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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS (ACRS)

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RADIATION PROTECTION AND NUCLEAR

MATERIALS SUBCOMMITTEE

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OPEN SESSION

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WEDNESDAY

DECEMBER 16, 2009

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ROCKVILLE, MARYLAND

The Subcommittee met in Room T-2B3 at the Nuclear Regulatory Commission Headquarters, Two White Flint North, 11545 Rockville Pike, at 8:30 a.m., Michael T. Ryan, Subcommittee Chairman, presiding.

SUBCOMMITTEE MEMBERS PRESENT:

MICHAEL T. RYAN, Chairman

DENNIC C. BLEY

JOHN D. SIEBER

ACRS STAFF PRESENT:

NEIL COLEMAN

DEREK WIDMAYER

NRC STAFF PRESENT:

MEKONEN BAYSSIE

PATTY BUBAR

LARRY CAMPER

JEAN-CLAUDE DEHMEL

J. PEYTON DOUB

DAVID ESH

MIKE LEE

MIKE MASNIK

CHRIS McKENNEY

KIMYATA MORGAN-BUTLER

EDWARD ROACH

GREGORY SUBER

PRIYA YADAV

ALSO PRESENT:

JAMES H. CLARKE, Vanderbilt University

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

(8:32 a.m.)

CHAIRMAN RYAN: The meeting will come to order, please. This is a meeting of the Subcommittee on Radiation Protection and Nuclear Materials.

We will be meeting today on three topics. The first of which is an update on staff efforts to revise and update the Radiation Protection Standards in 10 C.F.R. Part 20 and 50; the status of NRC rulemaking efforts for "unique Waste streams," including depleted uranium; and review of proposed revision 2 to Reg. Guide 4.11, "Terrestrial Environmental Studies for Nuclear Power Plants." And we will have a public comment period after that last presentation, if there are any public comments to have.

The meeting is being transcribed, so we ask that you speak with sufficient clarity and volume so that you can be readily heard. And if you want to make a comment, please come to the microphone and identify yourself and speak clearly so that we can all hear you.

Without further ado, we will move into our first briefing and we have ask Dr. Kimyata Morgan Butler who is going to make the presentation on the

options to revise Radiation Protection Regulations.

Good morning Dr. Butler. It is nice to see you.

DR. MORGAN-BUTLER: Good morning. Thank you for having me.

Dr. Donald Cool, in the normal situation would give this briefing; however, he had a meeting at the IAEA in Vienna and he wasn't able to make it. He sends his regrets and he sent me to make this presentation.

Over the last year or so, we have been working on outreach efforts with NRC licensees. And this is going to give an overview of just a little background on what we have been doing for the last year and why we have been doing it and some of the things we have heard from the licensees during that last past year and also the public.

Recently or last year, the NRC staff previously briefed the ACRS on staff plans in November of 2008. In that briefing, Dr. Cool outlined the options paper that the staff was in the process of drafting. That option paper ultimately became SECY-08-0197 and it outlined the options of moving or not moving towards a greater degree of alignment with the recommendations in ICRP Publication 103.

Also, Mr. Jean-Claude Dehmel gave an update on Part 50 Appendix I updates in that same briefing and Dr. Cool focused more on the Part 20 updates.

In February of 2009, after we submitted the options paper to the Commission, we came back in. We briefed the full committee of the ACRS again and we gave the outline of that options paper. And from that meeting, there was a letter written on behalf of ACRS and it endorsed four things that the staff proposed.

It first endorsed the staff recommended option of moving towards a greater degree of alignment with ICRP Publication 103 but first looking at the impacts and benefits to the stakeholders and public. So, it allowed us to go out and interact with the public and you endorsed that.

You also concurred with us that the current regulatory radiation protection regulatory program provides for adequate protection of health and safety for workers and the public. You also made mention of not developing a second set of recommendations based on the ICRP recommendations on protection of the environment. So not to take into account the flora and the fauna in protection of the

environment, under the pretense that if we protect man, we also protect the environment.

And you also urged us to continue to interact with other international bodies and organizations, as well as other federal agencies and Agreement States and non-Agreement States with our state program.

And so, the Commission relied heavily on that letter in the SRM that was actually sent down based on SECY-08-0197. There was a lot of influence in that paper. And the Commission approved the staff recommendation in April of 2009. And so since that time, we have gone out and we have participated in many outreach efforts.

And the Commission gave us an objective for these outreach efforts and the objective is to explore the implications as appropriate, and where scientifically justified, of a greater alignment with ICRP Publication 103.

And they also told us, given that there is adequate protection, the discussion is to focus on discerning the benefits and the burdens and the impacts associated with revising the radiation protection framework.

So just to outline in the status update

our outreach activities, shortly after the SRM was signed by the Commission, we made and developed a website and that is publicly available now. We drafted a *Federal Register* notice and that was published, inviting inputs from different stakeholders and licensees. And we also developed a dedicated web address for comments. So, in addition to the website where you can submit comments or where one can submit comments, you can also directly email the regs4rp email address and that will be a way of submitting public comments. And they will all be docketed to the FRN, so they are part of public reference.

We also submitted an article for the FSME Newsletter and that is disseminated to a number of material licensees. We disseminated a press release and an All State Letter to both NRC Agreement States and NRC states.

And on the next slide, I am just outline some of the presentations that we have made. Dr. Cool made me put that picture up there. I really didn't want it there.

As part of these presentations, we brief the Conference on Radiation Control Program Directors, the Organization of Agreement States, the Society of Nuclear Medicine, the Health Physics Society, the Fuel

Cycle Exchange Conference which was held here at the NRC, the American College of Nuclear Physicians, the National SLO Conference, which is a conference that is dedicated to the state-appointed liaisons. There are governor-appointed liaisons for the states for interactions with the NRC. The NEI; the American Society of Nuclear Cardiology; the ACMUI, the Advisory Committee on Medical Uses of Isotopes, which is also an advisory committee here at the NRC; the American Association of Physicists in Medicine; the Florida HP/AAPM fall joint meeting. That was a more specialized meeting for Florida-based health physicists and medical physicists.

And also we briefed, recently, NASA, through a teleconference. During that teleconference, their health physicists were reached. There were maybe 13 satellite divisions of health physicists that we were able to brief. And also the fifth annual Asian Conference on the Evolution of the System of Radiation Protection. So we have had both national and international stakeholder meetings. We have gone out and we have contributed to these outreach efforts.

Our future plans, right now we are looking to engage the industrial radiography community because they are a special community, based on their inputs.

And I will get into that a little later. And we are also looking at other industry segments, such as public citizen groups. We are just looking at any way we can reach out to our stakeholders.

We have also scheduled presentations to the ISO/EPRI ALARA Conference, which is coming up in January of 2010; the RIC Conference which is scheduled for March of 2010; and also CRCPD, which is scheduled for April of 2010. So as you see, we keep our schedule pretty full with different groups.

