year, with 48 full-time radiographers received a dose of 64.47 rem in an eight-month period. Which if you divide that by eight

months gives you a dose of 8.05 rem a month. Take that out. Extrapolate it over a 12-month period gives you a 96.708 rem. Divide that by the 48 radiographers and your average is over 2 rem, 2.015 rem for the year.

Already in eight months we've had 11 exceed 2 rem in the eight-month period, of 48. And I just don't see the benefit of doing this for several reasons that I've already mentioned. And the major one, I would think, would be there's no demonstrable evidence that dropping the dose rate to 2 rem a year will have any benefits, as far as the health or longevity of any of the industrial radiographers.

MR. HODGKINS: Thanks, Lloyd. Appreciate it.

MS. JONES: Lynn Jones with Metco. Like the other industrial radiographers, radiography companies that have spoken, we have similar numbers, as far as our radiographers. And I will send you some exact numbers. But about half of our radiographers would either exceed 2 R in a year or they would get close enough that we would have to remove them from industrial radiography for fear that they would exceed. So my preference by far is 2A.

But I also want to address the issues with

2B. That one is going to be very difficult, because as it is now we do request the exposure histories of everyone that joins our company, going back as many years as we can.

But I will tell you it's rare to even get an exposure report for the current year received back.

So there's just not any way that we're going to get ten years' worth or five years' worth of previous records, so that one is just not one that's going to be able to reasonably be achieved.

And as far as the 2 R, again, we would have so many personnel that would go over. If that is the option that is decided, I'd like to see that phased in sort of in the way that you described, that perhaps with, you know, over a three-year period, it's down one R and then another three or four years it's down another R.

You know, the industry is changing and there is different developments that we have that have reduced the exposure for personnel. And over a long, ten, 15-year period I think we could achieve 2 R. But I don't think today that industrial radiography could achieve 2 R. Thank you.

MR. HODGKINS: Thank you very much.

Next?

MR. WITTER: My name's Dwight Witter with CAN USA. I think that the film badge issue really becomes a non-issue when you look at radiation dose, because if you're a good RSO, you're tracking that throughout the year. You can tell when they're not wearing their film badges anymore, because their dose drops way down. Their activity stays high but their dose goes way down, so you can track that, so that's a non-issue.

I think one of the bigger issues is if you change to a 2 rem per year limit then how are you going to effectively do that across an entire industry. And the only way I can come up with is you lower the curie strength, keep your crank-out distances for industrial radiography about the same. So you stay with the same size radiation areas and you have lower curies.

If we have lower curies then you can effectively keep your 2 rem. But does that mean the next thing the NRC does is raise that level on iridium 192 sources so now you're talking about a 25-curie source of concern and anything below that you don't have to worry about?

So there are going to be some other things that have to go along with this to help the industry

out rather than just saying, Okay, today we're doing a 2 rem, tomorrow we're going to have to work on the sources of concern, because you're not going to be able to use 100 curie sources anymore.

MR. HODGKINS: Okay.

Next?

Thank you.

MR. COLWELL: Dan Colwell. I'm from Westinghouse Commercial Nuclear Fuel. We're a fuel fabricator in Columbia, South Carolina. I wanted to reiterate that I think the ALARA requirements that we have currently are the effective way to reduce dose.

In our particular case we monitor 700 employees. Currently we're below .8 rem per as a maximum dose. We average about .2 rem. And that's been totally through our focus on ALARA. So my point is whether or not you reduce this -- the annual limit of 5 rem to 2 rem won't have any effect on the way we're managing our doses right now. Just wanted to reiterate that.

MR. HODGKINS: Okay. Thank you.

MR. HART: Tim Hart with the United States Navy. First question I want to ask is if I looked at the amount of work that's done in the United States, the amount of work using radioactive sources done in

the United States and then looked at any other country in the world and compared how much work we do as opposed to how much work they do and then I started looking at -- thinking about well, with -- I've got all these people that are very well trained and I'll put any radiation safety program in the United States against anyone anywhere else and we're not federally subsidized -- well, I am but -- most of the radiographers, most of the moisture density gauge workers that I've worked with, most of the folks that are doing -- pick your poison -- medical, nuclear power, it's not funded by the federal government.

So here we are, we're looking at trying to find a way to basically do one of two things, either reduce our source strength and take a lot longer time to do work, which means I'm going to pay somebody to do work for a lot more and now you're going time and a half or I'm going to take and get me -- we're ahead ten radiographers in my company -- I'm going to have 20.

And now I've got 20 people and that's 20 people that I've got to make sure all are trained to the same level and not make mistakes, because, you know, even the good ones make mistakes. So now I've got twice as many people to police.

And I guess I go back to what everybody else has said. Where are we going with the exposures? At what point does the low level of exposure become so low that we don't have to do anything else? Okay. So the next time becomes -- the next time they do an ICRP 175, in ten years it is 1 rem. Or 500 MR or whatever it might be. And so at what point?

You know, folks, we're our own worst enemy, because now we come and tell everybody out there, Well, it must be really bad stuff because they have to keep knocking the levels down. This is terrible stuff. So I just don't -- I don't know where we're getting any gain from. And so my friend from the NRC would like to hold up the mirror. And here's the mirror.

I'm going to ask you to hold up the mirror. At what juncture does the NRC come out and say -- does anybody think it's a good idea to do this as opposed to telling us, Here's what we're going to propose to do, or, Here's what we've got, let's go do it. It's kind of like we're guilty and now we have to prove we're innocent. With all these regs, every time I see it come out -- and I won't even go to Part 37 -- it's, This is what we want to do, here's our proposal, now you guys tell us why we shouldn't do it. How

about coming to us and telling us why we should do it?

MR. HODGKINS: Well -- hey, back to the microphone. Back to the microphone. So put your NRC hat on. All right? And so what should they come to you with, as far as, you know, your request for doing it?

MR. HART: I personally cannot find a good reason to do it. Navy runs a great ALARA program. Okay. Now, I'll tell you the secret, gang. Our radiographers -- we have not had a radiographer break 100 MR in five years. Okay? Why? Because we got a butt load of our radiographers and we spread them out and we're federally funded. Okay? And it's not a good thing.

The other thing is I can't make an argument for something that seems to tell the public, We have to knock this down because it's bad stuff, because if I said to my friends in the medical community, You better start knocking down that exposure for everybody that you're treating, ever notice how radiation for -- that when you go get treatment for cancer or I get my cardio scan, my thallium cardio scan, it's not bad stuff. That's not bad stuff. But boy, if I go out there with a radiography source it's bad stuff. I can't make the

argument. Okay? All right.

MR. HODGKINS: Question did come in. And I guess I'd say to this person, How would you answer it. But because it's anonymous I want to ask you guys this. How can one tell whether your cancer was caused by exposure to radiation? And so what's the meaning of that question as you -- as it's posed to me, you can't. So --

All right. So does the audience want to answer that? Come on up to the microphone, somebody who'd like to answer that. Come on. Who wants to say something?

(No response.)

MR. HODGKINS: Panelists?

Yes, Leonard.

MR. EARLS: This is Leonard Earls. I'll give it a crack.

MR. HODGKINS: Thank you.

MR. EARLS: The -- you can't tell on a given individual whether that particular cancer was caused by radiation or smoking or little green men. What is usually done is a case study or a controlled study of some sort. Epidemiology, where they say, Okay, we'll -- we look at a population of people, this population was exposed to radiation of a certain

level, this particular part of the population was not, is there any difference in cancer incidence rates and that sort of thing. It's a statistics things.

Given that, the major population that a lot of these numbers come from, of course, is the atomic bomb survivors from Hiroshima and Nagasaki, which some of them are getting pretty old right now. And then there's subsequent data. I think you mentioned Mayak in the USSR, former Soviet Union. And other data. We had a study of shipyard workers. I believe some of that data comes in.

But short answer is for a given individual you cannot tell whether that cancer was caused by radiation. Leukemia is about the best tie I think we have to radiation exposure. There are some data that indicates some change in solid tumor incidence. But it's not a matter of, I've got cancer, I must -- it must be radiation. Don't go there because you can't.

MR. HODGKINS: Okay.

Anybody want to amplify it? Come on up, somebody.

MR. KIRK: Yes. Scott Kirk, Waste Control Specialist. I'd like to amplify on that point. You know, cancer is -- it's a naturally occurring disease. It does occur within our population at a very high

frequency or -- I think about 20, 25 percent of the people in this room are expected to get some sort of cancers, some of which are fatal cancers. But I would even further go on to say that the ICRP also says that radiation, even at high doses, is characterized as a weak carcinogen, meaning that it's not that effective at inducing radiation. And I think that under -- if you look under options 2B --

Don, I think as you had mentioned, the limit -- I mean the recommendation was not to exceed 5 rem in a year and then the 10 rem over a five-year period was really supposed to be a way that you could increment -- or I'm sorry -- enforce that standard because the real threshold would be 100 rem in a lifetime.

So I think when you really look at our population right now, our workers, very few of them would ever exceed a dose of 100 rem. And if 10 rem over a five-year period of time is a way that you could better enforce it maybe it's just a better way that you could explain to the public and our regulated population that we already have standards, if you will, by the way, that we handle our workforce. Nobody exceeds a dose of 100 rem if that is the threshold that you're worried about. Those are my

comments.

MR. HODGKINS: Thanks.

Panelists, amplifications, echos?

Yes, Jean.

MS. J. STATON: I have a question. What could we do to make the -- what about training? We train our guys. But like everybody knows, we can't be out there all the time. But on the training it depends on your RSO. If your RSO knows what he or she is doing, if they're updated on the latest information, if they care. So I would like to see some -- we have to get our license renewed every five years. Okay. So that gives us -- gives the guys a brief refresher of what's going on, yadda yadda yadda.

But what if we had professionals? And I'm not saying because I have friends that's a consultant, I'm a consultant. But I really think somebody other than the owner of the company should give a mandatory class. If we got to take our five years -- take our license every -- renew our license every years why not renew our 40-hour radiation safety course? Yes, that would cost us some money. But wouldn't we be helping? We could eventually get to the 2 R a year.

MR. HODGKINS: Comments, questions, amplifications?

In the back of the room. Come on up.

MR. HOLLIER: Well, I got a question. Gabe Hollier with National Inspection Services. How does the NRC propose to keep track of this -- of this 100 MR or 100 rem per lifetime dose on employees? We can't keep track of it for the last five years. Guys switch, might go six, seven different companies in a year, you know. And you're chasing, you're chasing, you're chasing him trying to establish a dose for the year. How do you guys plan to do that?

And why -- second question is, Why is there such an emphasis by the federal government and the NRC to switch over to a worldwide system when what we have works, when everybody here is taking participation in the ALARA programs and the things we currently have in place and making them work. Why is there such an emphasis to push towards something else that is unnecessary with no medical evidence behind it that suggests that we need to?

MR. HODGKINS: So, Gabe, let's do the questioning for you, too. As far as in your first question, How would you keep track of it, let me ask you how would you see yourself being able to keep track of that.

MR. HOLLIER: We can't do it now. We

can't do it now. I don't know. Is there a radiography company out here that has the entire dose for every employee that has been -- you know, you have some companies. Give an example. You have a guy that's been in business 25 years. Ten of the companies he worked for have gone out of business. So how do you estimate his dose for the whole -- for a lifetime.

MR. HODGKINS: And --

MR. HOLLIER: What I'm asking is how is the NRC preparing to do that. Are they going to -- are you all trying to set up something eventually like the MSTS, where we have a national tracking database on -- you know, that we'll be able to go to and we got to start hiring a bunch of secretaries to start inputting dose every month? I mean, how -- what's the extent of this is my question. What is the extent?

MR. COOL: That's a good question. And there's no good answer, because the first part of the answer I would imagine would be the fact that NRC requires some licensees to report the exposures of their individuals each year.

MR. HOLLIER: Uh-huh.

MR. COOL: Now, because the U.S. is set up with all of the Agreement States that means that while

you, as a radiography company, report your data you're going to report it probably to Texas.

MR. HOLLIER: Yes, Louisiana, Colorado or one of the other --

MR. COOL: Or Louisiana. I've --

MR. HOLLIER: -- license states.

MR. COOL: Wherever you work. Which means that there are 37, 38, 39 or so different places that have bits of the data. If -- for the NRC licensees we have it in a database. No, it's not MSTS. It's called Radiation Exposure Information Reporting System, REIRS. You may have heard of REIRS, what it's called. The only group of licensees for which that is close is probably the power reactors. Fuels might be pretty close, also because you have to report and they're all NRC licensees. So it all comes into the same place.

When you look at just the radiography, you've got 37 states and the NRC so you've got 38 different places. And if by some mechanism we were able to share that, then perhaps you'd get a momentary capture.

One of the questions that has come up, holding up the mirror, is exactly the question you asked, Should we require all licensees to report the

occupational exposure of each of their workers each year?

Then the question would be how would the different regulatory organizations share that so that Texas, Louisiana and Maryland and Virginia and Georgia and Florida and NRC all get together so we could cross-connect them. That would be a second-tier question.

The requirement on the licensee would be very simple. But, of course, that also has implications of -- of course, now, you have that requirement already. The meds don't.

MR. HOLLIER: Well, it's not quite that simple to gather all of that information and send it in to the NRC and to each individual state and what not.

