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NUCLEAR REGULATORY COMMISSION

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ADVANCE NOTICE OF PROPOSED RULEMAKING

POTENTIAL CHANGES TO NRC'S RADIATION PROTECTION REGULATIONS

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THURSDAY

OCTOBER 2, 2014

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ROCKVILLE, MARYLAND

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The public meeting convened at the Nuclear Regulatory Commission, Two White Flint North, Room T2B3, 11545 Rockville Pike, at 1:00 p.m., Butch Burton, Facilitator, presiding.

PRESENT FROM THE NRC:

BUTCH BURTON, Facilitator

DONALD COOL

CINDY FLANNERY

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

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

1:08 p.m.

MR. BURTON: Good afternoon, everyone. I want to apologize for the late start. I understand some people had some issues getting on the line, but I think we've got everybody now. So appreciate your patience.

My name is Butch Burton and I'm from the NRC's Office of Nuclear Reactor Regulation, and I'll be serving as your facilitator for today's meeting. My role is to help ensure that today's session is informative and productive.

I want to welcome everybody here at headquarters as well as folks on the line. Today's session is the second of several meetings to receive input from stakeholders on the development of a draft reg basis to support potential changes to the NRC's current radiation protection regulations contained in 10 CFR Part 20 titled, "Standard for Protection Against Radiation." The goal of this effort is to achieve greater alignment between Part 20 and the 2007 recommendations of the International Commission on Radiological Protection, or ICRP contained in ICRP Publication 103.

Last week we held our kickoff meeting for this effort where we provided a general overview, background information, general discussion of the main

issues and a discussion of plans for upcoming meetings.

Today we're focused on how Part 20 needs to be updated to align with the methodologies and terminology in ICRP 103 and the occupational dose limits for the lens of the eye. Specific questions on these topics were included in the Advance Notice of Proposed Rulemaking, or ANPR, published in the *Federal Register* on July 25th of this year. You can access the ANPR through our Agencywide Document Access Management System, or ADAMS. The accession number is ML14183B015.

This is a Category 3 public meeting, which means that members of the public can participate at designated points throughout the meeting. Hopefully everyone has signed in and received copies of the handouts. These include the meeting agenda, the presentation slides, the *Federal Register* notice that contains the ANPR, the staff's issue papers on today's topics and a feedback form. For those of you here, you can sign in, if you haven't already and find all of the material in the back of the room.

Before I introduce our speakers I'd like to take a few minutes to go over a few meeting logistics. First, this meeting is being transcribed, so we want to make sure that our transcriber, Mr. James Salandro, can get a clear copy of the meeting. Therefore, we ask that

you please turn off or mute any device that rings, buzzes, beeps, alarms, talks back to you, anything like that. And we'd also like to try and minimize any side conversations.

Also, we want everyone to know that even though your feedback today will be included in the transcript, only written comments will be addressed in the regulatory basis. So please be sure to submit your comments in writing. We'll tell you how you can do that during the meeting.

For those here, to get to the restrooms, when you leave the room, go straight back, turn left to go to the men's room and turn right to go to the ladies' room.

If we're asked for reason to evacuate the building, please follow the direction of the security staff or the NRC staff here. We'll try to keep everyone together as we muster outside and we'll make sure that we can account for everyone.

At the end of the meeting please complete the feedback forms and return them to us. The feedback forms help provide us with feedback on how we can improve our future meetings, so it really is important to us that you provide that, if you can.

There will be opportunities to ask

questions for each topic as identified on the agenda. For the folks in the room, when asking questions please use the mic. It's located under the monitors towards the back of the room. For folks on the phone, be aware that you'll be muted as the operator mentioned until we're ready to take your questions and comments.

We have an operator, Teria, which you on the phone have already met, who will be helping us with this, so when you want to speak, as she mentioned, just press star one. This will let me know that you wish to speak. I'll then ask Teria to un-mute you and you'll be able to speak. For all speakers, whether on the phone or here in the room, please identify yourself and your organization, if applicable, and speak directly into the mic or your receiver.

We're trying very hard to stay on time, so we'll have to be flexible with how much time we'll have for questions and comments, although I do think we probably will have plenty of time to accommodate everyone.

Are there any questions either here in the room or on the mic for any of the logistics I just went over?

(No audible response)

MR. BURTON: Okay. I'm seeing nothing

here.