Also, we are planning to start discussions for facilitated round tables. That is for April 2010. We are at the beginning planning stages for that but we envision maybe three or four round tables throughout the year next year, starting in the spring.

So, what have we heard? In interacting with the public and in interacting with these different stakeholders, what have we heard and what has been their vision of making these updates to the standards? Well, we have heard a wide range of views on some of the major topics that we introduced and I will go through each major topic in the next upcoming slides.

We have heard general support for increasing alignment with the international

recommendations and some of the other national regulations to improve consistent and transboundary considerations.

So one of the major considerations was with workers who were from Europe coming over and working in the United States and their potential to be injured, occupationally injured because of some of our radiation protection standards. So, we have taken that into consideration.

MEMBER BLEY: When you go through the rest of this list, would you do me a favor and highlight any areas that actually surprised you in what you heard or anything that has changed your planning for what you are hoping to do?

DR. MORGAN-BUTLER: Okay. Okay, thank you.

CHAIRMAN RYAN: Just for everybody's benefit here, this is really a two rem versus five rem question with the workers going across boundaries. Correct?

DR. MORGAN-BUTLER: Yes.

CHAIRMAN RYAN: Okay.

DR. MORGAN-BUTLER: And also, there is general agreement that the scientific information should be updated. During the last briefings, we

mentioned that the Part 20 regulations are based on the 1977 recommendations of the ICRP and Part 50, Appendix I is based on 1959 recommendations from ICRP-2. So there has been a general push that some of the scientific information should be updated.

So first I will start with effective dose. For Part 20 the change in effective dose, right now we use the terminology effective dose equivalent. And the ICRP recommends using effective dose. So for Part 20, it is not really a major change. It is a terminology change because the underlying method of adding internal plus external dose exposures is the same.

So Part 50 is a little different. For Part 50, Part 50 is based on the whole body dose plus the doses to the individual organs and it is not a sum. So, there will be a change for Part 50 if we change the effective dose but in making this change, we are hoping we will have more alignment across the Agency and with our international counterparts.

So in general, people have been supportive of the update. There has been no surprises on this one. There is a question of application of the current rule. Right now under the current rule, there was a change that was made in 2008 that the deep dose

equivalent may be used for an effective dose or in exchange for the effective dose. And so there is a change in how our current rule is actually implemented. We allow some two-badge methods now versus just a badge on the collar. So there is a slight change. And the licensees have questions about this, especially the states because this was an NRC regulation change. And so the states are wondering how do we interpret this.

CHAIRMAN RYAN: So some states, NRC states will have to use the NRC regulations, of course --

DR. MORGAN-BUTLER: Yes.

CHAIRMAN RYAN: -- because they are licensed directly by NRC. And other states will use whatever the state regulation is, until it is revised, or updated, or whatever it might be.

DR. MORGAN-BUTLER: Exactly.

CHAIRMAN RYAN: So there is a little bit of variability out there.

Are you going to talk a little about the differences in internal dose calculations between ICRP-2 and all the others?

DR. MORGAN-BUTLER: Well, in terms of there is different dosimetry models that are used. I don't know the specifics on exactly what has changed

but there is underlying differences in the internal dose models and that is what we are looking at for the numerical values, the nets.

CHAIRMAN RYAN: The key thing that has got to be addressed is that for ICRP-2 (1959) it is a dose that is calculated not based on an intake per year. It is a different kind of a calculation.

So if you want to limit somebody to five rem in a year under ICRP-2, you can get five rem from an internal burn of plutonium per year and be compliant, yet they are committed to 250 rem for a 50 year period. Whereas, we have a committed dose under the new system so that the committed dose per year never challenges the annual limit, like it does under ICRP-2 modeling. So, that is, I think a very important and probably more important difference between the old modeling versus the new modeling for internal exposure because that is a huge change in the allowance of dose and where workers that are managed under ICRP-2 could have a much higher dose in a given year than a worker who was managed under later either NRC or ICRP recommendations.

DR. MORGAN-BUTLER: Right. And so with the effective dose, that is more of terminology. But for the numerical values that are outlined, the next

subject, that is completely what we are looking at.

CHAIRMAN RYAN: Okay.

DR. MORGAN-BUTLER: In terms of the numerical values, we are looking at the radiation weighting factors, the tissue weighting factors, and all the physiological models versus the interaction between the physiological models and the radiation dose.

So people in general have been supportive of the update but the schedule for that, there is a schedule that the ICRP has under their subcommittee number five and they expect that the most widely used radionuclides, these weighting factors and dose conversion factors will be ready in 2011, whereas some of the transuranics and the ones that are not used as much, they will be ready in 2014. So that will impact on our rulemaking abilities, if the Commission decides to send us into rulemaking.

CHAIRMAN RYAN: The actinides are the ones where the biggest changes occur.

DR. MORGAN-BUTLER: Yes.

CHAIRMAN RYAN: So I wonder if it is a good thing to leave those until last.

DR. MORGAN-BUTLER: Yes, that is Dr. Keith Ackerman is working on that in Oak Ridge and that is

the schedule that they came up with. There has been some interactions with him through the Interaction Steering Committee on Radiation --

CHAIRMAN RYAN: You are absolutely right. It is true that there are very few plutonium intakes in any given year and mostly not at NRC licensees, it would be at DOE facilities, if there are any.

DR. MORGAN-BUTLER: Yes.

CHAIRMAN RYAN: But it is one with the biggest changes so that is something to think about.

DR. MORGAN-BUTLER: Yes and I think it is important to note that DOE recently updated their regulations to reflect ICRP-60.

CHAIRMAN RYAN: Yes.

DR. MORGAN-BUTLER: And so they are a little bit more advanced than in terms of our Radiation Protection Standards, compared to the recommendations.

For NRC licensees, for example, the fuel cycle licensees, we regulate them on, I hate to say it this way, but by exemptions. They seek exemptions to use the newer methodology, ICRP-72, which has different weighting factors that are much less conservative than the older numbers. So they petition the NRC for an exemption from using the older

standards and they are allowed to use ICRP-72.

CHAIRMAN RYAN: Got you. Thank you.

DR. MORGAN-BUTLER: Okay. And so the next topic is exactly what you touched on before, the occupational dose limits. Many that we have talked about or talked to, and this was a bit of a surprise to some people. You know, there is two camps and this could have been a bit of a surprise. Many wanted to stay at the 5 millisievert per year limit. There were a few comments to reduce the limit. The licensee segments that are concerned are the industrial radiographers and the cardiologists, the medical interventional cardiologists and radiologists. They think they will have a problem meeting a reduced limit.

From the reactor side, we have heard that they have planning values in place so it may not be as a big of a burden but they also have their opinion on it. They are going to submit us a position paper and I will outline that a little later.