So what I'm saying is by changing something that is currently working, that's currently fine, everybody understands completely, just to be the same as the other countries in the world, which, to be honest with you, most of us in here and most of our employees don't give a hoot what Europe's doing, doesn't care what Mexico's doing or Canada for that matter. I don't care. I'm an American.

And, I mean, why do we want to open up

that can of worms and start adding all of those things that you just mentioned that would probably have to come down the pike to be able to track all this stuff? There's no need for it. This is all unnecessary. So --

MR. COOL: Well, let's hold up the mirror for a second.

MR. HOLLIER: Okay.

MR. COOL: So you're a radiographer. I think you said you were in Louisiana. So you're reporting to Ann.

MR. HOLLIER: Uh-huh.

MR. COOL: And I assume that each year you're reporting the occupational exposure of each of your occupationally exposed workers to Ann. Correct?

MR. HOLLIER: Yes.

MR. COOL: So what would need to change? Maybe Ann and Alice and Don and all of the other people need to do a better of sharing their information. Well, what would need to change from your standpoint?

MR. HOLLIER: Well, when you have multiple licenses it's -- it gets more difficult when you have multiple. You have to report to multiple state agencies for the people that work like -- give an

example, we hold licensees in Florida, we hold licenses in Mississippi, Arkansas, Alabama.

I mean, you got to start reporting or you got to keep track of all that for each one of those areas. So to congloborate all of it at the end and provide that when an employee goes -- say, he gets hired on in Texas -- it gets to be a lot to put in.

MR. COOL: So at the risk of going someplace that I don't want to go, are you actually suggesting --

MR. HODGKINS: But he will.

MR. COOL: -- it would be simpler for you if you just reported it to one place?

MR. HOLLIER: Oh, I don't want to report to the federal government. Believe me. It's hard enough to deal with you guys as it is.

(General laughter)

MR. HOLLIER: So --

MR. HODGKINS: So, Gabe, did -- that was the first question you asked. Wasn't there a second part to it?

MR. HOLLIER: Yes. We got so carried away I forgot what the second question was.

MR. HODGKINS: Take your time. Be patient. And you'll get another opportunity if you

did lose your track.

MR. HOLLIER: Yes.

MR. HODGKINS: Thanks for the courage to stand up, because I think it did represent some people out there.

MR. HOLLIER: Absolutely.

MR. HODGKINS: And for those he represented, come on up to the microphone. Okay?

MR. PEDERSON: Roger Pederson, NRC. Just a little clarification. I heard the question from the previous gentleman. What the NRC was proposing, in terms of 100 rem in a 50-year working lifetime. And I think the answer is we're not. I haven't heard any proposal from the NRC that we're planning to regulate on a lifetime dose where you'd have to keep a lifetime dose history.

I've heard a number of people ask, you know, what the technical basis is for changing the dose limit. I think we're forgetting that early on Don pointed out that the risk factor changed significantly. A number of years ago -- just a little bit of history -- the justification for a 5 rem dose limit was attacked several years ago. And the ICRP came up with a rationale that if you look at the risk of dying of cancer at a 5 rem dose limit, that that's

comparable to the risk of dying from other causes in what is considered other safe industries.

So that's that comparability. That's that -- I'm not sure of the word -- that calibration point, I guess, in terms of how safe is safe enough, in terms of radiation exposure.

Well, after that rationale was put into place then the dosimetry of the survivors from Hiroshima and Nagasaki was looked at and it was determined that the doses that were estimated were way to high. So they recalculated the doses of those individuals which caused the risk factors to go up by a factor of five almost.

So now given that, that the risk factor is five times higher than what you thought it was when the rationale was put into place, the 5 rem a year is safe enough, then that's the basis for changing the dose. That's the basis for why the ICRP went to now a 2 rem per year on average or 100 rem in a lifetime.

So there is some technical basis there. It's not hard science. It's more rationale. And what we're looking for is what the -- you know, what the impacts would be from doing any of these things, whether we should change a 5 rem per year dose limit, whether we should, you know, go to 2 rem per year like

some people did. The purpose of having a 2 rem in a year or a 10 rem over five years is so that when an individual works for an entire lifetime they're not more than 100 rem. That's what -- that's where you get to that 100 rem in a lifetime thing.

MR. HODGKINS: Thank you, Roger.

Anybody else want to -- yes, Mark?

MR. LEDOUX: If the NRC looked at -- I mean, the current rules, including ICRP and so forth, including the radiation protection industry is based off the linear no-threshold model dose response curve, it's my understanding that that is -- I mean, it's conservative and it's prudent but it's by no means conclusive that that is. So what about we looking at that again and going something that maybe is not so onerous and then this would make more sense here? Does that make sense what I'm saying or what I'm asking?

MR. COOL: Okay. That's a good observation. And, in fact, there is an ongoing huge, in terms of dollars, effort looking at trying to further understand effects at low dose.

And I'm going to put that in quotes, because the Department of Energy Low Dose Program -- when you start to analyze what they mean by low dose,

they mean basically anything that's under about 10 rem, because of the way you do the dosimetry and those sorts of things.

So there's a lot of effort that's trying to deduce whether or not you can distinguish effects at lower and lower levels. So the obvious question that I think you've rightly put on the table is, Okay, we don't know what the effect is so we're going to have to make an assumption.

And all of us have our own personal beliefs about whether a linear assumption is exact right, whether it's a sort of quadratic linear component, whether there's any dose rate effectiveness that should be accounted for in low levels of exposure, whether in fact there is some point at which there's a threshold and we really should ignore everything below that, or whether it's super linear and that when it gets to very small levels, if in fact, it has more effect per unit dose, or whether in fact not only does it go through a threshold but whether in fact has a -- the word is hormesis, like a actual positive effect. Okay? All those models are out there.

The state of the science today as I understand it -- and perhaps you'd like to elaborate

where your understanding is -- is that's an area where we don't actually know.

So what ICRP said in their recommendation is what we don't know. So for purposes of a prospective radiation control program. we recommend the linear approach so that you can add things together and have some sort of rational model for setting up a control program.

They actually were kind of careful this time about not saying they believed that that's what the science actually was. And, in fact, if you read some of the words about how they view the use of collective dose and adding up all of the exposures, they say, You shouldn't do that because adding those up and then doing the mathematical calculation to get number of effects is not accurate or appropriate, there's just way too much uncertainty, you can't know so you really shouldn't use collective dose.

So if you look at ICRP, at least as I remember reading it the last time, they are a bit -- I won't say ambivalent -- but they are not firm except that for lack of anything better, constructing a radiation control program on a linear basis is a reasonable and prudent and fairly safe hypothesis. So all that's very nice.

But we're in a range where you can't exactly know. And people continue to do the research. And there will be the ongoing debate back and forth about whether there is a beneficial effect and what level it is and how the regulatory program would work. We don't quite know. So the question has to come back to under those set of circumstances -- because I'm fairly confident it isn't going to be resolved before I get to retire. It is, by the way, a nice single-digit number. And this probably won't be done before I leave, which is okay with me, too. I'm with you on that one. What kind of description should we, the NRC staff, be providing to the Commission as a basis for a policy decision.

So this is where I'm going to do what Dan said I was going to do a little bit ago and say, Okay, I've got to write this paragraph -- a couple paragraphs and a commission paper -- that says, We should not change the dose limit, it should remain at 5 rem per year, that's what the staff recommends.

Now, the paragraph you need to write for me is the explanation which counters what they are being told by various other groups and international folks, some of what Roger just said was, Well, the underlying basis changed and all the other -- all of

that scientific information says it's more risky than when you based your regulations, how can you say that there's no technical basis. What would you write? What would you suggest that we put in that record? This is your chance to write something that the staff would say, Give to the Commission.

MR. HODGKINS: And are the -- any of the panelists want to jump in? Because it looks like we have someone who's volunteering from the audience to start the conversation. You guys okay with that?

Come on to the microphone. And you may start the conversation.

MS. JONES: I'm Cathy Jones. And I have my own consulting company, Service & Compliance. And I consult to nuclear medicine facilities, PET, diagnostic therapeutic nuclear medicine. And there was something that -- I'm writing the paragraph.

We were talking earlier in the session before lunch about everyone didn't want to make a change. And the facilitator made a comment, Aren't we the United States of America, shouldn't we be the leaders rather than the ones sitting back thinking we shouldn't make a change. Why can't making no change be the leadership? Because we don't have good data and we do stupid things when we just jump off a cliff

because everybody else does.

And I work in the medical industry. We don't have a big problem if you said we had to make it, you know, 2 rem rather than 5 rem. We don't have a big problem. Maybe in a few situations we would. But what you're telling the public is that for all -- my whole working life that 5 rem has been okay, even when it was five times whatever into the -- whatever -- we know what it is. But anyway, when we changed that in '94 to just 5 rem per year. But we're telling the public, who's already schizy as heck that that's not safe enough.

And already we have like, if somebody has a cardiac scan, we've got echo techs who don't want to do an echo on this patient because he was injected for a cardiac scan because they're scared to death. Well, I may be pregnant, or, I may be thinking about getting pregnant in the next five years. And we have to do all these staff in-services on why the public dose is okay because so and so doesn't even get anywhere near 5 rem per year and they work with it all the time.

But you're going to scare people even more. And when you scare people you get into liability issues. And when you go to a court of law we may know a whole lot about radiation exposure, but

jurors do not. And when you don't even know if something created a higher chance of that person getting cancer, having a problem with their baby and you have a doctor going to court on this and it could be settled against him -- or usually, he's going to settle outside of court and he's got more liability. We have enough liability.

We shouldn't be doing things when there's all this wishy-washy science. And we should be the leaders. That's why we're the United States of America. We're not in the EU. We are the United States of America. And we're leading. We're saying, No, enough is enough. And that's all.

MR. HODGKINS: Thank you.

(Applause)

MR. HODGKINS: Echo, amplification? We got someone else coming up?

MR. SHARP: Jim Sharp with Sharp Radiation Services. I just want to reiterate what Catherine just said. I think we've lost sight of the fact that often we have questions asked of us, What is safe. And what are we going to tell the public? And we have levels for members of the public. But the thing is, when you're trying to tell someone what is safe about radiation we got to give them an answer. And we say 5

rem a year. So now we're going to change it to 2. What are they going to think now? And like she said, it leads to a lot of complications. That's all I have to say.

MR. HODGKINS: Thank you.

Anybody else, audience? Starting with audience first this time. Risky, I know. But we're going to do it. Come on, you guys. Anybody?

(No response.)

MR. HODGKINS: Panelists then, can you -- Gayle?

MS. G. STATON: Gayle Staton, Acuren Inspection. I would like to echo what the two of them just said but broaden it from the general public to our workers, because, as I said earlier, our guys in the field depend on us, the RSOs of the industry, to keep them safe. And now all of a sudden we drop from 5 to 2. That's a huge drop. And it's going to scare them half to death.

It would me. I've been in the field for many years. And I'm already just listening to you guys talk I'm thinking, huh, wonder how unsafe I've been all these years, even though my exposure to date's not that high. I have been exposed to low-level radiation for many, many years. So I'm starting

to think just listening to you I'm -- already the little cranks are turning and the rust is falling off of them. But, yes, the general public is going to go berserk. But so will our radiation workers.

MR. HODGKINS: How about to close let's go around the room. Okay?

Tony, comment?

MR. YUNKER: No comment at this time.

MR. HODGKINS: Susanne?

MS. SAVELY: No comment.

MR. HODGKINS: Mark?

MR. LEDOUX: Nothing to add.

MR. HODGKINS: Laurie?

MS. McGOWEN: Laurie McGowen. Well, I agree with the last three people. Number one, you know, you set thresholds and then you say we can get so much. And it's like working in a refinery. You say ten parts per million is a safe level. Well, we accepted the risk to work at a safe level. Then five years later you change it to, Oh, no, ten wasn't safe, you got to get five. Well, what about the dummies that have been doing it for 20 years? Oh, well, don't worry about it. It will be all right. It's the new generation we want to save.

(General laughter.)

MS. McGOWEN: So you got to be able to give them a reason. I mean, you can't just drop from 5 to 2. And if you're going to go from 5 to 2, then you're going to have to say everybody that's gotten 5 over the past umpteen years, what could your medical effects be.

I've been a radiographer for 32 years and I haven't reached 100 yet. But now, hell, I'm worried about the 70 or 80 I got.

MR. HODGKINS: Toby?

MR. HEAD: I've got nothing else to add.

MR. HODGKINS: John?

MR. MILLER: I think there were some good points made with the public perception in ALARA. The gentleman from the Navy brought that up initially. And I know our industry as a whole, we bang our head against the wall wondering why we can't convince the general public, like, Nuclear energy and nuclear power is the way to go, and radioactive materials are very beneficial and we can't live without it.

But at the same time we drill down into the people that are working with radiation and radioactive materials that they got to get lower and lower and lower.

And so there's a perception there that,

you know, nothing is safe. And so it's a double-edged sword, the ALARA philosophy. Thanks.

MR. HODGKINS: Ann?

MS. TROXLER: Ann Troxler. No comment.

MR. WANG: Wei-Hsung Wang. I support no change and maintain the annual dose limit because there's no consensus in this radiobiological research in terms of the low-dose radiation versus effect.