Teria, is there anyone who has identified that they'd like to ask any questions?

OPERATOR: Not at this time. There are no participants in the queue.

MR. BURTON: Okay. Great. All right. So let's go on and get started.

Let me introduce our first speaker, Dr. Donald Cool. Don is a senior advisor in our Office of Federal and State Materials and Environmental Management Programs. Don will start us off with a discussion of the alignment of the methodology and terminology between Part 20 and ICRP 103.

Don?

DR. COOL: Thank you, Butch. Good afternoon everyone here and on the phone.

As Butch mentioned the first topic that we're going to address is the methodology and terminology that is used within the regulations, the methods for calculating dose the way that we refer to those.

If I can have the next slide? So a little bit of background. Methodology and terminology have changed a number of times over the years. Currently 10 CFR Part 20 has a set of terms: the total effective dose

equivalent, the committed effective dose equivalent, those sets of things referring to the sum of the internal and external exposures, the internal exposures, the committed effective dose equivalent being from the intake of radioactive materials. Those were based on the recommendations of the International Commission on Radiological Protection from back in 1977 of location 26 and the supporting technical information that was in the various volumes of ICRP Publication 30.

So the first change that happened in around 1990, just about the time that the NRC was finishing up its revision of 10 CFR Part 20 back then, updated some adjustments to the calculational approach, and with those adjustments some changes in the terminology. Most of the world has moved to those materials. I'm going to discuss some of those bits in just a moment.

The recommendations in Publication 103 from 2007 that we're examining revised some of the factors, but did not actually change the methodology itself, nor did it revise the terminology. So while we are looking at some terminology and methodology changes in comparison to the existing portion of 10 CFR Part 20, in fact we're looking at essentially terminologies that go all the way back to 1990.

If we can go ahead and have the next slide?

So to start the discussions, just to remind everyone of what is in the advanced notice and the additional information which is in the issues paper which elaborates on that a little bit more, the Commission directed the staff to develop a regulatory basis which would align with the most recent methodologies and terminologies for dose assessment. So that means that we have laid out a series of proposals for the purposes of obtaining comment.

As I mentioned last week in the original introduction meeting, this says the word "proposal." Please don't construe this as a proposed rule. This does not contain specific regulatory language as in 20 point blah, blah, blah, change from X to Y. Rather, this contains the proposal for the conceptual direction. We have not yet nailed down specific language. We will be talking about specific proposed changes to some of the factors like the tissue weighting factors and radiation rating factors, but I would not want you to confuse what's in this advanced notice with a specific proposed rule. That is yet at some point in the future after we have developed a draft regulatory basis and after the Commission has approved that basis.

That set of proposals for purposes of discussion would be to change the existing set of

terminologies from total effective dose equivalent and similar terms to total effective dose. I'll talk about each of these a little bit more in a moment or two, so I'll quickly just go through these.

It would incorporate new tissue and radiation weighting factor values into the definition sections. It proposes to use an age and gender averaged approach to the calculation for a reference member of the public, and I will be explaining that in just a moment. And it would propose that we would update the many numerical values which are in Appendix B of 10 CFR Part 20 for annual limits of intake, derived air concentration and effluent values.

So if we could have the next slide? So let's start with some of the questions on terminology. So as I said, the regulation today uses the phrase "total effective dose equivalent." When I talk about methodologies in a few minutes I'm going to talk about changes in the use of some of the terms. As a result of changing the terms that were used in the calculation approach, the ICRP's recommendations in 1990 changed the word or the term that was applied to the resulting calculation.

The terminology that is now used by ICRP, similarly recommended by the International Commission

on Measurements and Units, is for effective dose rather than effective dose equivalent. What we call "total effective dose equivalent" would be similarly reconstrued simply as "total effective dose." You could also have the committed effective dose. The individual organs would receive an equivalent dose rather than a dose equivalent.

And I know an immediate reaction would be, well, that's certainly a small change and perhaps confusing, and I will grant to you that it is a change and perhaps, depending on which language you might translate it in, sometimes gets completely lost. But in fact the change in the terminology helps to recognize, or at least one advantage the staff sees in changing it, is so that if you look and you see a particular reference or a particular unit like the total effective dose, you would know that that calculation was done using a certain set of tissue weighting factors, radiation weighting factors that allows you to help understand what the calculation actually entailed.