CHAIRMAN RYAN: Okay.

DR. MORGAN-BUTLER: Also, certain groups of individuals continue to have, licensees continue to have individuals above this 2 millisievert per year index, what I just mentioned, the industrial

radiographers.

Also, I wanted to mention here that some nuclear medicine programs, they have individuals that have a hard time meeting this regulation also.

So we have heard that from our comments. We have heard that at different conferences. We have heard that from our e-mail box, where you can submit e-mails to us directly. And so that has been a common theme. And there is a preference by some stakeholders to keep the higher limit as a legal boundary and to increase ALARA and perhaps constraints to reduces doses. And what we mean by that is they propose maybe that they will formalize their planning values agree with the constraint, rather than a change in the dose limit.

But as we move on with constraints, we don't have the foundation yet on how we will move forward with constraints. Many licensees are concerned that this will end up being a legal requirement versus a planning value where you would have to submit to the NRC how you would reduce your dose exposure below a certain limit, below a certain level. It is more a debt than between the dose limit and the constraint level.

So a constraint is not meant to be a dose

limit, as indicated by ICRP. They did not want that to be interpreted as a dose limit.

MEMBER BLEY: May I ask you a question? Because I haven't been following it. I am pretty familiar with what has gone on in the nuclear power plants to reduce doses and what is happening with the newer plants.

Have there been similar efforts in radiography and in medical or just nobody has been pursuing that? Or is it not feasible?

DR. MORGAN-BUTLER: As far as I know, no one has been pursuing that. There is not really many formal planning value programs or programs that incorporate planning values, especially on the industrial radiography side and for the interventional cardiologists. We just haven't heard of them.

MEMBER BLEY: Okay.

DR. MORGAN-BUTLER: They may be out there but no one has indicated to us we have this program in place and this is how it has worked for us.

MEMBER BLEY: Thank you.

CHAIRMAN RYAN: There are a couple of groups that address it. I think ACMUI, which is an advisory committee here, has looked into those issues. The American Academy of Physicists in Medicine, the

American College of radiology have done some of that.

You know, one program, for example, of the American College of Radiology was looking at diagnostic techniques on children because there was a big concern that the parameters for children's exposure should be much different than an adult because of size and weight and all of the rest, and there was a significant effort to address that.

So it has been, I think ad hoc is a fair way to say it. They have looked at emerging problems but it hasn't been perhaps as systematic as the INPO and NEI efforts have been for nuclear power. But when they do address one, it has been fairly comprehensive.

Another one has been and now some many years past is mammography and looking at the quality of image versus exposure in that procedure. So there have been examples where I think there have been improvements in nonreactor areas but it is not quite as systematic.

The one challenge I think that might benefit from some additional input, Dr. Butler, is for radiologists and cardiologists in particular, is it their whole body exposure or it is their extremity exposure then calculated into an effective dose that we get into trouble?

DR. MORGAN-BUTLER: Right. I don't know.

CHAIRMAN RYAN: Yes, I think that is -- remember, a cardiologist has got an apron on. It is a pretty reasonable layer of lead. He has got a badge underneath it and a badge on top of it. And then his extremities, of course, are dealing with the patient more near the beam.

So, I think there is a question of is it a whole body exposure in the sense that it will work if he is doing steam generating work where he is in a constant field versus he has got a hand exposure that might average out in some way that is different.

MEMBER SIEBER: Do they make any effort to use selective dosimetry to figure that out?

CHAIRMAN RYAN: Oh, yes.

MEMBER SIEBER: You know --

CHAIRMAN RYAN: To my knowledge, yes.

MEMBER SIEBER: -- in power plants, in the old days when you did manual steam generator manipulations, they had dosimetry on your hands, arms, whole body, legs, feet.

CHAIRMAN RYAN: Yes, I mean, it is very common to wrist, whole body, and front, back, top, head.

MEMBER SIEBER: So does that validate the

hypothesis that the extremity dose is a controlling dose, the quality is not there?

CHAIRMAN RYAN: Yes, I am not sure of the result of that question but that was the question I was reaching for is how do we, what are we really worried about in basic radiology area? Is it extremity dose, actual whole body dose, or some averaging procedure that ends up with a number that is --

MEMBER SIEBER: Well then what we have then is the question as to what do you expect practitioners to do. Do you expect them to have dosimetry all over the place so that you can legally differentiate between whole body and extremity or are you going to make some global assumption that says ten percent of it is whole body, the rest of it is extremity? And since the limit for extremities is 20 times the limit for whole body, we aren't going to worry about it?

DR. MORGAN-BUTLER: I think, in practice, the real issue is the extremity dose, especially in terms of the cardiologist because they are actually manually manipulating on some of the rating.

MEMBER SIEBER: Yes, I've been there.

DR. MORGAN-BUTLER: Yes and that is why

that group as a whole may have less problem or more problems meeting the lower dose limit than some of the more generalists.

CHAIRMAN RYAN: And I think, in fairness, and I have heard medical folks say this is that if they are in a life saving situation where they have got a patient that is going to die if they don't do something, fix something, their hand dose is not necessarily at the forefront of their thinking at that very second, although it is not a trivial matter, they are looking to save a patient's life.

Now, that is different than an ALARA planning for steam generator activity.

MEMBER SIEBER: Yes, on the other hand in emergency situations you have larger dose limitations that are allowable for lifesaving purposes. The question becomes, you know, how do you define lifesaving?

CHAIRMAN RYAN: I'm not sure that is true in the arena of the diagnostic radiologist.

MEMBER SIEBER: No, it isn't.

DR. MORGAN-BUTLER: In terms of Part 20, Part 20 is not for emergencies. So, it is not in effect for emergencies, emergency situations.

CHAIRMAN RYAN: So may be it has some

thinking to do about how ALARA is practices by area, by say nuclear power versus medicine versus environmental versus radon versus any other kind of exposure.

DR. MORGAN-BUTLER: Now we have heard that comment from both our international counterparts and from some segments within the United States.

CHAIRMAN RYAN: Yes.

DR. MORGAN-BUTLER: And from a regulation standard, that may be hard to manage and put our hands around but we are considering it because this relates to it.

CHAIRMAN RYAN: Yes, I threw out just for thought the idea that if you have a pretty clear standard and then you have flexibility for an ALARA program to show you meet that standard, based on your industry type, that certainly has some merit to think through if that would be the way to go or not.

DR. MORGAN-BUTLER: Right. But the person on the other side of that argument may say, you know, Canada and Europe and other countries have been able to comply with a lower dose limit, so why can't we.

CHAIRMAN RYAN: Yes, and I am not saying a numerical value. I am simply saying how do we apply it?

DR. MORGAN-BUTLER: Yes.

CHAIRMAN RYAN: So, I think --

DR. MORGAN-BUTLER: And these are conversations that we have and we try to look at all sides of that conversation.