MR. HODGKINS: Jean?

MS. J. STATON: Jean Staton, Metco. Where did the 2 R come up? I mean, what was the IAEA's reasoning to go to 2 R? Why?

MR. COOL: The IAEA picked up on the ICRP's recommendation that the average be about 2 for reasons associated with the change in the risk factor and a practical, sort of year-to-year approach in order to have some degree of confidence that a lifetime exposure would not exceed 100 rem. The NCRP actually does it a little bit differently. I'll toss this out and we might want to come back to it after the break. I don't know.

The NCRP in their recommendation from a few years ago, said that an individual's exposure should be limited to one times their age. Again, with the same effect of trying to make sure that over a

lifetime someone wouldn't get over 100 rem. Just to make life a little more complicated for people. That's another point of reference for you. I see you smiling and I'm like, Oh, my. Okay.

MS. J. STATON: Well, you know, like some of the other people have said, that it's going to open up -- it would if it's allowed to change. It would open up a lot of possibly lawsuits. My husband was in the business for -- since he was 17. Yes, that wasn't legal, but it was the 70s and, you know. He died. And he was full of cancer. So does that mean I can come back and say, Oh, well, they let him do too much. It was -- who do I sue? We are a very litigious society.

MR. HODGKINS: Doris?

MS. BRYAN: I think a couple of comments that have not come up, or at least I don't recall their coming up, there are a lot of studies out that show absolutely not provable effects below 10 rem acute. Yet we're talking about chronic doses. And as far as I know and what I've been taught all of my long years, is that they're not accumulative in the body. So what's the problem? It ain't broke, so don't fix it.

MR. HODGKINS: Ellen?

MS. ANDERSON: I have nothing else to add.

MR. HODGKINS: Steve?

MR. CAMPBELL: This guy behind me kind of scares me, that he took --

That's correct.

VOICE: Scares me, too.

MR. CAMPBELL: If you take the factor of history from -- and he mentioned it twice, I think, Hiroshima and Nagasaki. Is there something else we need to know?

(Laughter)

MR. HODGKINS: Any other comment?

MR. CAMPBELL: Well, I mean, that was 60 years ago. Correct? Sixty-plus years ago. And just to throw it out there, I have 30 years in the business and was diagnosed with thyroid cancer six years ago. I got the scar from ear-to-ear to prove it, thanks to M.D. Anderson and the well taken care of staff up there that took care of me. There was no background or anything that says my cancer was associated with my industry actions.

MR. HODGKINS: Alice?

MS. ROGERS: Alice Rogers. Nothing to add.

MR. HODGKINS: Eric?

MR. ROHREN: Just a couple of comments. One, you know, it's just a shame that we can't be more data driven in all this process. The American College of Radiology Society of Nuclear Medicine are starting to put together registries. And we look at patients' medical radiation exposure.

And there's -- patients are becoming more interested. They're coming in and saying, Okay, I've had a heart scan, two PET scans and a handful of CT scans over the last year, you know, how much exposure did I get. Now, it's a little more straightforward for radiographic procedures. But nuclear medicine can be factored in, as well.

Now, you put together a sum like that, talk about public perception, they're going to be over that 5 rem per year limit. You know, we're exposing patients to this amount of radiation on a fairly regular basis. Now, the ACRS&M and others are forming a consortium to start to track these. Now, we've had 50 years of, you know, plus of radiation exposure.

It's a little surprising we don't have more data to say that, you know, given what these regulations are set at, are we seeing any higher incidence of malignancy in this patient population, in this population compared to folks who did not work in

the radiation field. I think going forward whatever changes are adopted by the NRC, part of that should be a tracking system to validate whether these are actually having an impact on the outcome or not.

Just little observation, too. Something doesn't quite add up when you say we're recalculating the risk based on the fact that we thought it was one -- or 5 percent, now it's 1 percent. There's a factor of five difference. And yet the change in regulation from 5 to 2 is only a little more than a half-of-a cut in that. So it's not quite adding up that that, you know, justification is based on those numbers alone.

So it just is reflecting again, number one, there's a lot we don't know about this and we need to get better data on what these exposures mean. And then, number two, you know, thinking about public perception from the medical imaging field when we try to convince the patients that it's in their best interest to undergo these therapeutic and diagnostic procedures, you know, to convince them that we actually --

I mean, I sit there every day and tell them, We don't think we're doing you any harm by subjecting you to this procedure, you know, we stand to gain this benefit by finding out more about your

condition. But that equation changes once that perception is out there that now all of a sudden we don't have confidence in what our values have been up till this point.

MR. HODGKINS: Thank you.

Leonard?

MR. EARLS: This is Leonard Earls. Just to follow up a little bit on the shape of the dose response curve at very low doses. Whether it's linear or super linear involves hormesis. Whatever it is, we know it's very little. Radiation is a weak carcinogen. The issue about whether linear no threshold is the way to do regulations is an argument for a scientific-type discussion.

The issue is it's sort of like how many angels can stand on the head of a pin. You're down in a region where if you try to epidemiology you're going to have to have literally millions of individuals in your study, because the effect -- we know the effect is so low it would be very, very, very difficult to observe. So that -- just keep that in the back of your mind. Is it beneficial? Is it more harmful than we think? Less harmful than we think? Or do we have any thought on the process? So don't worry about low doses. We know that the effect, whatever it is, is

low.

MR. HODGKINS: Don?

MR. SIDES: Don Sides, Stark. It kind of troubles me that scientific community's still relying on data from the Hiroshima and Nagasaki bombs and probably some of the Pacific Island tests. How do you separate the data from the fallout and the actual direct radiation? You can't separate that. So to my limited, uneducated little mind, that's not -- it's not something that you can use for a reliable data source, because you've got several effects. You've got the blast -- you've got the fallout and you've got the direct radiation. How do you separate it?

MR. HODGKINS : Okay. Yes. We're going to take a break. Fifteen minutes. I've got 2:40. So we'll be back in the room 2:55 to continue this conversation. Thank you.

(Whereupon, a short recess was taken.)

MR. HODGKINS: -- our session here with Don helping us go through the option questions. And starting with question 2.1. Is that right?

MR. COOL: Okay. Now, I'm not necessarily expecting that there's going to be a lot of additional discussion. But this is your opportunity to think if there's additional things that you want to provide for

us. The first question was the impact associated with dose histories, things like that for multi-year averaging. And I know that several of you have mentioned and a couple of people mentioned in sidebars on the break how difficult it was to do that, how difficult it is to get dose histories over even the current year, let alone five years, people moving in and out of your organization and other organizations.

And I'm seeing a lot of heads nod up and down. But again, heads nodding up and down don't exactly translate onto the transcript there. So I'd like to verify that briefly with you. If you can validate that. If there's any other questions.

And then to add one little tweak to that as you go around and see if anybody has any thoughts, several of you have touched on well, what you wold really need would be a national registry. And believe me, I am not here to suggest that I really want to go to a national registry. You know? I thankfully don't specifically work with NSTS and some of the other things you're familiar with. I actually tried to get some of those things going before that was started. So I remember the really bad days.

But on the other hand, we do require information to be reported. That gets reported to

ourselves or to Texas or to Louisiana or Colorado or whomever. And so if there are any other thoughts that people want to put on the table to how to look at the regulatory structure in terms of facilitating knowing what your workers are getting, that would be something good to add to the record now.

MR. HODGKINS: Want to go around the room? Anybody want to jump in?

(No response.)

MR. HODGKINS: Nobody wants to jump in. So we'll start with Doris.

Anything you want to add?

MS. BRYAN: Not at this point.

MR. HODGKINS: Should Don rephrase the question?

MS. J. STATON: No. There is going to be -- it's going to be very difficult if you had to send this to the state and the state to the NRC, because you cannot keep track of each individual.

As I said earlier, I'm still trying to get radiation history on people that's started in January and February. I've sent repeated -- so what do I have to do? I have to allot them the minimum -- or the maximum, actually, 417 a month. So you're getting an estimate. You're not getting the real dosage.

MR. WANG: Wei-Hsung Wang. I pass.

MR. HODGKINS: Ann?

MS. TROXLER: Ann Troxler. That was my first, maybe second sticking point on this entire thing. How in the world are you going to keep track of five years of data and enforce with that data? I was hoping you guys would have some idea how that was going to happen, but guess not.

MR. HODGKINS: But do you have an idea how it could happen, how you would track an individual worker, on what ID you would use?

MS. TROXLER: Not a clue.

MR. HODGKINS: Yes. Laurie?

MS. McGOWEN: Laurie McGowen. Well, this didn't come from me. It actually came from somebody in the audience. But since we have nav-lab companies who go by your social security numbers and they have their badge tracking, it would make more sense that they track it instead of the NRC and the Agreement States and that they serve up a web-based or some kind of computer-based program that we can go to and put your social security number in and get your lifetime dose.

MR. HODGKINS: Any agreements with that?

MS. J. STATON: I'm -- Jean Staton. I'm

afraid that's going to start touching on privacy issues, using our social security. We use our social security enough. And now we're giving it to any individual? We've got some very good owners out there, very good RSOs but we also have some very bad ones. And as NRC notices in Texas -- the State of Texas and Louisiana, some of them are not very scrupulous. So we got to be careful how much we use our social security number.

MR. HODGKINS: Anybody else? Yes. Doris?

MS. BRYAN: In addition to that, I have found in relying on the film batch company, when I changed suppliers, they didn't ask for any previous data. So unless I added previous data to what they show on their badge reports, you still wouldn't have a current database.

MR. HODGKINS: Okay. Good.

Anybody else?

(No response.)

MR. HODGKINS: And we're at John.

MR. MILLER: Yes. I would just see that the licensee would have to demonstrate compliance with another regulation. And that's going to cost money. And it's going to require, depending on the size of the licensee, it could be database, it could be hard

copy records.

And I think relying on a dosimetry provider to do that for you, you know, the regulator is still going to cite the licensee for being out of compliance and not the navlab dosimetry provider. So this will all be the responsibility of the licensee to comply with. So there is going to be costs associated with it, and I'm not sure if the NRC has even begun to do a cost estimate on the proposed rule.

MR. HODGKINS: Toby?

MR. HEAD: I've got nothing else to add on that.

MR. HODGKINS: Sorry?

MR. HEAD: I've got nothing else to add.

MR. HODGKINS: Laurie, did you want to say anything more?

MS. McGOWEN: Laurie McGowen. Well, I don't want to go to any one place to keep that. But if we had to go to someplace I'm just picking the film batch people. I don't want the state to do it. I don't want the NRC to do it. And I don't want to do it. But I'm just saying if we have to pick somebody they seem like the most likely person.

We already learned our lesson with NICS. No offense. But we already learned a lesson and we

have to check the data that they input into the computer. So if you made it the -- if you had to have somebody do it, then I think the badge supplier would be the more likely person. If I send it to the state and the state messes it up and sends it to the NRC and they mess it up then that's just, you know, a big mess, just like we have right now.

MR. HODGKINS: Mark?

MR. LEDOUX: Yes. Nothing to add.

MR. HODGKINS: Susanne?

MS. SAVELY: Same here. Nothing to add.

MR. HODGKINS: Tony?

MR. YUNKER: Tony with Baker Hughes. Nothing to add.

MR. HODGKINS: Gayle?

MS. G. STATON: Gayle. I don't have anything to add.

MR. HODGKINS: Don?

MR. SIDES: Don Sides, Stark. Actually, I've got film badge records going back to early '60s, the ones that the cockroaches haven't eaten up since the state won't let me get rid of any of that crap. A lot of those folks are dead, but they won't let me get rid of any of it.

MR. HODGKINS: Leonard?

MR. EARLS: Leonard Earls. The problem with assessing and retaining dose histories in nuclear power, it's not an issue for a given licensee. I know very well what a particular worker has received from my facility. That's easy to record, easy to find.

Where you run into problems is with transient workers that come in from -- you know, work for outages. They may be simple laborers; they may be specialists like steam generator, Eddy Current people, the Westinghouse people. When they come in, they bring their records with them.

But Joe Carpenter that you get to come in and help build scaffolding for an outage, he doesn't have a clue. And trying to keep that for five years starting at any given point, I don't know, he probably doesn't even remember where all he's worked. He may work at a nuclear plant. He may work in a construction facility. He may work at a refinery, whatever. So without the individual being responsible for it, it falls on the licensee because the licensee is the person that's regulated by whatever entity, whether it's the NRC or the state.

MR. HODGKINS: Thank you.

Eric?

MR. ROHREN: I have nothing to add.

MR. HODGKINS: Alice?

MS. ROGERS: Alice Rogers. This look like an inspection's nightmare to me.

MR. HODGKINS: That's it? You don't even want to give us what the nightmare looks like, huh?

Steve?

MR. CAMPBELL: It's Steve with TC Inspection. No comment.

MR. HODGKINS: Ellen?

MS. ANDERSON: Leonard, I'm a little confused. Ellen Anderson from NEI. The industry uses a system. We have a database where we collect dose information from each worker. It's called PADS, Personnel Access Data System. It's -- it was actually developed for security purposes so that when a transient worker went from site to site we could actually monitor where they were and what their security status is. That was upgraded several years ago to include both dose information, training information, respiratory protection information and -- there's one other one and my brain just went blank. Anyways, we do have dose information for workers.