The NRC staff is not at this point looking at changing the way in which compliance would be measured or the actual dose limits that would be used. Compliance would still be the sum of the internal and external exposures. So this would be a more or less

simple replacement. Where the regulation today would say total effective dose equivalent, it would say total effective dose. And similarly for the other components.

If we can go to the next slide? Since everyone is going so what actually is changing here? Well, in the current regulations today there are a series of quality factors which was a way of representing the relative effectiveness of different types of radiation and the extent to which they cause damage within cellular materials of the body. Those are currently found in Section 20.1004. Those were replaced in 1990 and subsequently updated a little bit in Publication 103 in 2007 with what we'll refer to as radiation weighting factors. And I am not going to try and get into the specific dosimetric and physics details that go along with it, but there are some bits of difference between the quality factor the way it used to be constructed and the radiation weighting factors.

The slide has the current set of factors. This is from ICRP's Publication 103. For photons and electrons, X-rays, gamma the factor is one. That really doesn't represent any change. Protons is a two. The quality factor used to be 10. That's one of the potentially more significant changes that you'll see in

the set. Alpha particles at 20 is essentially unchanged from alpha particles. And there was a continuous function for various energies of neutrons.

If you look at the second table in the existing Section 20.1004, you'll see a whole series of values. That's sort of a semi-discontinuous representation of what you could also construe as a continuously changing function. So the shape is slightly changed. So depending on the particular energy of the neutron that you might be dealing with; if you have monoenergetic neutrons there could be some small changes, but it's a similar sort of thing. So the radiation weighting factors would replace the quality factors in Section 20.1004.

If we can have the next slide? The other piece of this puzzle is the tissue weighing factors. There are tissue weighing factors today in the definitions. Those have been revised a couple of time. The set that's in Part 20 today represents our understanding of the relative contributions of different organs to the overall cancer risk in the human body back in the 1970s. They were revised with the recommendations in 1990 and have been revised again with the recommendations in 2007.

You'll notice a couple of things: There

are some more organs that are there. The list wasn't as extensive as in the proposal from ICRP Publication 103. And you'll notice that some of the values have changed a little bit. In part that represents the fact that the sum of all the organs has to be equal to one. The parts of the body can't be more than the whole body taken collectively together, and these tissue weighing factors represent the relative contribution to the total cancer risk if you irradiated the whole body completely uniformly. So everything was receiving the exact same contribution.

One of the more significant changes, if you examine this table in a little bit more detail, is that you'll see that the tissue weighting factor of the gonads was in fact rather substantially reduced. This is in large measure due to experience and examination since the '70s which has indicated that the potential contribution of heredity effects and those sorts of things is less than had been previously assumed. Some of the other changed to a lesser degree. As I said, the summation total continues to add up to 1.0 as in a uniform whole body exposure is a 1.

So let's go on to the next slide and the next topic. So when you do then the calculation for an individual, if you're dealing with an adult and you're

dealing in an occupational setting obviously you would use the calculational materials that are available for an adult. And there are actually very detailed calculational models that allow you to model the human body, males and females separately, and work on combining them together to prepare a reference individual. And that's what get used for occupational exposures since occupational exposure is specifically controlled to an adult.

Now back at the time that Part 20 was revised, completed in 1990, the adult was the only references that we had available. So when the values in Appendix B, Table 2 for effluent concentrations for air and water were developed, what the NRC and other organizations did was to take the adult value and to apply some modifying factors. One for the amount of time, 2,000 hours on occupational year versus a full year's worth of time, 8,000-plus hours, changes in breathing rate, some additional factors to represent the fact in a general sort of way that we knew that there were more age groups and otherwise.

But there was no way to more specifically incorporate changes that happened as an individual is born and grows over a period of time. Even though we know that that's what happens if you're born in the

vicinity of a facility and grow up until you go away to college or something, you go through a whole series of life stages and certainly not all of those are an adult.

We now have today a much larger set of models. There are in fact models available for infants, 1-year-olds, 5-year-olds, 10-year-olds, 15-year-old males and females, as well as the adults. And so what the staff is soliciting comment on is an approach to try and more accurately reflect a person born and growing up receiving a particular exposure to the effluents which would combine the various age groups in percentages consistent with what percentage of the population is that particular age and that particular gender. And you can derive that rather simply with the census data that's available. The U.S. Bureau collects that every 10 years.