CHAIRMAN RYAN: Sure. Well, it is clear you have got the issues on the table and you seem focused on the same things we are thinking up for you.

DR. MORGAN-BUTLER: Yes.

CHAIRMAN RYAN: Okay.

DR. MORGAN-BUTLER: Also, the next issue and this was a topic at the February meeting where we had a bit of discussion on the dose limits for the embryo/fetus. We received mixed feedback from that for making that change. Right now the NRC limit is five millisievert per year for the entire gestation. ICRP recommends one millisievert from the point of declaration. So if we make this change, it could be more or less conservative, just depending on when an individual decides to declare pregnancy. And under federal laws, a person has a right to determine exactly when they want to declare pregnancy to their employer.

So, we have received mixed feedback and there is alack of data on this.

And this brings me back to another point that you made in terms of data from licensees, there is different requirements for reactors versus materials. We have the REARS Program here at the NRC where certain power reactor licensees have to submit to us occupational data from their workers. We don't have that intact for some of the material licensees.

NRC regulated licensees on the material side but for Agreement State licensees, they don't have to turn in that data to us. Some of them have volunteered to give us some of their data based on our efforts now, but there is no regulatory requirement that they share that data with us. So, we have very limited data on occupational dose exposure, both for the general occupational exposure and for this exposure to the embryo fetus.

CHAIRMAN RYAN: And the interesting part about the dose to the embryo/fetus is the sensitivity periods are not constant over the gestation period. I mean, Dr. Bob Brent, who is a world renowned expert, can tall you in great detail about what is the actual period of risk in a pregnancy versus the entire pregnancy. So, I wonder if you are considering things like that as well.

I know it is much easier to say for the

gestation period it is X.

DR. MORGAN-BUTLER: Right. So that is why we say you know, it could be less or more conservative. If someone decides to declare in the fourth month, for example, in the first month versus the fourth month, there may be a big difference there, or versus the ninth month where the embryo/fetus is more sensitive at the beginning of the gestation period.

MEMBER SIEBER: Is it true that the radio sensitivity is highest at the youngest stages?

CHAIRMAN RYAN: The earliest stages, yes.

MEMBER SIEBER: Right. And that is where there is great uncertainty as to whether there is or is not or how old it is. Right?

CHAIRMAN RYAN: Yes.

MEMBER SIEBER: I have read through perhaps a hundred of these cases where this issue has come to the point of exceeding limits. And generally in pregnancies of that type, a primary reason is because a woman doesn't know she is pregnant and that is when the greatest radio sensitivity occurs.

CHAIRMAN RYAN: That is the most common question submitted to the Health Physics Society, is I had a dental x-ray and found out two weeks later I was

pregnant.

MEMBER SIEBER: Yes.

CHAIRMAN RYAN: What should I do?

MEMBER SIEBER: Yes, well --

CHAIRMAN RYAN: And the answer Dr. Brent gives over and over again is nothing because the dental x-ray dose to the fetus is trivial.

MEMBER SIEBER: Yes well, on the other hand the cases that have been cited as violations, I think there is 87 cases or something like that, where it was thyroid treatment, potassium iodide.

CHAIRMAN RYAN: That is a whole different world. But yes, I mean, it is certainly a question of time and exposure of the aging fetus as to what the sensitivity is.

MEMBER SIEBER: Well I think this, personally, needs a look at as we go through all of this.

DR. MORGAN-BUTLER: Okay and I will make note of that.

CHAIRMAN RYAN: You know again, I would offer the idea that Dr. Brent, who is very generous with his time and talent would be a really good resource to help to address this question.

DR. MORGAN-BUTLER: Okay, thank you.

CHAIRMAN RYAN: In fact, we might even invite him to come and give a talk to the subcommittee at some point.

DR. MORGAN-BUTLER: Okay.

MEMBER SIEBER: Thank you. Sorry for the interruption.

DR. MORGAN-BUTLER: No, no.

There are some opinions, actually, that challenge the limits for detection, I mean of detection for monitoring. They are worried about whether the detection methods are adequate. And so we have heard those opinions.

And we have heard specifically from nuclear medicine labs that they prefer the current limit for operational reasons because their workers will most likely hit upon a reduced limit. Five hundred millirem or five millisieverts, they are able to meet, but one millisievert, they think that there will be a definite problem there.

CHAIRMAN RYAN: And again the question that I would ask and maybe it is the whole body is the limit, but is it the extremities, the hands, whether behind a shield doing closer manipulations, that is driving that average?

DR. MORGAN-BUTLER: I would suspect for

this population, it would be extremely possible.

CHAIRMAN RYAN: And maybe the question isn't what should the effective dose number be but maybe the extremity calculation or assignment of the weighting of that exposure versus the whole body exposure might be something to think about.

DR. MORGAN-BUTLER: Okay. And also I just wanted to mention that by us using the 77 ICRP weighting factors and tissue weighting factors, we may end up seeing some changes once we make those conversions to publication 103 in terms of extremity dose and making those calculations. We are not sure yet what the magnitude of those changes will translate at this point.

CHAIRMAN RYAN: The unfortunate problem here is constraint in many people means limit.

DR. MORGAN-BUTLER: Yes.

CHAIRMAN RYAN: And ICRP does not mean limit when they use constraint.

DR. MORGAN-BUTLER: No.

CHAIRMAN RYAN: So a very carefully developed glossary of terms will be helpful to get everybody over the hurdle, if you do it.

DR. MORGAN-BUTLER: Yes. And also in terms of constraints, we don't imagine a constraint

being a limit where there will be an enforcement action. It will be a planning value where if you exceed that value, then you will have to submit to the NRC how you are going to limit your exposures for the rest of the year.

CHAIRMAN RYAN: Yes, how are you going to adjust your ALRA program. I mean, that is the exact point. It is a different kind of a thing than a limit, --

DR. MORGAN-BUTLER: Yes.

CHAIRMAN RYAN: -- in terms of what you just said, which is compliance oriented thinking. So making that clear as a bell in the development would be helpful to, I think, educate the regulated community.

DR. MORGAN-BUTLER: Okay. And our next topic here, use of constraints for ALARA planning, constraints are not well understood at the fifth annual Asian Conference on the Evolution of Radiological Protection. There was a robust discussion on implementation of constraints. And actually members from the core ICRP committee and from the subcommittee that was appointed to look at constraints, they were at that conference. And they admitted that there has been some back and forth over

exactly how constraints should be implemented.

So we have heard that also from our interactions with the public. What is the constraint? How are they going to be implemented and what is the general concept? And as I mentioned, there is questions on inspection, and compliance, and reporting of these constraints. And some of the stakeholders are leaning to endorsement of a constraint because they already have that in their system, a planning value or they want to set a value to provide flexibility.