And, Leonard, I hope your guys are putting that information -- that was training information, actually radiation protection training data that can

be placed in there so that when you -- we have workers that go from site-to-site we can actually see what they've been trained on so that we don't have to retrain them.

But we do have a process now. And that actual PAD system is monitored. Actually, it's owned by the industry and Nuclear Energy Institute, who I work for, we actually own that and monitor that for them. We have a consultant that does that.

But there's a cost involved. There's a start up cost and there's a cost, an annual cost that's -- I mean, for some of these larger utilities it's not as -- it doesn't hurt as much. But if you were to get a situation where you had a mom and pop radiography company or whatever that needed to use that it could be very expensive.

So one of the things we do need to know is, you know, if you're going to do something like a national database or whatever, who's going to pay for the initial development and then who's going to pay the annual fee that would have to be done in order to maintain that.

MR. HODGKINS: Thank you.

Leonard, did you want to add, since your name was used several times in that discourse?

MR. EARLS: I've -- this is Leonard again. I'm familiar with PADs. And it's a good system. Of course, it's only as good as the data that gets put into it. And sometimes -- we've had to reverify data sometimes.

The other thing is if you're talking an international worker, we -- like I said, we have had workers from Mexico, we've had workers from Slovenia. They don't necessarily put their data in PADs.

MR. HODGKINS: Ellen?

MS. ANDERSON: He's right. As a matter of fact, the problem there, too is even if you go out to request the data most of the time either you don't get it or you get it after he's already left. So for international reasons, yes, that -- it is very difficult to use PADs.

MR. HODGKINS: Okay. Yes, John?

MR. MILLER: Yes. I'm just curious -- John Miller with International Isotopes. For transient workers -- and you're looking at a five-year period hypothetically here -- you know, you could go for five years and for each individual year you're always in compliance. But then when you do the average you find yourself out of compliance. So how do you cite that violation? And what licensee, as a

transient worker, is responsible? Who gets cited? I mean, that would be a nightmare.

MR. HODGKINS: We didn't want to go there. All right. Can I --

Oh, Ellen, did you want to say something?

MS. ANDERSON: Yes, I do want to say something about that, because the nuclear power industry is also -- we don't really regulate it but we also have something called INPO, the Institute for Nuclear Power Operators. And they've actually -- we've actually had this conversation with them in preparation for a potential 2 rem per year. They actually wanted to go in and require us as part of Excellence, to go to 2 rem per year.

And this has been issue for me, because I know exactly what you're talking about having been a radiation protection manager with a fall outage, a high-dose fall outage. And I'm the guy that could possibly put them over. That's an issue. So what do you do? Do you get hit because you're the last outage that that person has to -- that the person's attending? So even though you may have only give that person say, 100 millirem what about the rest of the dose? And I'm responsible for that? That is an issue.

MR. COOL: Can I clarify something? Because I think, in fact, that issue is in play whether or not you're looking at a multi-year average or even now with just an annual dose. The number's just not as close so you're not running as close to it? Am I correct?

S. ANDERSON: I don't understand your question.

MR. EARLS: This is Leonard. To address Ellen's point, under the current regulations with a 5 rem per year limit -- and that's from all licensees -- if you happen to be the person that pushes them over the number then it's your hit. That's just the way it works. And I -- this would be the same way as far as I could understand. The way this would work.

MR. HODGKINS: Ellen?

MS. ANDERSON: Recognizing the point, too that no utility takes people up to 5 rem per year. We have administrative dose limits. But let me tell you, you don't want to get to -- you want to go above that administrative dose limit because it takes an act of congress and -- at least within your company -- to go above that. And I'll be honest with you, that from a radiation protection manager's perspective it's political suicide to even consider it. So --

MR. COOL: Okay. Thank you.

We'll come back to a number of things about administrative limits and the law and things, because many of you have mentioned that. And that's the last of the topics that are on our agenda. So hold some of those thoughts, because we'll have an opportunity to work our way through some of those.

The second question we've put out there I think you have answered in spades already. But just in case someone doesn't feel like they've had an opportunity to address impacts that you would feel if the dose limit were decreased by one of the mechanisms. Going once, twice --

MR. MILLER: I just want to make another comment on that, because we've heard a number of people get to the microphone and say that they're -- you know, they're well below 2 rem per year already. But that well below takes into account a level of comfort that that company is satisfied with. And so, you know, don't just look at how far below you might be with 2 rem right now. But if it does drop down to 2 rem how far below do you have to be from where you are today to feel comfortable that you're going to maintain compliance with the revised regulation?

MR. HODGKINS: I'm just going to go around

because there was lot of head nods.

Toby, you want to add anything to that?

Laurie?

Mark?

Susanne?

Tony?

Gayle?

MS. G. STATON: Gayle Staton, Acuren Inspection. Something that I would consider if we lowered the rate to 2 R per year, I think Jean alluded to the fact that this industry is a transient industry and we have people jumping ship and moving to the next company. Whoever's got a turnaround going on, I think, is the way it works. And I would be reluctant to hire someone if they were already at, you know, 1.5. I probably would not hire them. So this is going to be an issue in hiring, as well. You know, we'd have to look at their dose, not only long term but short term, too, for the year, as well as for the five-year period.

MR. HODGKINS: Don?

MR. SIDES: Don Sides, Stark. Historically we -- I've had one person in probably 20 years go over. And he did that on purpose because he didn't like the job he was on, he thought he'd get on

a better job. But he did. He got unemployment. But the thing is, is I watch the doses pretty close. I watch them from the beginning of the year. And the further along the year gets, the tighter I watch it. And we don't have a set policy when I will pull your badge.

But currently, with our corporate safety guy we're looking at about 4 rem, I'm going to pull your badge. I'm sorry if you got a wife and 14 kids, if you've got 4 rem and it's September you're not going to make the end of the year, because if you've already got 4 rem before the busy season gets here, sorry, you're out of luck, it's just the way it is.

Because I don't like to deal with the state when I have to call and say, I had somebody go over. It's not a pleasant experience, because they ask a lot of questions and I don't always have the answers. Just, that's the truth -- you know, truth of fact there. So, you know, if you're 4R in September you're probably going to be working for somebody else because I'm going to pull your badge.

MR. HODGKINS: Leonard?

MR. EARLS: Just to summarize impacts, any change in regulation is going to require, as a minimum, revision to procedures, revision to training.

If the dose limit is actually decreased it has a very high potential of causing issues with fall outages in nuclear plants, which around these parts outages are spring and fall. It may have impact on a person's livelihood because of the dose limitations.

You can -- I don't know how you get into this business with right-to-work versus I'm-below-the-limit-but-you-won't- hire-me. So is that a -- can I sue you for a right-to-work kind of issue? Potential litigation issues, that sort of thing. But that's true whether the -- no matter what the dose limit is. But I'd say training, procedures and probably some software revisions of some kind for people that have a lot of records to keep.

MR. HODGKINS: Eric?

And, Alice, did I -- no, I didn't start with you. Alice?

Alice is a hold.

MR. CAMPBELL: Pass at this time.

MR. HODGKINS: Ellen?

MS. ANDERSON: Ellen Anderson, NEI.

Don, I was thinking about the comments that were made about the badges not -- film badges or TLDs not being used. I think that that's an important thing to put in your paragraph. I think that what you

should consider is that is an unintended consequence and that it is real. We heard that here. We heard that last week in Los Angeles. So again, I think that's how I would bucket it, as an unintended consequence.

MR. HODGKINS: Doris?

MS. BRYAN: If the limits ended up being decreased I think that you'd need to put something in there for special situations like we have now. And we may touch on that later. But like the planned special exposure. There should be some exception in the regulations to cover those types of things.

MS. J. STATON: Okay. Lowering the dose doesn't just affect the employee or the company itself. It also is going to go to the fabricators, the customers. It's going to cost them. They're -- we're going to have to have -- redo calculated boundaries. Unless the customer requires an actual 2 MR. We're going to have to always do an actual 2 MR. So that means more time, more shut down time for the public because they can't work where we're at.

And as it is now with the calculated boundary, we can make a smaller boundary and still everybody is safe. We lower it, there's no way. So it's -- the ramifications are going to just keep on

spiraling and it will -- it anticipates -- it acts against everybody, which makes the economy go crazy. We'll be in worse situations than what we are now.

MR. HODGKINS: Wei-Hsung?

MR. WANG: Wei-Hsung Wang. Nothing to add.

MR. HODGKINS: Ann?

MS. TROXLER: I'll pass.

MR. HODGKINS: Okay. You know, two questions just got asked and I never really did open it up to the audience last time. Does the audience want to add anything to the two questions?

(No response.)

MR. HODGKINS: All right. Let's move on. One last one. Isn't there one last question?

MR. COOL: There's a couple more, actually.

MR. HODGKINS: Oh, okay.

MR. COOL: This is where I ask again about dose information. And some of you have talked a little bit about the doses that you're seeing in your organizations. This is more a plea to send me something afterwards than I think you're actually going to be able to tell me, distributions of folks, at the moment. And I'm not looking for personally

identifiable information.

But to the extent that you may have information in your organizations about the kind of distribution of doses, how many individuals in five to four, four to three, three to two, two to one and a half, one and a half to one, some sort of distribution like that to help us understand for different kinds of uses, different kinds of work environments, the kinds of distributions that are actually out there.

Because people ask me the question all the time, So how many people in the United States get over 2 rem, 20 millisievert in a year. Well, don't know exactly. In part, because there's 37 states plus NRC plus a few other odds and ends. So we really don't have that assembly.

But that comes back to haunt me when I need to go to the Commission otherwise and make a case about what the impacts are, because many of you around the room have said that there would be a very significant impact because you have individuals over the 2 rem number. So to the extent that you could help me understand how many, how far, every single year and operational considerations that you might have to go along with that to help us build the record that would be good.

But I'll open it up if anyone has something that you'd like to add to this at this moment.

MR. HODGKINS: So who would be over 2 and kind of why and what that special exception would be. Anybody have any ideas, comments?

Yes, Ann?

MS. TROXLER: I have a comment. Have you taken a look at NCRP 160, where the occupational doses have decreased by .2 percent between the 1980s and 2006 and the consumer doses increased? We're doing a better job but the consumers are getting more medical x-rays, radiation than industry. I think that says a whole lot about -- well, we can't regulate people, the public. We can do better with our medical procedures, bringing those down. But according to NCRP 160 we've decreased in industry.

MR. HODGKINS: So specifically, to the medical folks there are going to be people over 2?

Eric, do you want to address that at all?

MR. ROHREN: Well, there really are no hard and fast regulations on how much radiation a patient can get because it's all being done to treat, diagnose, et cetera. But you're exactly right. You know, the highest, most recent figures are that the

greatest preponderance of radiation exposure to the public is through medical radiation. And that's an issue that obviously is in -- it's in the public eye right now. Something is going to have to be done to address that. But, you know, what we do to address that is multi-factorial and not exactly clear at this point.

MR. HODGKINS: Mark?

MR. LEDOUX: Well, then it's not just someone that's going to exceed 2 rem, it's getting close to it.

MR. HODGKINS: Right.

MR. LEDOUX: Again, because if you're like, 1,500 millirem, which we have people at our processing facility, that's only 500 millirem margin. Just, you know, one thing and you're over. And so there's those kind of issues, also.

MR. COOL: Right. And to re-say what I hope I said -- but I'd have to go back and look at the transcript when it's available in ten days to find out -- yes, it's individuals in the various categories over but also, in various categories coming up to 2 and otherwise. It's important because you're quite correct, the margin that many of you have mentioned, how close you are and the need to make sure that

you're comfortable and in compliance. That information is also very useful.

And just to follow up, because Ann mentioned the NCRP -- the National Council on Radiation Protection -- Measurements Report, which talks about what the exposure is to an average person in the United States. It's mere hypothetical type of individual and the relative percentages. And there is some interesting information there. And, in fact, the NRC staff is working on a contract action with NCRP to go back into the information that they used to develop that to try and pull out some other just dose information if they can from the data they have. That's something else that we're doing in parallel with this to try and find all the data that we can.

So that was a very good thought. Thank you.

MR. HODGKINS: Any other comments, concerns, questions?

Yes, come on up. Your name and then your comment.

MR. HART: If you don't know by now I'm not going to tell you.

MR. HODGKINS: Yes. But our transcriptionist doesn't. So --

MR. HART: Tim Hart with the Navy. I'm sorry to back up here just a little bit. And I'm not being facetious. I don't know what the NRC does with the radiography doses that get sent to them on an annual basis. I mean, I've never seen a product or any piece of information that's come out and said, This is what it was last year, this is what it is this year and we're doing great to reduce exposures. Or, We're doing terrible, or -- can we -- because we're going to start -- I'm going to start sending you more information. And so what are we going to do with it? I mean, that's --

MR. COOL: An excellent question. And some think that is a rightful challenge. We every year have our contractor go through and look at the data, assemble some information on it. For a long time it was actually published. And the reactor stuff was published as a new reg. They do similar analysis for the staff. But they don't end up in nice, cute, little, new reg publications that are available to the public every year, because -- da-da-da-da -- budget cuts and information and what people were finding, in terms of useful things that we put out there.