This approach in fact has already been calculated and is used by in fact the Department of Energy; has been for a number of years, in looking at the compliance around some of their facilities. This slide contains the specific DOE Technical Standard, and a copy of that is available as one of the links on the Web site. The values which are in that standard are based on the 1990 recommendations of the ICRP and on the 2000 census data.

What the staff is looking at is using a similar approach to calculating it using the newest set of models and weighting factors and using the 2010 census data so it is the most up-to-date available sets of information to help represent an individual over the course of time. Now this approach the staff believes has perhaps a couple of advantages. Most importantly it contains an explicit way to actually incorporate the fact that you're an infant for a little while, you're a one-year-old, you're a five-year-old. And we know that those different age groups have different sensitivities to radiation, radioactive material, committed effective dose over a period of time.

So if you had a dose coefficient and you had the dose coefficient for an adult, it would not be the same as the coefficient for a 15-year-old, a 10-year-old, a 5-year-old or 1-year-old. Now the extent to which those differ very much depends on the individual radionuclide. So doing this approach means that each calculation then takes into account the sensitivities to an individual, to a radionuclide with the biokinetics and otherwise that are associated with that particular radionuclide. So the differences between an adult and an age gender average will depend on the kind of radioactive materials. So what we're

looking for is some comments and suggestions on that particular approach.

If we can go ahead to the next slide? So let's move on to the last piece of this puzzle, which is the actual changes that would be in Appendix B. All of those wonderful tables of numeric values of annual limits of intake and derived air concentrations which are occupational based on an adult for Table 1. Table 2, the effluent concentrations which would be based on this age and gender averaged composite approach for calculating the value, and the sewer concentration values which also would be based on an age and gender average.

If we can go to the next slide? So to wrap this up and then open it up for questions, the advanced notice has several questions. Certainly you don't have to be limited to these questions in providing comments back to us, but these at least get you started.

What are the implications of changing the terminology? We are well aware that although changing the word sounds very nice and obviously has certain advantages associated with being able to track, well, if it says this, then it was that kind of calculation approach, simply changing words in procedures and regulations and otherwise all have intendant costs and

difficulties. You have to go in and change this to this, this and this and you have to explain it to people and understand it and figure out where it is. So we're looking for specific information on the associated costs.

We're looking for; question 2, considerations that might help us with an implementation time frame that would go along with this. Obviously we can say, okay, effective date of the rule everybody snap, change instantaneously. That would have one set of costs. There might be other approaches which would allow a more gradual transition over time which would allow organizations, licensees and otherwise to adopt it when they would normally be doing changes to updates and procedures as part of their review process which perhaps could reduce the burden of the possible change. So we're looking for your views as various stakeholders on what might be the appropriate time frame, how to avoid too much confusion in this process in looking at the optimal way to consider making such changes.

The third question specifically looks at the issue of calculating the effluent and sewer concentrations with regards to the modeling, the age and gender average weighted composite, other issues that

people might want to raise associated with that.

And the fourth question leaves open the possibility of whether or not the NRC should continue with taking the dose limit for members of the public at one milisievert and taking half of that and applying it to the air effluence and half of that to the liquid effluence for purposes of calculating a basic number for the demonstration of compliance. That's the way it is today. The staff in fact has not suggested changing it, but we're open to views on that and any other issues that people might want to raise around this particular area.

So if we can go to the last slide. So that wraps up my brief discussion. Obviously there is more material in the issues paper. As Butch had mentioned, we are in the process of accepting comments. While this is being transcribed we very much want you to provide specific comments on the record. There are a whole series of ways to do that which are in the advanced notice, as well as here on this slide.

It's also particularly important to us that you not only tell us what you think should change, or worse yet just yes or no to our questions, but in addition to that provide the rationale and basis and thoughts that you would wish for us to consider and why that's the right thing to do. This is an opportunity

to help us elaborate and explain as completely as possible why we might want to consider such changes, what the implications are, the pros and cons, the costs and otherwise that go with this. So we would very much encourage individuals who are commenting to provide as much information as you're able to that will help us in developing the regulatory basis.

And, Butch, with that I'm done with my summary and I would love to invite questions on this particular topical area.

MR. BURTON: Okay. Great. Thanks, Don.

Yes, what we're going to do is now we're going to open it up for questions. So what I'd like folks on the phone to do -- I'm actually going to start with folks here in the room, but what I'd like for you all on the phone to do is if you do have a comment or a question, if you would hit star one to let us know that you would like to provide a comment or a question.