So the next portion we are looking at Part 50 of Appendix I. Mr. Jean-Claude Dehmel from the Office of New Reactors is here also and he will answer, if there is any specific questions about some of these issues that they have heard, he will make comments on that. But the staff, over the last few months, has had an ongoing, or for the past few years actually, even before this project, they had ongoing discussions with industry reps as related to efforts on new reactor licensing.

And in general, the industry has been supportive of revisions of Part 50 in guidance. They propose a comprehensive recommendations for the regulations surrounding Appendix I.

There also are some concerns, however. There is a concern about the scope of the revision, the industry participation in the effort, and how these revisions will be implemented, ultimately.

The industry also is looking to urge a revision of 40 C.F.R. Part 190 as implemented under Part 20.1301(e) for reactors. So, in Part 20 1301(e) there is requirement that licensees must comply with 40 C.F.R. Part 190.

We have heard that the EPA plans on making some revisions to 40 C.F.R. Part 190 but we are not sure. I am not sure, personally, of the scope and how long that process will be but we have heard they are considering that.

CHAIRMAN RYAN: Is there an interagency effort or steering group or working group to try to address consistency?

DR. MORGAN-BUTLER: The Interagency Steering Committee on Radiation Standards, --

CHAIRMAN RYAN: ISCORS.

DR. MORGAN-BUTLER: -- ISCORS, there is an EPA reference under this and they are looking into making changes to 40 C.F.R. Also, they are also making changes potentially to their Federal Guidance, Federal Guidance 11, which are dose conversion

factors. And this coefficients and dose coefficients are presented in FGR 11. FGR 11 is a little different from the international dose coefficients. FGR 11 is based on the U.S. population. So it is a smear of the U.S. population versus the international population.

CHAIRMAN RYAN: Right. It is the cancer risks that --

DR. MORGAN-BUTLER: Yes, the fatal cancer risks.

And NEI expects to issue a White Power in March of 2010 with recommendations on realignment with ICRP-103. They told us this, that they expect to issue a White Paper.

So looking into schedule, what are we doing over the next few years? In the spring, we will initiate detailed discussions, including possible workshops, on the options and the impacts. We are also looking at our Office of Research on Technical Basis support for data needs, such as occupational data, looking at some of the impacts of reducing our dose limits and supporting some of the weighting factor updates.

And also we have ongoing interactions with federal agencies and state agencies through ISCORS. Also through ISCORS, the EPA's Federal Guidance for

occupational dose limits, which is the EPA actually is in charge of the Federal Guidance and it is signed by the President. They are actually convening a subcommittee or reconvening a subcommittee to look at updating the Federal Guidance for both the occupational dose exposure and the public dose exposure.

CHAIRMAN RYAN: And the EPA does not, I mean they regulate the public exposure part but not workers. Is that correct?

DR. MORGAN-BUTLER: There is Federal Guidance for occupational dose limits also. And that guidance, it directs other agencies. We are not obligated to do it on the NRC side but we usually comply with that Federal Guidance. And it is signed by the President. There hasn't been an update to the Federal Guidance since 1987 for occupational dose limits. And all the way back to the Eisenhower Era for the public dose exposures.

And also we are continuing to monitor any international developments. We are interacting with our international counterparts to pick on some of their implementation efforts for ICPR Publication 103. What we have heard is that since they already adopted ICRP Publication 60 in 1990, that adopting 103 has

been a much easier process. It is going much faster than the process of going from ICRP-26 to ICRP-60.

And for any questions, you can of course ask me questions today, but we also have the web page that I mentioned before, the web page that is on the NRC public site. There is a tab on the NRC public site that says "Radiation Protection." If you click on that, it will take you to a second page that has "Other Related Information" which is at the very bottom, it is a choice at the very bottom, and you click that, then you will see a link for options to revise radiation protection and regulation. So, it is three clicks in from the home page. We tried to get it further up but we weren't very successful in that yet. We may get there, though, eventually.

We also have an e-mail address regs4rp@nrc.gov, where stakeholders can send us, to make comments directly to us and we monitor that. We also docket each of these comments to the *Federal Register* Notice that we have out for the subject.

And with that, I will open up to any more questions.

CHAIRMAN RYAN: Questions?

MEMBER SIEBER: I am curious about a number of things. Of course, the following slides

here have talked about implementation strategies and the options that are available but one thing that I notice from looking at various pie charts of radiation dose received, you will notice that --

DR. MORGAN-BUTLER: It's more medical.

MEMBER SIEBER: -- background radiation from terrestrial and cosmic forces is 250 as you are younger, going up here. And manmade contributions are a small fraction of that but they have been increasing drastically over the last 10 or 15 years. That pie chart has changed quite a bit in my work and career to show that now, you can expect with contributions for medical procedures, perhaps a total dose including maximum radiation of five or six hundred millirems per year.

CHAIRMAN RYAN: Remember ITIP, I think, put out in the 103 report is 602 or something like that. It is now medical equivalent to the radon.

DR. MORGAN-BUTLER: We have.

MEMBER SIEBER: It is up there. So the question becomes since more than half of that is manmade radiation, is there a consideration of total dose to the entire population, versus individual doses to individual people, as far as setting the limits? Is there a consideration in trying to perform ALARA on

all of this so that in three hundred million people, for example, the population of the United States, the positive radiation dose to that entire population results in less fatalities, if you know what I mean.

You have to go by the assumption that there is no threshold limit in order to make that conclusion. But there is a lot of dose out there these days that weren't there when I was a young man.

DR. MORGAN-BUTLER: I can give you ICRP's point of view on collective dose. They do not endorse using collective dose. They would prefer that individual dose be used for limits, the public exposure limits.

MEMBER SIEBER: And so from the public health standpoint, that would be the direction that NRC and EPA and others are going.

CHAIRMAN RYAN: Yes, I think the collective dose is fraught with a lot of difficulties.

MEMBER SIEBER: Yes, I know. It is.

CHAIRMAN RYAN: Because the collective medical dose is not delivered, on average to the population. It is delivered in much larger chunks to a very small proportion of the population.

MEMBER SIEBER: And one can say that you don't give a medical dose unless a person is already

in trouble. And so the question is, do you improve life or do you shorten life by the application of ionizing radiation to a patient where it is shown that there is a benefit associated with that. I think that would be difficult to regulate. But the thought keeps going through my mind about that. And then when I look at things like procedures that are not necessary techniques that are not appropriate for a human examination, I tend to want to look further at --

CHAIRMAN RYAN: Yes, and I appreciate that. I do recognize many of my colleagues that work in medical areas are very serious about radiation protection and ALARA and look at it from a worker's standpoint and a patient's standpoint and all of that, you know, in the context of what you just said, which is they are very often saving life.

MEMBER SIEBER: And I have also noticed improvement in the training of technicians and positions over the years, which I think has been substantial in the limited scope of mine.