So the contractor can and does run those data for us whenever we have a specific request within

the database. But there isn't at this moment an annual publication the way there is for the reactor sets of data.

MR. HART: Has there been any thought that perhaps we could alleviate some of the submissions from the field to get rid of that simple, little, annoying thing that one of us spends a couple weeks every year trying to pry out of the hands of a few organizations?

MR. COOL: I'll take that on the record as now we have at least one request to reduce the reporting that you do to go along with the suggestions of some people to increase the reporting so we all know what we've got. No one had actually asked that question that way yet. But, okay. Fair enough.

MR. HART: The other -- I'll provide you with the data point, because I believe if you use this administrative control level thing -- I told you a little bit ago our radiographers don't get over 100 MR in a year. Our administrative control level is 50 MR per year. And do the math by five. And where I would end up if you cut it down to 20. Then it would start getting difficult.

MR. COOL: Okay. As I recall, at that level you'd be starting to press the detection ability

of a film batch on a monthly basis. Once upon a time I actually did real work.

All right. Let's move on --

MR. HODGKINS: Yes. Next?

MR. COOL: -- before I get myself in more trouble.

Because medical types of licensees are one of the groups that don't have to report at all this was a question that was inserted -- and we only have one person here from the medical community -- about the impacts in different kinds of medical uses.

And I will tell you from the other couple of meetings that what we have heard is that interventional radiology, interventional cardiology, PET technicians -- that's Positron Emission Tomography technicians preparing the doses coming out of the accelerators -- and some of the multi-modality uses have been identified previously as places where they push or exceed the 2 rem per year. And for at least a couple of those they push and maybe exceed the 5 rem per year, depending on how they do the calculation.

But I'll look at Eric and see if he would like to add to that and whether anyone else in the audience from M. D. Anderson and some of the other

folks would like to elaborate on that for us.

MR. ROHREN: Yes. The -- Eric Rohren, M.D. Anderson and Society of Nuclear Medicine. The groups you named are indeed the ones that generally have the highest radiation exposure, the interventional fluoroscopy folks, the interventional radiologists and cardiologists and those involved in positron emission tomography. At least for the former group you can do some with shielding. So lead aprons and thyroid shields and things like that will assist with the radiation exposure.

Nuclear medicine and positron emission tomography in particular, unfortunately, the intensity of radiation, the energy levels of the protons are high enough that there really is no portable shielding solution. So it just comes down to time and distance is the only thing you can really practically do to decrease the radiation exposure.

Where does all this play? Well, obviously, on a day-to-day basis we're focused on what is the need of the patient. So I mentioned before we're not in control of what the patient chooses to do at any particular time.

So from a nuclear medicine perspective, which is my specialty, patient's injected with 10

millicuries of fluorine 18 FTG and immediately starts having chest pain, you know, we don't have the option to say, This patient to say, This patient is highly radioactive, at this point I'm going to step around the corner and put two meters of distance between myself and the patient. You know, whoever is interacting with that patient needs to be right there.

We don't need somebody in the back of their mind thinking, Well, the patient's complaining of chest pain but I'm getting pretty close to my limit, you know, it's probably nothing, I'm going to, you know, just see how they do from peeking my head around the corner of the office. That can't be the first thing in people's mind. It's important that those involved in the medical industry don't feel that hard cap over their head.

From a interventional radiology and cardiology perspective the analogy would be someone in the procedure, something's not going quite right, they realize it's going to take additional time under the fluoroscope, you know, do they keep working or do they throw up their hands and say, you know, This case is a failure, I'm not going to go that extra distance to try to get this patient's problem solved because again, I know that my badge is sitting right here

accumulating the dose that I'm receiving as this procedure goes on.

I don't know why it's the case, you know, which came first, the chicken or the egg. But the 5 rem limit works pretty well. You know, like you said, and our experience at M.D. Anderson is that most people are under a 2 rem limit. But that 5 rem works really well, even for those who are at the upper end. And so most of what we do can be accomplished with a comfortable margin.

And it was said before by other folks, you know, even though we're under the 2 limit if you make the limit 2 all of a sudden everyone starts to get nervous, because it's not that we're, you know, .5 or .3, it's that people might be 1.5, 1.8, things that would trigger an alarm if that limit were 2. So the limits work pretty well in the medical field and give us the flexibility to do what we need to do for our patients.

What works best in the medical filed, actually -- and this was brought up by one of the members in the audience I talked to at the last break -- would be to look at it on a population aggregate to say our goal for the medical field -- and you could break it down by specialty, you could look at everyone

in one group -- is to keep the group at an average exposure level of X amount, recognizing that there are going to be those that because of their expertise, because of their chosen profession, are going to exceed that limit; but not to set that, that that person is going to trigger an alarm and all of a sudden be ineligible to do what they do.

You know, someone might be the most gifted cardiologist in the world. If they happen to exceed their limit on a couple of patients does that mean that they have to stop working for the remainder of the year? Does that mean that they have to take a year off? You know, that's not to the benefit of our patients, either.

So in society we accept that there are certain jobs that have more risk. And I would put that in quotes because it's not even clear that we're dealing with concrete risk in the field of radiation exposure. But we know that certain things that people do have an added risk compared to somebody who sits at a desk and works in an office all day. And we accept that. And sometimes they get paid a little more money. There are ways to compensate for that.

And so from the medical perspective that concept seems to be the one that would fit the best,

is to say, We're aiming to keep everyone as a population within a certain range, recognizing that somebody may or may not peak above that level from time to time.

Now, if you have systematic problems that that same person is consistently high then that may be the time to raise a flag and say, Are there things we can do to correct this, and look at that as a teachable event and ways to correct that particular deficiency. But that's really what the ALARA concept is. And in general, I think we do pretty well. But not having that hard and fast limit that would prevent us from doing what potentially needs to be done for the care of our patients.

MR. HODGKINS: Hey, anybody from the audience medically want to amplify, add to, come on up. And I'm sure there will be somebody over here.

I'm going to pick on you because your head was nodding a lot. Woman in pink, you want to add anything? Yes. Come on up. Good.

MS. JONES: The question is any potential impacts on patient care. And one thing we haven't addressed is cost, which is extremely important right now in patient care. Everybody's worried about costs now. We've government healthcare, what have you.

When I do shielding calculations, if we're talking about lowering to 2 rem per year all of my models for PET are based on restricted exposure 5 rem per year. Okay. I can change my models. You know, somebody's going to come out with a new wheel and I'll do my calculations differently.

But that means more lead. And do you know how expensive lead is? With anything, whether you're talking about adding a fluoro room, whatever, you're talking about more lead in your calculations. And that is an impact on cost and that will impact patient care. And in some institutions, especially -- you know, universities, what have you, that's one thing. But when you get out there into the real life place, little hospitals, little towns do patients get the care that they need? Because the hospital can't afford to put in a PET CT because they can't afford the lead in their walls. That's just another cost that you're adding to the facility who's maybe already at 2 percent above cost and may be either just struggling to make 2 percent profit.

Radiation safety people sometimes don't think about all those people out there in the field the way that they should. And they are limiting people in the field from -- what's wrong with a

healthcare provider making a profit?

What's wrong with your doctor living in the biggest house at the end of the street? I always kind of expected they went to med school so that they could, you know, have a good living. And it's like the medical community has just turned on doctors and turned on anyone making a profit in healthcare. But that is a big limitation on patient care when facilities have to think about cost so much. And lead is getting dadgum expensive.

MR. HODGKINS: Thank you.

MS. NEMETI: Yes. My name is Krisztina Nemeti. I'm actually a nuclear medicine technologist. Well, now I'm in radiation safety, but previously I'm actually in a clinic, or was in the clinical field.

What I just would like to add is my badge reading on a monthly basis were about like, 166, 180 millirem. And why I'm saying that, because I was working actually in a hospital and I was working also in private settings when working for cardiologists.

And why is that important that the 2 millirem per -- I mean, sorry -- 2 rem per year? Because I would exceed greatly that, especially doctors pushing patients like ten a day, and that actually -- again --

I was working in Alabama, as well. Now, I don't want to give away secrets. But what they do is like there are -- of course, you know, the first dose is 10 millicurie, and the higher dose is 30 millicurie. There is actually a -- like, between 10 to 18 millicuries what they could give the patients for the first dose. The second dose we could give actually for 30 to 50 millicuries actually.

Now, when the dose is higher the patient actually -- I mean, when the dose is fresher the patient gets actually higher dose, as well. So we are -- basically, put out a little bit more exposure.

And when the doctor's pushing actually ten patients a day, that is on us actually more, you know, again, exposure. So this is the only thing I just was wanting to say. And, of course, if you do that in the PET, then it's even more, because that's a higher energy.

MR. HODGKINS: Thank you for your perspective. Appreciate it.

Anybody else? Comments?

(No response.)

MR. HODGKINS: We have one more? Okay.

MR. COOL: Okay. We have one more question. Before we go to that I'd like to thank Eric

for some of the things he just said. And I'd like everyone to put in the back of your mind for tomorrow when we get to the last topic, which says dose constraints, which means the whole process of doing ALARA and optimization and that effort, how you might construct what I think you were suggesting about some sort of stated ambition that wasn't the limit but that which gave people a real direction to be going to that was more flexible.

Because that might be part of the discussion that we would have tomorrow. In fact, I think it might be. So file that away. Let that percolate overnight. See if any of the drippings get a little bit concentrated into something that you'd like to share with us then.

I think this last one you have also already touched. And I think we have had at least one view on each side, which is should we try to move to more uniform reporting with all of the implications that you've already talked about. So one last time on that issue.

MR. HODGKINS: Mark?

MR. LEDOUX: Question. You say the NRC. Are you talking if you're an NRC licensee or the NRC even if you're an Agreement State licensee?

MR. COOL: A good question. I -- when I drafted up the question -- Don Cool -- I was thinking an NRC requirement which would be translated in the appropriate way for each of the Agreement States, not that I was thinking, Okay, I'm going to revoke the agreement for 37 states. No, not going there. But whether or not there should be reporting for the classes of licensees that aren't required to tell any of the regulatory authorities what their doses are now.

MR. HODGKINS: Ann is shaking her head no. And now she's shaking her head yes saying that I said no.

So now I'm confused, Ann.

MS. TROXLER: Ann's saying, Don't send all that to me.

MR. HODGKINS: Alice?

MS. ROGERS: Well, I guess I'm curious to understand how this goes with NRC's emphasis on performance-based inspections, where we look at this data when we're at the facility but we don't require them to submit it to us. So that's one question.

And the second one is the Agreement States are not funded in any way by the Nuclear Regulatory Commission. And the Agreement States currently are

broke or more than broke. And so I am a little concerned about how we're going to absorb this additional workload in addition to Part 37 and all those others that we've gotten recently.

MR. COOL: Okay.

MS. ROGERS: You didn't answer my first question.

MR. COOL: Because I'm not necessarily thinking I'm going to add any requirements. I'm looking for views. And I just heard a pretty strong one. That's fine. That's exactly what I was looking for, because literally -- and believe it or not -- I don't have the answer already. I know you don't believe that. And that's okay.

I'll tell one quick little story. We'll finish this off.

MR. HODGKINS: All right.

MR. COOL: Former Chairman of the ICRP, Roger Clarke, in talking about the way that ICRP used to do business, said that they were a bad organization. They decided, they announced and they defended whatever it was that they'd decided. And being a good Britisher, he said that the new approach they were taking was a MUM-type of approach, which was Meet, Understand and Modify.

That's where we are right now. We really don't -- I'm really looking for the things that would lead us towards a direction. Not that I have in the back of my mind already decided and I'm just going to pick and choose which one of you I'm going to quote, because it ain't true.

MR. HODGKINS: All right. Shall we move on then to -- oh, wait a second. I think we have --

MR. COOL: Oh, okay.

MR. HODGKINS: Hold up.

MR. HART: Tim Hart, United States Navy. What are you going to do with it if we report them? I mean, why report it if you're not going to do anything?

MR. COOL: Yes.

MR. HART: There has -- if you want us to report it there had better be something tangible that we're going to see as a result of the report.

MR. COOL: Yes. At the time the question was posed people were asking me, Well, you don't have the report so you can't generate a technical basis; shouldn't you require this information so that you can answer everybody saying, Well, how much did people get and what were the trends over time, as in we can go in and do an analysis, some of the things that you were

talking about. So with that scenario there would be a basis for what you're going to do.

On the other hand, I'm taking some of the discussion here today and certainly reflecting on the discussion in the last couple meetings that people don't necessarily see a lot of value so there's not much cost that would offset that. And so most people have said, Don't go there. But that's just a reflection on generally what we've heard over the last couple of meetings.

MR. HODGKINS: All right. Move on.

MR. COOL: All right. I recognize it's 3:45. And the next topic of discussion, which actually on the agenda would be -- I'd assumed that there was going to be a little more time that we would probably have engaged in this dialogue. There's a set of discussions about special populations. This includes dose to the embryo/fetus of a declared pregnant woman and some of the other questions related about public exposure.

Before I launch into the discussion background, I'm actually going to look towards Dan and ask the question as to whether this group would like to engage in this for awhile today, not likely finish it today or whether you'd prefer to fight the Houston

traffic or whatever it is a little bit earlier and start fresh on this tomorrow morning, because I think we will have enough time to deal with both issues tomorrow.