And while you're doing that, I'm going to open it up to folks who are here with us in the room to see if anyone would like to provide a comment or a question. If you would please step up to the mic so everyone can hear you. Anyone?

(No audible response)

MR. BURTON: It is very quiet here. Okay.

All right. Okay. So we don't have any comments or questions here in the room. Let me turn to folks on the phone. I am not seeing anyone who at this point wants to step up and provide a comment or a question.

Operator, are you seeing anything?

OPERATOR: No, there are no questions in the queue at this time.

MR. BURTON: Okay. All right. Oh, we have one here. Okay. Please. And give us your name and your affiliation.

MS. ANDERSON: Ellen Anderson from the Nuclear Energy Institute. Good presentation, Don.

With regard to the Department of Energy process for the age and gender assessment has the NRC performed any analysis using the DOE model and the most recent U.S. population census data to determine if there will be any substantial difference in the dose to the public?

DR. COOL: Thank you, Ellen. I think I could answer that a couple of ways. We have looked at the methodology and looked at the differences between what you might calculate as simply being adult or using an age and gender weighted average. It very much depends on the radionuclide, as I mentioned.

Part of my sort of hesitation in giving you an absolutely yes, which we will eventually do, is the fact that we are still working with the international community and our domestic partners at Oak Ridge to develop all of the dose coefficients that would actually allow us to do that with the final set of values.

We have some estimates now. In large measure they are similar to but not identical to for some isotopes. Iodine and some of the others the difference is a little bit more than some of the very long-lived radionuclides for which there is very little difference between an age and gender weighted average and a calculation that might simply use an adult.

MS. ANDERSON: Can I follow up that question?

DR. COOL: Sure.

MS. ANDERSON: So the Commission hasn't performed any real analysis, so you really don't have the answer, correct?

DR. COOL: We don't have a complete answer yet.

MS. ANDERSON: Okay.

DR. COOL: We have taken a preliminary look. I wish I could say that we have done it, but I don't actually have the numbers to yet actually do the

ones with the final sets of values because we're still awaiting the dose coefficients for different age groups.

MS. ANDERSON: Okay. Thanks. So I'm looking at the questions in the ANPR and you're asking us what we think about the issue, we the licensees think about the issue. You're asking us for an opinion. You don't have the answer, so at this point you're sort of leaving us with a crystal ball trying to determine what the response will be. And so I just want to bring to your attention that you're asking for a opinion and answers and we can't necessarily give you anything specific because we don't have the answers either. You hold the key to the data and that analysis can't be done by licensees until you provide all the data.

DR. COOL: Yes and no, because in terms of what the values would be based on the ICRP 103 recommendations and the 2010 census data, you're right, none of us have those final values yet. But I would suggest to you that you can get a reasonable understanding by looking at the differences you would see for your favorite radionuclide using the DOE standard that's out there, which is the ICRP 60 values and the 2000 census data. That gives you some indication of how various radionuclides will vary. So

it is not a complete crystal ball, but there are still some uncertainties as we look at the changes.

Our understanding is that for many radionuclides there would be very little change between the doses that would be calculated with the ICRP 103 calculational factors and the doses that were calculated from the ICRP Publication 60 factors. Those are of course quite different from the values that are currently in Part 20 which go all the way back to 1977.

MR. BURTON: Okay. Please. Yes, please. No, that's all right. Come on. I don't see --

MS. ANDERSON: Okay. I have another follow-up question. So if you calculate the dose based on the current census data in the United States and you're looking at dose to members of the public, and from our nuclear facilities we would be looking at the members of the public who reside in the area of these nuclear facilities. How will you know that the population in the U.S. Census applies to those communities near the nuclear facilities and that whether you were actually using the right information?

DR. COOL: That's a good question. That's a good question. For purposes of constructing a prospective regulation that applies universally, we believe that it's reasonable to use the census data.

Obviously that can't be an exact representation of a particular population. I think it might be quite reasonable if a licensee wanted to propose more detail-specific if they knew that there was some unusual attributes of a distribution or other facility that they might wish to use. Licensees can always apply for specifics and additions as part of their license conditions and amendments.

I will tell you that the Department of Energy experience with the standard where my understanding is that several of the national laboratories have in fact done such analysis. They have found almost no difference between the generic calculation and what they would derive based on considerations of the populations around their facility. So that little bit of information gives us some confidence that using the general census data is a reasonable way to represent any particular situation.