CHAIRMAN RYAN: If you turn to slide 15, I can give you a picture of where we have come from. This is the first x-ray machine in that picture. And the guy sitting on the couch on the left is actually the timer of the x-ray machine. He is got a stopwatch

in his hand.

MEMBER SIEBER: He holds up the lead shield in front of the beam?

CHAIRMAN RYAN: If you look carefully, right over the patient's thorax, you can see a bare x-ray tube.

MEMBER SIEBER: Okay.

CHAIRMAN RYAN: Yes, you have to look up close. But radiation protection in medicine has come an awful long way from those early days, which were actually the turn of the century. That is in World War I. It is a battlefield x-ray and under the physician's feet, on the right of the picture, there is a whole bunch of truck batteries that so those together are the power of the x-ray tube.

MEMBER SIEBER: In the 1950s they used a fluoroscope to see if your shoes fit your feet. Oh, we used to hang out at the shoe store.

CHAIRMAN RYAN: I think that gives you a baseline from which we have come many, many light-years from.

MEMBER SIEBER: Okay, we have had improvements over the years.

CHAIRMAN RYAN: This has been a helpful discussion, Dr. Morgan-Butler. I appreciate where you

are and where you are going. It sounds to me like it may be an additional subcommittee meeting around March, maybe when then NEI makes its presentation and maybe we could hear at the same time what they have to say or arrange somehow to coordinate that with your efforts.

DR. MORGAN-BUTLER: That would be perfect because March, if we do it in March or early April, we have a closing date for our comments. Our first closing date for public comments is March 30th.

CHAIRMAN RYAN: Maybe that timing would work well. It sounds to me like from what you are saying, you are really at an interim step here and it wouldn't be all that useful for us to think about writing a letter at this point but maybe hold it until we hear the NEI and then see where you are at the common close and go on from there.

MEMBER BLEY: Could you give us the rest of your schedule, beyond the closing comments?

DR. MORGAN-BUTLER: We have a SECY paper that is due to the Commission in December of 2011.

MEMBER BLEY: '11?

DR. MORGAN-BUTLER: Uh-huh.

MEMBER BLEY: Okay.

DR. MORGAN-BUTLER: Right now, we are

developing a user's need for research for some of the medical occupational exposures and other subjects on the medical side. The Office of New Reactors is there developing some information to inform the paper also.

And so around April of 2011, we will start drafting that paper that is due to the Commission in December. That is our next major deliverable.

And to just add some clarity to what I mean when I say paper, it is going to be a policy paper, which will outline some of the impacts and benefits and options of moving toward a greater degree of alignment. Then the commission will decide whether they will move forward with rulemaking activities and with technical basis developing it. So some of the things that we use to develop the policy paper may ultimately be used in our technical basis. But we are making gradual steps toward having the Commission give us the green light to go.

CHAIRMAN RYAN: So you are answering the SRM that you received from the Commission.

DR. MORGAN-BUTLER: Right now we are working towards that.

CHAIRMAN RYAN: That is goal?

DR. MORGAN-BUTLER: Yes.

CHAIRMAN RYAN: Okay.

DR. MORGAN-BUTLER: We had a few taskings from the SRM. And one of the taskings was to outreach with the public to stay in interactions and to also submit this paper.

CHAIRMAN RYAN: Great.

DR. MORGAN-BUTLER: And we have a progress report that will be sent this month also that we are sending. It is more of a status. In terms of you writing a paper for that, we are really interim. So, right now, we don't have any solid conclusions to give you to base your recommendations on.

CHAIRMAN RYAN: I would like to turn your attention just for a minute to the nuclear power arena. We have been given from NEI fairly comprehensive data on the worker exposure history and current trends, which has been downward for some decades now. And they have a large proportion of the workforce that are under two rems a year and perhaps some specialized groups that might be a little bit above that.

One of the efforts they are undertaking to address that one for the current fleet and then what structure are they thinking about in terms of new reactor designs in terms of ALARA. I must say we went through as a committee the EPR, radiological

protection chapter and I was pretty impressed that they had done an awful lot of thinking about maintenance activities, in particular, with regard to ALARA in that effort.

So is there a look at all of the reactor designs with this question in mind of what the new dose levels could be or not?

MR. DEHMEL: No. Because all that we had verification of is submitted under the current regulations.

CHAIRMAN RYAN: Okay. So how would that work out over time if these regulations changed?

MR. DEHMEL: Well, let's just take it once we start to develop the guidance and the rationale for the new regulations, you know, the industry will provide some input and we will address this during the rulemaking process.

CHAIRMAN RYAN: go ahead.

MR. ROACH: Good morning. My name is Ed Roach and I am the Acting Branch Chief for the Health Physics Branch of New Reactors. And one of the points I would like to bring up related to the current applications in the new reactors, all of those applications are coming in at or below the median value that is presented in the NUREG 0713. And I

think the most recent version I saw had about seven workers reported greater than two rem in a year. Other radiography and some others had around another 70 workers who received more than two rem.

So at this point, I think, the actions they are taking to maintain doses below two rem seem to be working currently.

CHAIRMAN RYAN: I guess at least in the reactors it is probably correct to think of those few exceptions as specialized work activities.

MR. ROACH: Yes, I would believe they are probably in-service inspection or NDE type work.

CHAIRMAN RYAN: Right. Okay, thanks.

MEMBER SIEBER: Maybe I can -- you originally asked for my comments and I asked a question instead of giving you my comments.

My comments are that I still support our February ACRS letter and I believe that the staff has done a really good job in obtaining a wide variety of information. They have been supportive of ICRP 103 and the implications of the implementation. And I think we are headed in the right direction.

So, I support what the staff is doing in this area and I think they have done a really good job.

CHAIRMAN RYAN: Dr. Bley.

MEMBER BLEY: I would go right along with what Jack said and I am pretty impressed with the range of outreach that you have managed.

That issue of the cardiologist and radiographers having trouble with a two rem limit and whether or not everything has been ad hoc up until now seems kind of interesting to me. And I am understanding better what the problem there is. It seems like it will be very useful and I will suspect you will know more about that the next time we talk.

DR. MORGAN-BUTLER: Yes, we've asked them for a voluntary data submission from different societies. We are still awaiting some of the information that may come in through that method.

From a regulatory point of view, we don't have any requirements for the data. So we are looking into outreach efforts and looking at surveys. And there is also a NUREG that is going to be updated by research as part of this effort. And that NUREG looks into different segments of licensees, medical, licensees.

The last time that the NUREG was written, it was written by Dr. Meinhold, Charles Meinhold and he looked at, or his group, they looked at the

different segments of the licensee's: medical, industrial, radiographers, power reactors, just to see what the impact would be and how many people would exceed a lower dose limit. And so they looked at a dose limit at five rem, two rem and one rem. And they found there that most segments they would not have any problem with the five rem dose limit but the two rem was more challenging. And I think maybe this time around we will ask for more specialized segments of the licensees.