On the other hand, I'm captive here and I'm perfectly happy to start this dialogue here this afternoon if you would like to.

MR. HODGKINS: Which means we might get out earlier tomorrow, looking ahead a little bit. Action Two is what Ann is saying. Panelists, move on? Leave early?

Audience, leave early? Keep going? Hit the road?

We got two votes. All right.

VOICE: Keep going.

MR. HODGKINS: Keep going? All right.

All those in favor of keeping going, raise your hand.

All those in favor of leaving early, raise your hand.

All right. Well, this is not a vote. We are just trying to get some consensus going, huh, Don?

And I think let's get going. Yes, let's get going.

MR. COOL: Let's just keep going.

MR. HODGKINS: All right. And see how far we get. And I promise we'll be able to pick up where we left off tomorrow.

MR. COOL: Okay. The first of two pieces of this discussion has to do with the requirements for those two, the embryo fetus of the declared pregnant female. Actually, related to occupational exposure. And it's in the occupational exposure section of the regulations. Currently applies to a situation where the woman has formally declared her pregnancy.

Let me say right here and now that there's all sorts of legal precedents association with the woman's right to decide whether or not she's going to declare. And this discussion in no way is intended to open that at all. Okay? Just so that we know what part of the ground rule is.

This is not a question of whether or not we should be making someone declare or any of the other things. That right is well established in law, which goes way beyond radiation and nuclear. Actually goes back to a case that I think had to do with lead acid battery manufacturer a whole bunch of years ago.

So with that out of the road, current NRC regulation says the limit is 500 millirem over the gestation period. Okay. And I'm going to apologize

in advance because one of the slides following says, Per year. And that's a mistake, but I haven't had a chance to go in and change it. 500 millirem over the gestation period.

When the individual declares her pregnancy, then the licensee has to go in, assess the dose that's already been received and control the additional exposures within that total limit for the gestation period. So there is some retrospective analysis that's necessary.

And if there's a situation where the individual has already gotten exposure such that the embryo/fetus has already gotten 500 millirem there is a provision to allow 50 millirem. So you just are not legally required to throw her off the line or off the work or whatever that is. 50 millirem is not very much over the remaining period. But a small allowance to allow some continued work.

The ICRP has stated in general terms the protection should be generally equivalent to that provided to a member of the public. Again, ICRP in my view is actually being pretty careful. They weren't saying that the embryo/fetus was a member of the public. They were simply saying that the level of protection afforded should be generally equivalent to

that that you would provide to a member of the public. So again, trying to stay away from the legal, ethical battle. Let's just set that off to the side.

Having said that, they said, Well, for a nice simple recommendation we now recommend that it should be 100 millirem after the notification of pregnancy. All very nice. Very simple. That has been adopted in a number of countries. But this is not a place where the international implementation has been quite so consistent as yet to date.

We have a variety of folks who do some things. Our friends up in Canada, for example, use 400. At one point they actually told me how they got there but I don't remember at the moment how their little calculation got them to the 400 millirem. So there are a variety of things. The IAEA and the International Basic Safety Standards that's currently being updated uses 100 millirem after the notification or the declaration of pregnancy.

Now, part of the interesting thing about this is that the level of protection afforded actually varies with the ICRP recommendation, depending on when you assume that the individual decides to declare a pregnancy. If they were really working on having a baby and they have finally made it and she declares

the day after she knows this is a much more restrictive kind of control.

If on the other hand, she chooses to wait until month seven or month eight, this is actually a less restrictive control than the way that the current NRC regulation is in place. And there's all sorts of variations in between that, depending on the assumptions that you make about how someone might behave.

So for this portion of it, options. One, leave it exactly where it is now. Continue with 500 millirem -- and this is where the mistake is -- during the gestation period, not a year. Sorry about that. Cross that out in your slides and change it. Don goofed. Or change the regulation to say, 100 after the declaration of pregnancy so you no longer have to do the retrospective analysis, the number lines up, it looks nicer, safe for all, that sort of thing. Or as someone suggested and which no one to date has liked, pick some other number like the 50 millirem that is allowed if they've already exceeded a 500 millirem number.

So there are a couple of different flavors here, and there are some pros and cons in view of the level of protection afforded, the level of effort that

you have to go through, the perception that someone has looking at the numeric values. And with that then, I open it up for discussion on this --

MR. HODGKINS: Okay.

MR. COOL: -- first issue.

MR. HODGKINS: A, B or C.

And Gayle --

MR. COOL: And Y.

MR. HODGKINS: -- can we start with you this time?

MS. G. STATON: You can start with me, yes.

MR. HODGKINS: Okay.

MS. G. STATON: But I'm not ready to answer yet. So I pass.

MR. HODGKINS: Okay.

Tony?

MR. YUNKER: Being in the oil field, I'm going to pass this one up right now.

MR. HODGKINS: Mark?

MR. LEDOUX: This is a tough one. And I'm not sure. We could go either way. I mean, it makes sense to reduce the dose for what you're dealing with. But we're not sure that we believe there's a scientific evidence, really when you're talking the

difference there, enough of a difference to go that route. So I'll leave it at that.

MR. HODGKINS: Laurie?

MS. McGOWEN: Laurie McGowen. I like A and B. A is 500 MR if I declare. You know, once I declare it, you have to go backwards. And B, I might not declare till I'm nine months into it, so I don't know.

MR. HODGKINS: Toby?

MR. HEAD: I'll pass.

MR. HODGKINS: John?

MR. MILLER: I'd have to agree with Mark. This is a -- this, to me, is a very difficult one. And, Don, I think it's very difficult to divorce the legality and the dose when you're trying to make this decision, you know, because you are looking at somebody's right-to-work. How they're going to make that declaration, I -- you know, I'm throwing my hands up in the air right now. This is a tough one.

MR. HODGKINS: Ann, you going to shed any light for him?

MS. TROXLER: No. I'm going to pass.

MR. HODGKINS: Wei-Hsung?

MR. WANG: Wei-Hsung Wang. I'm going to say something. I support no change since we're not

going to talk about any gender or religious issue, so let's just stick with science.

I think the tissue-weighting factor for the gonad system in ICRP 60 was .02, and 106 was .08. By reducing the tissue-weighting factor, that implies a radiosensitivity for the reproductive system was not as high as we expect.

Then why do we need to reduce the dose limit to the embryo/fetus? And based on my interpretation I still consider embryo or fetus as an organ. So that's why you have this tissue-weighting factor there. So that's just my opinion.

MR. HODGKINS: Okay.

MR. COOL: Let me come back and reflect just a little bit on that, because it may be a difference in our understanding of some of the organs and the weighting factors.

My understanding of what ICRP was doing was looking at principally the genetic susceptibility associated with exposure of sperm or the egg in the ovaries or the testes as part of that weighting factor, which would be very different from the degree to which an abnormality might be induced associated with exposure of the developing embryo/fetus.

So I sort of saw them as two different

effects that they were trying to cover, but I'd welcome some back and forth on that.

MR. WANG: Well, I'm still thinking that's based on the aspect of the germ cells, so --

MR. HODGKINS: You need to get --

MR. COOL: A little bit closer.

MR. WANG: Okay. I'm still looking at this from a germ cell point of view. So we still want to -- I still want to apply for this loss of treatment, though, which is highly dividing cell are more radiosensitive, and radiosensitivity is inversely proportional to the cell maturity.

So if we reduce the tissue-weighting factor for the reproductive system, shouldn't that same idea apply to a fetus or the embryo?

MR. HODGKINS: Okay.

Mark, did you want to add anything?

MR. LEDOUX: Well, I was just going to basically agree with what Don was saying. I don't see the -- I see one heritable, you know, and one being you've got a fetus with fast-growing multiplying mitosis cell, you know, development and much more susceptible to radiation. I don't see the two being equivalent.

MR. HODGKINS: Okay.

Any other point of clarification then on that point?

Jean?

MS. J. STATON: I like both A and B myself. But we've got to remember that the woman has to declare voluntarily when she's pregnant. So either one is really not going to affect her. It's when -- it's up to the woman to say, Oh, I'm pregnant.

MR. HODGKINS: Doris?

MS. BRYAN: I have always had a problem with this regulation ever since it came out. I could not understand why we -- even though she's occupationally exposed, why were allowing 500 millirem to an embryo/fetus and only 100 millirem to members of the public. I don't understand the correlation there. As far as my company, it would make no difference whatsoever whichever way that went.

MR. HODGKINS: Ellen?

MS. ANDERSON: Although we have obviously, less women in the nuclear power industry than we do men, although that number is growing pretty quickly, we really see no -- would request no change in this regulation. We haven't seen any scientific basis for changing it at this time. And, you know, knowing the fact that if you look at 3B and the fact

that it could be, depending on when the woman declares, she could actually get more radiation, then, you know, than 500 millirem. So we really believe that no change is necessary at this time.

The other issue, of course, has to do with the fact of declaration of pregnancy. And there are a number of women who do not declare their pregnancy and don't -- do not afford the protection from the regulation. And we see that if, in fact, there are -- if we go to the 100 millirem that we may, in fact, see more women decide to not declare because again, looking at the number of women in the workforce, the number of single moms today, they can't afford to go ahead and, you know, the 100 millirem versus 500. So no change.

MR. HODGKINS: Steve?

MR. CAMPBELL: No comment.

MR. HODGKINS: Alice?

MS. ROGERS: Alice Rogers. No comment.

MR. HODGKINS: Eric?

MR. ROHREN: Eric Rohren. We've had a number of pregnancies in the nuclear medicine department over the last several years, somewhere in the order of seven or eight or so. And all of those women, obviously have been extra badged with the badge

at the waist and carefully monitored their radiation exposure. All of them were uncomplicated pregnancies, lovely children, no complications whatsoever.

You can look at that one of two ways. You can either find that reassuring that we're doing things the safe way or you can conclude that the incidence with which we would be expecting any adverse reaction or adverse outcome is low enough that we're just not going to be able to detect that. It may be that latter. But again, I think it's important to keep in mind that whatever adverse outcome we would be talking about, it's such a low incidence compared to the baseline incidence of birth defects and other abnormalities in a woman's pregnancy.

It's like with cancer. There's a certain amount of statistical noise at the bottom of the curve, and we're looking at very small numbers of added events, whether it's cancer in the working population, whether it's birth defects or miscarriages in the pregnancy.

It can become very difficult to determine what's cause and effect versus what's a little blip in the statistics.

So we've carefully monitored those. We have the numbers. I don't have those on the top of my

head to say what those exact exposures were, but we do carefully monitor and haven't seen any adverse changes. So I would think no change for that.

MR. HODGKINS: Would you be willing to share that with us at some point afterwards, the kind of exposures you would typically see?

MR. LEDOUX: I believe we would. I don't own that data. But we could certainly try to get that to you.

MR. HODGKINS: Leonard?

MR. EARLS: Leonard Earls. Pass.

MR. HODGKINS: Don?

MR. SIDES: Don Sides. Pass.

MR. HODGKINS: Any additional comments from the panelists? Yes.

MR. WANG: Wei-Hsung Wang. Just one quick comment. What is the lower limit detection if we go down to 100 millirem with a monthly badge if we use lendar badge?

MR. COOL: That's a good question. And it's actually a question that has been raised in at least one of the other meetings. If an individual chose to declare her pregnancy early on, such that you were looking at seven or eight months, with film badges, as I understand it now, with a detection level

at about 10 millirem, someone with dosimetry processing people can probably give much more accuracy -- you are getting down very close to the bottom edge between the minimals, as in undetectable difference in the badge and some discernible number. That is correct.

MR. HODGKINS: Yes?

MR. HUBER: Dave Huber with Baker Hughes. Just wanted to mention that there is new technology out. For our pregnant worker program we use a badge that reads at 1 millirem per month.

MR. HODGKINS: Okay.

MR. HUBER: And also like to say I'd like to see implementation of 3B. It makes things nice and simple. It's always the woman's choice once she declares her pregnancy. That's the point where I can control her dose.

MR. HODGKINS: Thank you.

MS. HUTCHINSON: Hi. Enjonli Hutchinson, University of Houston. I'm one of the safety officers there in radiation safety. And as a pregnant radiation worker I think I have a little bit more perspective on input for this.

I support -- I think like a lot of the other women here, I think 3A or 3B is okay with me.

Only because with 3A, even though I know that I'm allotted the .5 rem for the entire, you know, gestation period, doesn't mean that I'm going to allow myself to get to that point. I was already taking precautions before and now I'm extra special careful with everything I do, making sure that I use proper shielding and, you know, things that I was doing before. But probably more now to the point of being anal retentive with what I'm doing, because I think, you know, as a pregnant woman, I think that that type of instinct, that responsible instinct comes into play.

So if it was lowered to 100 millirem for me, personally it wouldn't be an issue. I've never been close to 100 millirem. I've worked with radiation for seven years now and my, you know, lifetime exposure is probably less than 20. So I've never even been close to it. And that's working with both radioactive material, open sources, sealed sources and x-ray equipment.

So I think either one would be fine. But like you stated, also 100 millirem would kind of just make it nice and easy. But going on that point if you -- we did lower it to 100 millirem I think that that would cause a problem, as far as women voluntarily

declaring. I declared early on because I was extremely excited and wanted to tell everybody.