MR. BURTON: Yes, any other questions here in headquarters?

(No audible response)

MR. BURTON: I think those were very good questions. Stimulated good discussion.

Okay. I'm going to turn again to folks on the phone. According to what I'm seeing I'm not seeing

anyone who wants to provide a comment or a question.

Operator, do you see anything?

OPERATOR: There are no questions in queue.

MR. BURTON: Okay. All right. Well, I guess with that I'll thank Don and we'll turn to our next speaker, Ms. Cindy Flannery.

Cindy is a senior health physicist in the Office of Federal and State Materials and Environmental Management Programs. Cindy will discuss dose limits to the lens of the eye.

Cindy?

MS. FLANNERY: All right. Thanks, Butch.

And could we go to the next slide, please? All right. Thank you.

All right. So let's start with NRC's current limit for the lens of the eye, which is 15 rem, 150 milisieverts, which is established in 10 CFR 20.1201(a)(2)(i). And in April of 2011 ICRP issued a statement indicating that a review of recent epidemiological evidence suggests that some tissue reaction effects occur at a lower dose threshold than previously considered. So for the lens of the eye ICRP now considers the threshold for radiation-induced cataracts to be at a dose of about a half a gray or 50

rad.

So occupational exposure and planned exposure situations ICRP recommends reducing the dose limit for the lens of the eye to be 2 rem or 20 milisieverts per year averaged over 5 consecutive years, so essentially 10 rem in five years with no single year to exceed 5 rem.

Now this ICRP's recommendation here is really based on recent epidemiological studies of radiation-induced cataracts which found that the threshold for causation is really lower than previously considered because ICRP had noticed that earlier studies really had short follow-up periods, really had failed to take into account the short latency periods with low doses. They weren't designed to detect early lens changes and had relatively few subjects with lower exposures.

So these recommendations were really based on some more recent studies of populations with lower doses, lower exposures, populations that included subjects from diagnostic and therapeutic patients, astronauts, survivors of the atomic bombs, Chernobyl accident victims and cleanup workers as well as interventional radiologists and cardiologists.

Next slide, please. Okay. So following

ICRP's recommendation to reduce the dose limit for the lens of the eye, NRC staff went up to the Commission and recommended discussions with stakeholders about possibly reducing NRC's dose limit for the lens of the eye. The approach here would be increasing alignment with ICRP's recommendation but not necessarily a complete adoption. Complete adoption ICRP's recommendation would be two rem per year. That would put us in a situation where we have a more restrictive limit than our current whole body limit of five rem total effective dose equivalent which has never been in regulations to date. And our Commission has made a decision to not reduce that current limit. The Commission has agreed with the staff recommendation to, yes, go out and move forward with having these discussions with stakeholders about possible reduction of the dose limit for the lens of the eye.

All right. Next slide, please. All right. So the ANPR was published in July. The issue paper has several questions which we're hoping will elicit discussion and input from licensees, public and other stakeholders. So I'll just spend the rest of the time going through these questions.

So the first question is closer alignment or adoption of the ICRP Publication 118 recommendations

regarding the dose limit to the lens of the eye appropriate given the scientific information now available. So since ICRP had come out with its recommendations there is a lot of literature out there, a lot of information, so the bottom line question is is there a scientific basis to support the changes. These views will help us guide the development of a regulatory basis is the bottom line. Okay. Question No. 2. How should the impact of radiation-induced cataracts be viewed in comparison with other potential radiation effects? The NRC believes that further discussion is warranted in how the prevention of cataracts which really can be corrected by a well-established surgical procedure compares with efforts to reduce the probability of cancer which poses a far greater risk. So should fatal effects and non-fatal effects really be considered in a similar fashion? Are the potential changes in the eye a significant detriment?

Question No. 3. What mechanisms could be applied to keep the cumulative exposure to the lens of the eye below the threshold of half a gray? This limit is what ICRP said is the limit for radiation-induced cataracts and there is no indication that a protracted delivery of the dose is any less damaging than an acute

dose.

So what are some mechanisms? The obvious of course would be shielding, many types of shielding in a medical situation. You could have pull-down shielding, lead glasses with side shielding, fluoroscopy table shielding and portable shielding of various configurations. But other types of mechanisms such as training, for example, sensitive training on how to select and utilize shielding that would help in reducing one's dose to the lens of the eye.