For example, for power reactors, maybe steam jumpers and for the medical community, maybe information on cardiologists or interventional cardiologists. So we are thinking of ways to approach this issue this time that may --

CHAIRMAN RYAN: Another resource you might call on is Dr. Bob Emery who is down at the University of Texas. He has actually done some studies on well logging and found that there is a pretty strong correlation between events, both lost sources, and exposures and training. You know, when the oil fields have a layoff and everybody goes and does something else, they all kind of disburse. And when there is a boom, they all come back or new people come back. And that is exactly when the spike in troubles happen, is

when the new people out in the oil fields do some logging and so forth.

So, he might be a good resource to help tap into what is happening in that segment, which is one of the ones that always catches a little attention.

DR. MORGAN-BUTLER: Okay, thank you. Well logging was another segment.

CHAIRMAN RYAN: Yes.

DR. MORGAN-BUTLER: So at least we haven't named a follow-up.

CHAIRMAN RYAN: And he is actually in Texas and has been following this for quite some time and has a lot of very, very good insight. So he would be the guy I would call on to pick his brain.

And again, I second the comments we have had from other members that you have done a great job on getting started. You sure have defined a landscape well. And I think unless you have any specific need for us to write a letter at this point, it is probably best that it wait until march and hear from NEI, as you hear from it and then make that same assessment if it is letter writing time or not then. Because I am sure you will be further down the line on some of these other questions that you have raised today that

you are investigating.

DR. MORGAN-BUTLER: Yes.

CHAIRMAN RYAN: That's great. Thank you very much, Dr. Morgan-Butler. We appreciate your being here and we will tell Dr. Cool that he had an excellent stand-in. You did a great job. Thank you very much.

DR. MORGAN-BUTLER: Thank you.

CHAIRMAN RYAN: Let's see. We are scheduled to have a break and not reconvene until 10:15. So we are sort of stuck with needing to be on that schedule. So we will stop the record here and reconvene at 10:15.

Thank you all very much.

(Whereupon, the foregoing meeting went off the record at 9:30 a.m. and went back on the record at 10:15 a.m.)

CHAIRMAN RYAN: Okay, I would like ask everyone to come back please. Thank you.

Before we have our next speaker, I want to recognize all the ACRS and all the ACNW staff members. Dr. John Flack is retiring and I want to thank him for his many years of service to this Agency and particularly to this committee and its sister committee, ACNW. John, thank you very much and we

wish you all the success you can find in retirement.

DR. FLACK: Thank you, Mike.

(Applause.)

CHAIRMAN RYAN: And without further ado, we will have our next presentation. Priya Yadav is going to talk to us about the status of rulemaking for depleted uranium and other unique waste streams. Welcome.

MS. YADAV: Okay, great. Thank you. Well, let me introduce myself. My name is Priya Yadav. I am the Project Manager for Depleted Uranium and so I am talking to you about the status of rulemaking for DU and other unique waste streams.

I am going to give this presentation just because it is more of an overview presentation but I wanted to introduce our team. So when we get to the question and answer period, we have lots of resources here to answer technical questions and program-type questions. So for those of you who aren't kind of familiar with how the Division of Waste Management is set up, I just kind of wanted to introduce everybody.

Dave Esh is our Senior Systems Performance Analyst in the middle right there. So he is responsible for all of the technical work associated with this project. To the left of him is Christ

McKenney. He is the Chief of the Performance Assessment Branch. So he is Dave's chief. And the way we are divided up is Chris McKenney is the chief of the kind of technical branch, where we do all the performance assessment and then Greg Suber is the chief of the branch I am in, which is more the Project Management Branch. And then Patty is our Deputy Division Director of the Division of Waste Management. And I don't think Larry is here yet but he will be arriving shortly. Larry Camper is our captain. So, he is our captain and Patty is our co-pilot. We are all available to answer questions after I get through this presentation.

I also wanted to beg your forgiveness. I am 36 weeks' pregnant, so I am definitely going to sit. I can only stand for like one minute and I am a little short on breath. So, I am going to breathe heavy every now and then. Sorry about that. Let's get started.

Just an overview of where we are going with this presentation. First, I am going to give a little bit of background on depleted uranium and then talk about specifically the Commission direction, where we got our marching orders from to specifically look at the regulation of DU; then talk about our

rulemaking, kind of the steps that we are proceeding along right now; give a quick summary of the workshops that we had in September of this year; and then talk about our next steps.

So to start off with the background, we developed this term "unique waste streams" to apply to significant quantities of DU because really DU is very different than typical low-level waste. Primarily the concentrations in quantities of DU that we are seeing commercially generated right now weren't included in the environmental impact statements associated with Part 61. And the reason for that is because DOE was the only entity generating large quantities at the time the Environmental Impact Statements were developed. So, it wasn't a commercially generated waste stream at that time.

So as a consequence, large quantities of DU have not been included in the Environmental Impact Statements for Part 61. DU is also different because it behaves differently over time than typical low-level waste. So typical low-level waste, you would see the hazard kind of decreasing over time. DU actually the hazard increases over time and persists for a much longer time frame due to the in-growth of long-lived daughter products.

We think that the impacts from DU disposal are manageable and so mitigation is possible and some of the ways you can mitigate them are to either increase the burial depth that you dispose of DU or to install a robust radon barrier and to be able to justify the performance of that barrier for long performance time frames, since DU is such a persistent hazard.

So, because it persists for such a long time, probably the right combination, the right engineered solution is probably a combination of those two mitigating factors.

This graph just shows kind of how DU is different than commercial low-level waste. The bottom line is typical low-level waste that you would see at a low-level waste disposal facility. And you can see at about time a thousand, you decrease to about less than one percent of the initial activity. In contrast, DU actually starts to increase at year a thousand because you start to get the in-growth of a lot of the long-lived daughter products. So the radon activity starts to increase. And at about a year a hundred thousand you start to exponentially increase and you don't see the peak impact, the peak dose from DU until after a million years. So you can see that

the inventory is very different than to the low-level waste. That is kind of why we have to look at DU differently.

DU is currently a Class A waste stream. And this is because of a default provision in 61.55. 61.55(a)(6) currently says if a radionuclide is not listed on tables one or two, then it can be classified as a Class A waste stream. This was an attempt at the time to kind of catch waste streams that weren't considered to be generated in significant quantities, weren't expected to be very hazardous, persist for a long time.

So as a result, only small quantities of DU are kind of assumed in Part 61, approximately six metric tons. There was a draft limit in the draft Environmental Impact Statement of 0.05 microcuries per centimeters cubed. This limit was not adopted in the final, based on comments that were received on that number in the draft EIS. And comments were received that the types of uranium bearing waste streams that were being generated did not warrant having a specific limit for uranium in the waste classification tables. So that limit was not adopted. It is just kind of to give you a comparison of what was considered with the EIS, compared to the specific activity of DU, which is

actually ten times higher.