But, you know, a lot of women, I think, come to the point of feeling that there might be some discriminatory action, as far as where their work is concerned, because then it becomes a point of, Okay, where am I going to put them and now I've lost a worker and I'm losing money on this person and then they're going to go out on maternity leave and the whole bit. So I think that might be an issue.

But even though there's no scientific data, as you stated, for any type of birth defects to go along with, you know, .5 rem exposure to the fetus and there are now lots and lots of lots of notations of radiation workers who have had perfectly healthy babies and have had -- been at that point doesn't mean that we should still put everyone at risk if we don't have to. So even though we're at 500 -- or .5 rem, 500 millirem for the gestation period it doesn't really mean that we still have to let them be towards that or close to that exposure.

MR. HODGKINS: Okay. But can I -- you know, back to the microphone. So what if someone like yourself -- I mean, maybe you work with someone who feels like just the opposite is true --

MS. HUTCHINSON: Uh-huh.

MR. HODGKINS: -- that, you know, you're trying to expose yourself to as little as possible --

MS. HUTCHINSON: Right.

MR. HODGKINS: -- but somebody else says, No, I don't care, none of it's going to harm my fetus --

MS. HUTCHINSON: Right.

MR. HODGKINS: -- how do you deal with that?

MS. HUTCHINSON: I think at that point that goes again to personal responsibility. That's their choice to work with radiation at the same instance that they're working with it to begin with or to even declare. And that goes to personal responsibility. You can't make someone do it. I mean, you can obviously see if someone's pregnant but you can't force them to take the precautions.

But personally, work -- and I've worked with other -- some of the graduate students that I monitor and work with -- because I do our dosimetry program at U of H -- so some of the graduate students that I know are pregnant and have not declared and I kind of just -- you know, I watch their dosimetry levels a little bit closer. I don't tell them

anything. I don't go and tell everybody they're pregnant. But I watch them a little bit closer to make sure they're not exceeding.

And for the most part, the things that we work with particularly are so low level they never really exceed. Maybe -- I think the most I've seen is maybe 5 on any given dosimetry report for deep dose on someone. So with the exception of the x-ray instrumentation workers. Those tend to be a little bit higher.

MR. HODGKINS: So what's de-motivating them to declare?

MS. HUTCHINSON: I think -- well, a lot of the times I think that even though they do the training and they do the refreshers, they just don't ever really either remember to do it or they just don't think about doing it, you know. Or they're working in the laboratories but next to the person working with, you know, the iodine 125 but they're not, you know, physically touching it so they don't feel like they're working with it, even though they're in the exposure range. So they don't declare.

And that goes kind of -- and that's kind of, I guess, a misunderstanding with them. You're still in the area, you're still in the area of the x-

ray instrumentation. Yes, you're not working with it but you're still there in the exposure area. So I think that's a lot of things. They feel like if they're not working with it directly it doesn't affect them.

MR. HODGKINS: Okay. Thanks.

Anybody else from the audience, comments?

(No response.)

MR. HODGKINS: Panelists?

(No response.)

MR. HODGKINS: A, B or C?

(No response.)

MR. HODGKINS: Want to do the questions.

MR. COOL: We'll go ahead and do the questions. I find it interesting that a number of you have said that it probably wouldn't have a direct impact on your activities. And I found it very interesting that several of you said that you sort of like A and you sort of like B sort of for different reasons. I have to admit that I'm trying to figure out how in the world I would write the paragraph that makes a recommendation on this one, given that discussion.

So as I start to ask the questions I'd like to sort of urge you to give me a little bit of

differentiation for this, because in the absence of that, what I think I'm hearing -- and you can validate that, as well -- is that you feel that the level of protection afforded in each of the options is really about the same, they work in different ways but they're accomplishing sort of the same purpose. And so as we go through these questions perhaps we can elaborate a little bit on that.

The first question was significant impacts associated with reducing the limit, including the operational impacts. Had one discussion about some data being available. What do you see in your worker population in terms of the exposures when you've had individuals declare? What have they been running? Has it been a small fraction so it really doesn't matter to you or would it have made a difference in some cases?

And I'll tell you the reason for my basis right up front. In the discussion more than a year ago in one of the medical society meetings, actually, had someone from the nuclear pharmacy community come up to me afterwards and say, You know, the embryo/fetus thing would be a real issue for the pharmacists because they typically run 300, 400 millirem a year and as long as you leave the rule the

way it is they're perfectly happy; if you change the rule then I might have to do something.

Can any of you validate that? Invalidate it, not just in nuclear medicine but in some of your activities?

MR. HODGKINS: Analysts first.

MR. COOL: I'm getting a lot of quirky smiles. But not a lot of words.

MR. EARLS: I'll take a cut at that.

MR. COOL: Okay.

MR. EARLS: It's Leonard Earls. At the South Texas Project I don't see a change having an impact with respect to the declared pregnant woman. Of course, as I said before, any change will involve changes to your program. But we haven't had an issue with running declared pregnant woman up near 500 millirem. Typically, the doses they get are either immeasurable or very low once they've declared.

The only issue might be if they had some dose coming into the time of declaration. Previous. For example, a woman may not know she's pregnant for a month or two. It depends. So but we really haven't had any issues with that. And that's my data. And I'm not speaking for the industry, just the data that we have at South Texas.

MR. COOL: So if I reflect on this question and the number change to 100 post-declaration would that have made it more difficult or it really wouldn't have made a difference?

MR. EARLS: It really wouldn't have made a difference. Logistically, it's simpler for a dosimetry department to say, Okay, today you declared, I'm pulling your dosimeter, I'm giving you a brand new one and you'll wear this for however long your dosimeter's good for, whether a month, a quarter, six months or whatever. It makes it logistically simpler for the dosimetry people.

MS. JONES: I don't mean to be a big mouth. But --

MR. HODGKINS: Start with your name first then.

MS. JONES: Oh. I'm Cathy Jones, Service & Compliance. I've worked with nuclear pharmacy. I sub-contract to them but I actually worked for a nuclear pharmacy for about six years. And it was interesting what you said about the nuclear pharmacists, because the nuclear pharmacies are just anal retentive about the radiation safety programs because they can get in a whole lot of trouble if they have an issue. And the competitor is going to make

sure everybody knows if they have an issue. So that was just kind of odd to me.

But the lady from University of Houston that was talking about being pregnant and the way that you watch yourself, I have a lot of female pharmacist friends and I've been pregnant. And we just -- there's something about a mom and her baby. But then, you know, if she doesn't really care, like you say, you get into all these right-to-work issues.

I don't really see where it makes a difference. I don't know why we need to lower it, because I think a mom, if she cares she's going to be very, very careful about her little baby fetus. I mean, I will even -- I even get anal retentive with my clients, even though I know that the .5 rem during gestation is, I think, decently conservative.

But I understand being anal retentive about your baby. I was, too. But I just don't see it being a big issue. And I don't -- I think that if you lowered it in a lot of work circumstances you might make people less prone to declare. You know, we can get into all that, you know, like you said, the legalities of everything. And I just would be abhorred if I thought somebody didn't declare pregnancy, because I'm thinking about that little

baby. But we can't think about that. We have to think about that lady.

So if she -- and somebody said something about her having perhaps, you know, three more mouths at home to feed. Let's not make it more potential that she's not going to declare pregnancy because we're making that so low. And we don't really have any reason to think that we have a problem at a half-a-millirem during gestation. A good mom's going to take care of her baby. Bad mom's not going to care, not going to declare.

MR. HODGKINS: Thank you.

Anybody else from the audience?

Yes. We have one more comment over here. To the mike. And just say your name first, please.

MR. COLWELL: Dan Colwell from Westinghouse. We have up to about 12 pregnant declarations a year. It would have some impact just because our policy is to relocate them to a different job for that period. And it would just make it much more -- we'd have to watch it much more closely because we can approach 100 millirem for those people. So it wouldn't be an insurmountable problem but it would make it more difficult to manage.

MR. HODGKINS: Thanks, Dan.

Anybody else from the audience?

Come on up.

MR. SCHEELE: Ron Scheele. I'm from Memorial Hermann Health Care System here in town. And I think if I can get back to your part, when a woman declares a pregnancy generally it's at three or four weeks. But there is a period before that where a woman may not know she's pregnant. And there's sort of an all or none effect, because a lot of the people who are pregnant or have conceived will not develop into a pregnancy because conditions aren't perfect. That's something you might be missing there. You may not see those ever.

So that being said, I -- we can live with any of those, I think. But, you know, another thing that I have to do periodically is estimate what the fetal dose is from radiologic procedures. And the best book I think, as far as providing guidance on this, is the book by Lou Wagner. And -- which talks about the radiation of the embryo and the fetus. So you might want to take a look at that, too.

MR. HODGKINS: Thank you.

Roger, you look -- furrowed brow. Steve gets nervous when you get up to the mike.

MR. PEDERSON: I just wanted to share an

opinion that I heard last week at this meeting and maybe solicit some comment, whether they agree or not. The comment that I heard last week was that lowering the dose limit to 100 millirem after declaration would actually give the pregnant mother more control over being able to protect her baby. That in some cases a woman who is pregnant might want to be moved to another job, she doesn't want to be exposed to any more radiation. But the fact that she might not get to 500 millirem is a basis where her employer would say, No, you can't move to a lower-dose job or a no -- a non-radiation exposure job.

Now, I don't know how valid that is. But that was the comment. Does anybody have any experience along those lines?

(No response.)

MR. HODGKINS: Thank you, Roger.

Anybody else?

(No response.)

MR. HODGKINS: On to the next question. You're dying there? Here we go. Try that.

MR. COOL: Okay. My lavaliere mark died. That's probably telling me something. Since it's after 4:00 the microphone is off hours. Sorry about that.

The second question really was trying to get to whether or not you saw any issues that were associated with the record keeping, given that the current requirements make you go back assessed dose, keep track of that versus the ICRP recommendation, which is just post-declaration and whether there were any advantages or disadvantages that you could see from the standpoint of the records and the assessments that you would need to do.

MR. HODGKINS: Record keeping.

(No response.)

MR. HODGKINS: You're not going to make me go around the room, are you?

Eric, did you want to say something? Anybody? Don? Leonard? There you go.

MR. EARLS: I guess I'm a loud mouth. Leonard Earls. This would simplify record keeping once implemented, of course, because at the date of declaration it essentially starts 100 millirem ticker, a clock, if you will that lasts throughout the remainder of the gestation period.

Whether it's worth doing is a whole different question, but it's easier on the radiation protection person actually to try to keep records of this dose. I don't know if that's a good motivation

or not.

MR. HODGKINS: Don, did you want to add anything?

Don, did you want to add anything?

MR. COOL: No. That's sort of the impression that I had gotten. But I was looking to try and validate sort of those views, whether people thought that the having to go back and do those assessments were sufficiently onerous that a different approach would be more preferable. And I'm not hearing that as something that would really drive your selecting of an option. I still am seeing people who are really sort of ambivalent. They go, I could go this way and I could go that way.

MR. HODGKINS: Alice, any nightmares?

MS. ROGERS: This is Alice Rogers. It really sounds like a wash on record keeping and inspecting those records, to me.

MR. HODGKINS: Okay.

Anybody?

Yes. Say your name and then your question.

I just like saying it to him.

MR. HART: Tim Hart, United States Navy. I've kind of looked at your questions ahead of time

here, and I've been trying to find a place to fit this in, because we had a very what I got to believe is pretty unique situation.

We had a woman that was pregnant. She was a radiographer's assistant. Declared. And we did all the right things. And unfortunately, she was about a month and a half from her due date and she miscarried. She took a period of time off. She was off for about ten weeks.

She came back and she was pregnant. And fortunately, she got to talking to some of her coworkers, and it got to her supervisor, and to make a long story short, it ended up that we had her go back in and redeclare. Well, one of the problems that we ran into was she says, Well, I shouldn't have to redeclare because I never undeclared.

And I would ask you that somewhere down the road if we get into this seriously I would really like to see somebody consider putting just some words in there that say -- some consideration about, hey, this is when we assumed that the pregnancy was terminated or over or whatever it might be.

MR. COOL: Interesting case. I must admit I hadn't heard that one before.

MR. LEDOUX: I don't remember the new reg

number, but there's a new reg that explains in detail 10 CFR 20. And I think under this section they talk about that in there, I believe, a little bit more that it's kind of common sense that that's what happened. So you may just want to look at that.

MR. COOL: Yes. I know that there is -- I suspect you're talking about one of the new reg 1556 series, because there is a volume that's specific about implementation of radiation protection programs in Part 20. I'm not positive. And I must admit that I haven't looked at it recently enough to remember what it might say about that one. I suppose that would be homework for tonight. But --

MR. HODGKINS: Anybody else then?

(No response.)

MR. HODGKINS: Move on to the --

MR. COOL: Okay. Should we --

MR. HODGKINS: -- last one?

MR. COOL: -- move on? Okay. This gets to sort of the companion to that. Whether the reduction in the burden associated with not having to go back and do the assessments is of any benefit or any issue. It's a companion to the previous question.

MR. HODGKINS: Analysts?

No?

MR. COOL: For the record, most of the people are just sort of going, Ah, don't think so.

MR. HODGKINS: Audience?

(No response.)