But what other mechanisms are out there to help reduce the dose to the lens of the eye? And cumulative is really the operative word here, meaning reducing one's dose over the course of a lifetime because of this threshold of half a gray.

Next slide, please. Okay. What methods should be allowed for measurement or assessment of the dose to the lens of the eye? So any new requirements that NRC would put in place would have implications for measuring occupational exposures and the need to better estimate the dose to the lens of the eye.

So in practice nobody is really monitoring the lens of the eye specifically. So thinking in terms of a non-uniform field and somebody who's wearing a lead apron, for example, and being monitored with two badges,

one badge underneath the apron and one badge above the apron, what is the best dosimetry method? Should we simply just take the badge over the apron measurement for the eye dose, or should the eye dose really be extrapolated from the unprotected badge using some kind of a correction factor? Perhaps the variations using this particular method would really just be too substantial. And there are certainly some other factors that would come into play in terms of accuracy of dose assessment. For example, dosimeter placement, angular and energy distribution, things such as that, effectiveness and means of protection used and so forth.

Question No. 5. What methods should be allowed for recording dose when the eyes are protected? What we're getting at here is some sort of correction factor, eye protection factor, whatever you want to call it. There is no standard in place for a correction to adequately assess one's dose if somebody is using some type of a shielding like there is. I guess the best thing to compare it to is if somebody is using or wearing an apron for the whole body to measure effective dose. Some regulatory agencies will allow licensees to -- if somebody is wearing a lead apron and using two badges, they will allow them to use a correction factor and do a calculation to measure an effective dose. Well,

there isn't a similar type of calculation for assessing one's eye dose from measurement on a badge and somebody wearing lead glasses. So the question is should that be allowed? If so, what type of correction factor should be used, and is that appropriate, or would there be too many variables for this really to be practical?

Okay. So question No. 6. What are the potential operational impacts? A few possibilities here perhaps individuals who work at more than one facility, training impacts, cost implications, to name a few, but certainly this list is not exclusive.

And then the last question here, No. 7, what are the potential impacts on state regulatory programs? And certainly this does have an impact on state programs. Again, using the medical sector as an example, a group that has a potential for high lens of the eye doses would be interventional radiologists and cardiologists. They work with radiation-producing machines which fall under state regulatory programs and not NRC's jurisdiction. However, when NRC makes changes to the regulations and reducing dose limits and so forth, the states will also follow suit with their X-ray program. So it certainly has an impact on the state regulatory programs as well.

Next slide, please. Okay. So there are

several ways in which you can submit your comments. What I've listed here, the comment period is open until November 24th. They can be submitted directly to the Web site, email, faxed or by regular mail.

We have three more public meetings. There are six different technical issues in the ANPR. Today we discussed the first two of the six, but next week on October 9th we'll be discussing issues 3 and 4, which are dose limit for embryo-fetus, so a declared pregnant occupational worker. That's issue No. 3. Issue No. 4 is individual protection ALARA planning. So that will be next week on October 9th. October 16th we'll be discussing issues Nos. 5 and 6. And that is reporting of occupational exposure. And No. 6 is metrication - units of radiation exposure and dose.

Now the public meeting that will be taking place on October 23rd is really a wrap-up of all of the technical issues in ANPR. And then of course we have a link here to the Web site for Part 20 and it includes all the information. It has the ANPR, associated issues papers and all the supporting information to potential changes to Part 20.

So that is all I have. Butch, I'll turn it back over to you.

MR. BURTON: Okay. Great.

MS. FLANNERY: Thank you.

MR. BURTON: Thank you, Cindy. Appreciate it.

Okay. Again, what we want to do is we want to open it up for questions. Again, for folks on the phone in anticipation of when we go to you all for comments or questions, if you could start by pressing star one so we know that you're interested in participating. And while you're doing that, I will open it up for comments or questions from folks here in headquarters.

Anyone? Okay. And again, please provide your name and your affiliation.

MR. PEDERSEN: Roger Pedersen, senior health physicist in the Office of Nuclear Reactor Regulation here at the NRC.

I was intrigued by question Q6 -- excuse me Q5 that you were talking about, Cindy, the allowance for when protection is afforded the eyes. Currently for respiratory protection, if I could just diverge a little bit here, we have an Appendix A to Part 20, protection factors if a respirator is used for protection of intakes. Is that similar to what you were talking about where we would establish protection factors and have eye protection certified to some sort of a protection

factor? Is that an analogous control method?

MS. FLANNERY: That would be another example, yes.

MR. PEDERSEN: Okay.

MR. BURTON: Okay. All right. Thank you. Anyone else here at headquarters here in the room like to provide a comment or question?

(No audible response)

MR. BURTON: No? Okay. All right. So let's go to the phones. I am looking here. I do not see anyone who would like to provide a comment or a question.

Operator, do you see anything?

OPERATOR: No, there are no participants in the queue.

MR. BURTON: Okay. All right. Well, I hope that's because everyone is thinking deep thoughts about it and are prepared to provide their comments a little bit later.

Okay. Give it one more round see if anyone would like to provide a comment or a question.

(No audible response)

MR. BURTON: Okay. I think at this point then, being a Category 3 meeting, I want to open it up for members of the public at this point, if anyone has

a statement or a comment or a question. Again, I'll start here in the room, if there are any members of the public who would like to speak.

(No audible response)

MR. BURTON: None? Okay. Again, going to phones, if there are any members of the public who would like to speak, provide a comment. Give it a second here.

(No audible response)

MR. BURTON: Okay. All right. Okay. I think if there are no more comments or questions, I think we're going to start our wrap-up. But before I do turn things over to Don; he'll do the formal close-out, I'd like to pass on some reminders and some information.

First, again wanted to remind folks and encourage folks to fill out the feedback forms. For those here, you can leave it with us today. And for folks on the phone, you can get a copy and you can mail it in to us. Again, we really appreciate that feedback. We do take it seriously to see how we can improve our public meetings.

Also, as has been noted, we are accepting comments on the advanced notice of proposal rulemaking through November 24th, 2014. We do need your feedback to help us put together a strong regulatory basis to

support any proposed revisions to Part 20. There are several ways that you can provide your comments, as you can see on the slide. That information is also provided in the *Federal Register* notice. You can actually access all of this information at the link that you see at the bottom of the slide that you see there.

Wanted to note that the first meeting that we held last week, the kickoff meeting, it was Webcast and there is a copy and you can have access to it through the public meeting Web site. The slides and transcripts from the first meeting are also on the site. And the slides and transcripts for this meeting will also be placed on that site. So please be aware of that. Also you can get a copy of the advanced notice of proposed rulemaking on our ADAMS site. That stands for Agencywide Document Access and Management System. If you go that route, the accession number is ML14183B015.

As we mentioned before, we want everyone to know that even though your feedback will be included in this transcript, only written comments will be addressed in the regulatory basis. So please be sure to submit your comments in writing.

Finally, I wanted to take a moment to thank James Salandro, our transcriber, and Teria, our operator for her excellent support to today's meeting.

Okay. And with that, I'll turn it over to Don for our closeout. Don?

DR. COOL: Thank you, Butch.

Let me thank each of you for taking the time to listen. I hope this has been helpful to you in understanding some of the issues.

I'm going to hope that the fact that there weren't a lot of questions means that we've been relatively clear in the process of explaining the things that we're looking for answers on. There are a lot of questions and I'd like to emphasize again that we are looking for the answers to the questions and not just a yes/no sort of answer, but also with the supporting information and rationale that the NRC staff should consider in developing a position.

While it might seem strange, every bit of information that we get will be very valuable to us in terms of trying to develop a rationale for a position, all of the data that you can provide. Information on the various shielding aspects of different types of leaded glasses, the ways in which shielding in other configurations can be used, the impacts of the different terminologies and methodologies.

For each of the questions throughout the ANPR the staff is actively looking for your feedback

with the details that you would like to see addressed in a draft regulatory basis, which not only includes the what we think should be done, but the whys that go along with it. This is your opportunity to contribute to the whys that would be part of process of developing any regulatory basis.

As Cindy mentioned, I'll just reemphasize we will have a meeting again starting at 1:00 on next Thursday dealing with the issues on the embryo-fetus and applications of ALARA on October 16th dealing with reporting and the metrication issues and then a wrap-up for any final opportunity for other questions or clarifications.

With that, I very much appreciate all of your time and effort and thank you very much. Have a great day, folks.

(Whereupon, the above-entitled matter went off the record at 2:07 p.m.)