MR. EARLS: Let me ask a question. The dose here that we are talking about is the dose to the embryo/fetus. And current regulation says you're filing or essentially keeping that record with the declared pregnant worker's file essentially. How is this handled in the case of oh, let's say, in terms of effective dose equivalent if we have, for example, the abdomen covered with a shield or a shadow shield, that sort of thing?

You have to be careful that you're monitoring the right part of the individual. So you want to talk about that a little bit or throw it for someone else to consider? It's not my bailiwick, but I think it's worth talking about.

MR. COOL: And we can certainly toss it out and see what people would say. You're correct. It makes a fair bit of difference how you go about doing the monitoring, particularly in situations again, like the interventional folks, some of the folks for whom lead aprons and other things and x-ray photons at fairly low energy mean that you have a

really substantial difference between the dose to the abdomen underneath a lead apron and the dose that might be being recorded upon the collar patch.

For a number of the folks around the room in the industrial radiography and other areas which are a lot more energetic gammas, doesn't make a whole lot of difference unless you manage to get your body sort of behind a really big shield. But that's an interesting question. See if anyone has had any particular issues with that monitoring and assessment.

MR. HODGKINS: Questions? Come on up to the mike. Absolutely. Thank you.

MS. NEMETI: Just one observation about that again, from the clinical field in nuclear medicine. We see from the patient, when we actually process on the computer, about three feet. And if the lady's pregnant she has actually a apron. But from the back it's not covered at all. So again, Mary Catherine Jones was telling us -- she has already left -- but she was telling about a lead shield between the patient and the technologist while the patient is actually under the camera and we have to actually process, you know, the procedures.

So basically, again, the pregnant patients or even if it not pregnant, from the back we get a lot

of exposure again. So, yes, maybe not from the front where actually, the apron covers, but from the back you get actually, a lot of exposure. So that's all.

MR. HODGKINS: Thank you. Oh, you know what? Can you do your name? I'm sorry. I forgot.

MS. NEMETI: My name is Krisztina Nemeti. And I'm actually working at the University of Texas Health Science Center, radiation safety.

MR. HODGKINS: Thank you, Krisztina.

Okay.

MR. COOL: Okay. And this actually is the question that was in the list but it was already raised, because there are some questions associated with detection limits and periods. So I would open it up if anyone else has issues they would want to raise there in terms of the technology and how you would go about it implementing.

MR. HODGKINS: Panelists, you all have been very quiet. Maybe a little noise over here. Anybody?

(No response.)

MR. HODGKINS: How about from the audience once again? Anybody from the audience want to add discussion on this particular question?

(No response.)

MR. COOL: Okay.

MR. HODGKINS: Number 5?

MR. COOL: Number 5. And I sort of asked this once but let me ask it again. This is a lot less frequent than occupational exposure or even public exposures. And so this is a question on how many cases you see and what kind of actual dose that you see to individuals who have declared so that we have some understanding of the population and the distribution of doses out there, in terms of trying to form a judgment.

Because at this point you folks realize that you've left me in a position of A is okay, B is sort of okay and -- you know, this is not a vote and I know I'm asking why. But you've left it really open in the air for me. So any information on the dose distributions in your particular area or your particular organization?

MR. HODGKINS: Yes, John?

MR. MILLER: I think it's really going to vary on the industry, this aspect of the proposed changes, because, you know, if there's an industry where a worker typically gets 400 millirem per year then heck, a 500 millirem dose for the entire gestation period is pretty easy to meet. But if

you're pushing 2 rem or something and you're really in the spot where you have to figure out what you're going to do or, you know, are you going to remove the person completely, you know, give them the same pay obviously, but remove them completely from radiation work because, you know, the work that you do a person could get 100 millirem in a day, you know. It's very difficult.

The experience I've had and the facilities that I've worked at the doses were -- to the extent -- really, the only way to be satisfied and feel comfortable that you are going to comply with the regulation as it is now was to completely remove that person from radiation work.

MR. HODGKINS: Mark, you were going to say something.

MR. LEDOUX: No. I just really -- just confirming what John said. Where I've worked, too, the same. And same thing. Generally, once they're declared you still issue in dosimetry. But generally, you pull them away where they're really safe. You don't want them get any dose at all.

MR. HODGKINS: Eric?

MR. ROHREN: So like I said, I'll see about trying to get you that data. My recollection is

that most of the women that we monitored were over 100 millirem averaged over the nine months of their pregnancy. So, you know, depending on when you did that initial declaration it could have a significant impact on their ability to practice.

MR. HODGKINS: Okay. Thank you.

Let me pick on the folks who are here from the various radiography groups. How many times have you seen this and what have you had to do?

Yes. Gayle?

MS. G. STATON: I can only -- oh, sorry. Gayle Staton, Acuren Inspection. I can only answer for my company. And when someone declares a pregnancy we take them out of the radiation work and put them in the office. So none of this really applies to us. I can't really answer your question about whether I like 3A or 3B or anything because it's not going to make a difference to us. Everybody there, all the women that work in the field, know that they can declare as soon as they find out they're pregnant and we'll take them out of the radiation field.

MR. HODGKINS: Did you want to add anything, Laurie?

Anybody else then? John?

MR. MILLER: You know, I actually worked

at a place that allowed a woman to declare pregnancy if she was planning on getting pregnant. That was the concern and that was to prevent going back and doing an assessment.

MR. HODGKINS: Anybody want to declare now?

(General laughter.)

MR. HODGKINS: Any other questions? Audience, anything?

(No response.)

MR. HODGKINS: Back to the panelists.

Yes, Don?

MR. SIDES: And in the 40 years I don't think I've ever -- we -- I know at Stark we've never had a declared pregnancy. So it's a -- yeah, it's just a bunch of guys. Most women couldn't -- wouldn't tolerate the stuff.

MR. COOL: Okay. This is a discussion probably best held at the bar afterwards.

MR. HODGKINS: Name first, then your statement.

MR. DOWELL: I'm Corey Dowell with Furu Consultants. I had a declared pregnancy this year. And the lady was actually concerned that -- whether or not she should declare. She felt maybe that we would

react adversely to her, that possibly she could lose her job. And she ultimately did declare.

And as an RSO and a manager, I was relieved to see that, because once a woman declares, we're able to help her manage it. Similar to what -- Gayle's company, we take the stance that we want to protect our employees. And we want to do that whether the regulation is 500 MR for the duration of the gestation period or whether we've now restricted it.

I say don't change it, because I would want to encourage the women to declare. And I feel that that would allow them more opportunity to work if they want to remain in the field. This individual actually doesn't want to do office work. That's what she's doing now. But the circumstances have just -- that's just what they're -- we're allowing her to do, you know. She was a special case. But I think that most of the time if we were just to look at a woman's ability to work and allowing her to receive the most that she can legally then she can make that decision. Regardless, we're going to have to manage it. And that's the responsibility of all licensees. So I think that just leaving it and no change is probably the best.

MR. HODGKINS: Thank you for your

participation.

MR. COOL: All right. Any other things that you'd like to bring up? I think probably now is a good time to stop for today. We would start tomorrow morning with the second piece of the issue related to special populations and public exposure.

Dan, I'd invite you to do the cross checks and things for this evening.

MR. HODGKINS: Okay. Before we go, though, here's our assignment as panelists and audience participants. Two questions. One is on content and one is on process. So the content of this meeting so far and as we progress, is this a good way for -- to move forward? Do you feel like it's comfortable, you're getting heard? You know, is there anything we can do to improve? I want to say that through this process we have changed each one of the sessions that we've had to help and comply with what people thought were good, you know, steps in getting more people heard or more subjects heard. So first of all, let's take content. I'm going to go around the panelists first.

As far as Gayle, evaluating the meeting as far as content. Has this satisfied what your expectations were this morning?

MS. G. STATON: Yes, I'm very satisfied.

MR. HODGKINS: Tony?

MR. YUNKER: Tony Yunker, Baker Hughes. I'm satisfied, too.

MR. HODGKINS: Now -- and I'm going to just, Mark, pick on you. You're satisfied. If there's anything you could improve, is there something you would do to improve the process -- the content?

MR. LEDOUX: No. I really -- this is Mark Ledoux. I can't -- everything is going well and I'm glad to have the opportunity to be doing this. This is a nice way of going.

MR. HODGKINS: Okay.

Laurie?

MS. McGOWEN: Laurie McGowen. I'm satisfied.

MR. HODGKINS: Even with Don? Oh, to the bar. To the bar.

Toby?

MR. HEAD: Everything's been fine.

MR. HODGKINS: John?

MR. MILLER: Yes. I think the meetings are running really well. I was hoping to see some type of initial cost estimates, though. And I don't know if that's going to be later or if the NRC has

even started down that path of trying to estimate what the change in the regulations would cost the industry and the regulator, as well.

MR. COOL: Actually, we haven't started down that because we don't know what direction we'll take because we're asking you to help us understand what the ideas and impacts are before we go spending any time and effort trying to assess what might be viable or not such viable options.

MR. MILLER: It could be a good decision-making tool, though, once you see what those numbers might be.

MR. COOL: And we will, in fact -- I think this is probably a good thing to know. Once we have some of the policy issues fleshed out from policy perspectives the NRC staff will have to do cost assessments, value impact assessments. In the reactor world it's call back fit.

There's actually a specific regulatory requirement put in place after TMI that requires the staff to look in detail at the costs and benefits associated with any proposal. While theoretically that doesn't directly apply to the byproduct material used, is the staff, in fact, behaves in the same manner and will prepare that sort of assessment for

any proposals that would start to move forward. But we're not there yet. That's why we're asking you for help. But thank you.

MR. HODGKINS: Ann?

MS. TROXLER: Ann Troxler. I believe it's been very helpful and it's moving along quite nicely. This is exactly what I expected.

MR. HODGKINS: Okay. So it's met your expectations from this morning.

Wei-Hsung?

MR. WANG: Wei-Hsung Wang. I think the agenda is well organized and the content is well prepared and delivered. It's a good meeting.

MR. HODGKINS: Jean?

MS. J. STATON: Jean Staton, Metco. This has been a very good meeting. It's -- it allows us to give more actual data of what's going on and it gives us the different aspects, the medical versus the nuclear versus the industry. So it's been a good meeting.

MR. HODGKINS: Thank you, Jean.

Doris?

MS. BRYAN: I think it's an excellent forum for stakeholders and I appreciate being able to give input.

MR. HODGKINS: Ellen?

MS. ANDERSON: It's great the third time around.

MR. HODGKINS: Now, Ellen, we do have to count on you, though, as far as a historical perspective on some of those comments that were made in previous ones. If you can, you know, sort of forward them as you think of them.

MS. ANDERSON: I do have one comment, though. We went around the room about this last question issue. There were a lot of passes, which was very different than last week's where, my God, I think we could have talked all day about this issue. And I think it was because we had mostly medical folks in the -- on the panel. And I just thought it interesting that this group would rather pass than discuss some of these issues, at least this issue in particular. As it felt to me like some of the folks on the panel were uncomfortable about talking about this issue.

MR. HODGKINS: Do you want to check that out a little bit, as far as was there some uncomfortableness about the subject?

A little? And you want to talk a little bit about that, Laurie? No. She was right.

All right. Steven?

MR. CAMPBELL: Great session. I will say I'm still worried about Roger back here.

MR. HODGKINS: We'll keep him in check tomorrow. Okay?

Alice?

MS. ROGERS: It met my expectations. Thank you.

MR. HODGKINS: Okay.

Eric?

MR. ROHREN: Yes. Very nice forum. I have no recommendations.

MR. HODGKINS: Okay.

Leonard?

MR. EARLS: It was a good session.

MR. HODGKINS: Okay.

Don?

MR. SIDES: Good session.

MR. HODGKINS: Okay.

Audience participation. I think we kind of combined the content in the process in this one. Much like Ellen said, the other ones had some distinct, you know, compliments and criticisms and those kind of things. So for the audience, as far as is there any comment that you want to make? Do you

feel like you're being heard? Is the space there for you to make the comment that you want to make?

Tentatively yes? Anybody no?

(No response.)

MR. COOL: The transcription should note that there's lots --

MR. HODGKINS: Everybody promised me --

MR. COOL: -- of heads --

MR. HODGKINS: -- that would be --

MR. COOL: -- going up and down.

MR. HODGKINS: Yes. Lots of heads going up and down.

Anybody want to speak for the audience then?

(No response.)

MR. HODGKINS: Guess not. Okay. With that, I'll --

MR. COOL: Well --

MR. HODGKINS: -- close it back to you, Don.

MR. COOL: Thank you very much for a very interesting discussion. I have learned some things today that I hadn't heard before. And that's always a great thing because that's what we're looking for.

Your homework for tonight, to reflect on

today's discussion, some of the things that we talked about, because tomorrow we're going to talk about some additional issues, one in particular dealing with the whole ALARA concept, the planning of radiation protection, radiation protection programs. Several of you have alluded to that as being why performance has continually improved. And that part of the discussion is going to be whether there are things that we can do to help even further enhance that process, perhaps as alternatives to changing the limits, which everyone today said, Don't go there. So we'll let you reflect on that overnight.

I wish you a good evening, a good night's rest. and we'll see you tomorrow at 8:30.

(Whereupon, at 4:45 p.m., the meeting was adjourned.)