So right know we are kind of in territory that wasn't envisioned before 20 years ago, 30 years ago. So that is why we are looking at our regulations.

The current situation is that there is several commercial enrichment facilities that are now on the horizon. So Louisiana Energy Services, LES was licensed recently. They are projected to start up, I believe next year and our Office of Nuclear Materials, Safety and Safeguards is currently reviewing applications for GET Hitachi in North Carolina and AREVA in Bonneville, Idaho, the Eagle Rock facility. So, there is definitely new enrichment facilities on the horizon that will generate DU that needs to be disposed of.

DOE has significant quantities stockpiled at Paducah Portsmouth, gaseous diffusion plants that they have been generating for decades. They have deconversion facilities that are planned to deconvert the DUF6 cylinders that you see here into an oxide powder. And there will be an annual three putt from those facilities that needs to be disposed of.

In addition, there is actually also DU kind of legacy waste from DOE that is at the Savannah

River site that also needs to be disposed of.

CHAIRMAN RYAN: How much is hexafluoride?

MS. YADAV: All the DOE waste at Paducha and Portsmouth is hexafluoride.

CHAIRMAN RYAN: Hexafluoride. So you started off by talking about uranium metal. And we talked a bit about oxide and now UF6. I am guessing they all have a different profile from the disposal perspective.

MR. McKENNEY: Again, as she said, they are building deconversion facilities for Portsmouth's and Paducah's waste to be because the final disposition is is that they want to create all of the UF6 into a U308 oxide for disposal because of the various issues of trying to dispose of UF6 or a green salt. Both of which were looked and decided by DOE as not to be a long-term solution if it was decided that depleted uranium was a waste.

CHAIRMAN RYAN: Right. I just wanted to get to the idea that we are really talking about oxides and metals as a disposed material. Correct?

MR. McKENNEY: Right.

CHAIRMAN RYAN: And there are differences between those two you will touch on.

MS. YADAV: Well, I think DOE has told us

that they are looking at oxides and oxide powder, not metals.

CHAIRMAN RYAN: Well there is a lot of metal whether DOE likes it or not to deal with, too.

MS. YADAV: Right. So the Commission realized that the landscape is significantly changing from what was envisioned, what was encompassed in the Part 61 EIS statements. So during the LES proceedings when interveners filed contentions asking about the impact of DU disposal, the commission issued a direction to really look at this outside of the LES proceedings to look at whether large quantities of this waste stream warranted a change in our regulations. So they said, look at this catch-all statement that says do you use Class A waste and also look at the waste classification tables that make a recommendation specific to DU if we need to change our regulations.

So in response to that, we wrote a commission paper in October 2008 that SECY-08-0147 and we have four options in that paper and in conjunction with that paper, we did our technical analysis kind of to inform those options and identify what the key variables were that really were driving the dose from DU disposal.

So a couple summary slides on the technical analysis but feel free to ask more questions during the question and answer period to get more specifics. I mean, we pretty much spent two days talking about our technical analysis and different aspects of our technical analysis at our workshop. So feel free to ask questions as they come up.

But the screening model that we did, our technical analysis was really a screening model to inform our options and it was developed for a generic low-level waste disposal site. So it wasn't done to look at any site-specifics for any existing disposals sites like, you know, EnergySolutions at Clive, Utah or WCS in Andrews County, Texas. It was really just for us to kind of understand the range of variables and what is really driving the results. And so we looked at period of performance, disposal depth, receptor type, scenarios, and the site characteristics, and we vary each different variables probabilistically to understand the impacts.

We were consistent with Part 61 methodology as much as we could, and only updated things where we thought we had a lot more capability and really needed to be updated.

Just a few conclusions that we found from

our analysis. We found that if radon is included, shallow disposal, even at an arid site, is challenging. At humid sites as you would expect, groundwater pathway is what is driving the risk and that could exceed the performance objectives. Because DU is such long-term hazard, you really need to think more about long-term stability. And also that uranium's behavior is very site-specific. And so the conditions at your site have a large impact on your dose.

CHAIRMAN RYAN: I wonder if we could ask, this seems to be the only real slide that gets to the analysis and the conclusions. Could you maybe spend a couple of minutes on each one of these and talk about what parameters were driving that analysis conclusion?

MS. YADAV: I am going to defer to Dave for that.

MR. LEE: Dr. Ryan? Could I just ask one question? In that context, is -- Mike Lee, ACRS staff.

When you say a generic site, what kind of site was that? Was that a human --

CHAIRMAN RYAN: Yes, I am just trying to get a framework so everybody on the --

MR. LEE: -- or arid, or whatever?

CHAIRMAN RYAN: -- Site Committee has an idea. They didn't sit through the excellent working seminar that I happened to sit through in Bethesda so I think it would be helpful to get some insights into why you have reached these conclusions, each one.

MR. LEE: Okay.

CHAIRMAN RYAN: I don't know if you want to give them one answer.

MR. ESH: Yes, sure. This is Dave Esh. I am in the Performance Assessment Branch. And I had a couple of other people help me with this evaluation. Chris Grossman and Karen Pinkston. And the approach we took when we were faced with this problem was to try to break it down and say what sort of information or direction can we give to decision makers to help them in this process of what we need to do.

So, we set up what I would call a screening analysis to try to identify the major variables that would impact or drive the decision. And Priya talked about those I think maybe the slide before this.

The key variables that we came up with and that resulted, it was a couple of iterations, it wasn't a one-pass through, was the period of performance, the disposal depth, the receptor types

and scenarios, and the site characteristics. And you can imagine for this type of problem, the list is much longer than that. If you wanted to put a lot of energy into engineering your waste form or your facility, those sorts of things would definitely fall in this list.

But because there is, in general, probably a much higher cost associated with those things, we wanted to stick with technologies used today for disposal and limit our evaluation to those. We did set up our analyses to look at alternative waste forms and alternative engineering, that sort of thing, and see how it would affect the results.

If you have high concentrations of long-lived waste, then your ability to use engineering such as caps or resistive type barriers becomes a big challenge. But where there would be quite a bit of potential and promise would be in engineering the source term. So if you can create a waste form that is compatible with this disposal environmental and has low leach ability, low solubility, essentially, that would be your ideal situation. You can go back to the other slide, Priya.

So on each of these bullets that we wanted to talk about here, radon, the first one, what we

found is that the radon fluxes. And therefore, radon doses that you would get from this sort of problem are very dependent on the moisture content in the system. And that is the site averaged moisture content spatially and temporally.

So, if you have dynamic conditions that change your site from dry to wet or wet to dry or if you have heterogeneity in the materials at your site, that can impact your average radon concentrations that you would estimate. It is also very sensitive to depth. So it is non-linear with moisture content. If you have a much thicker layer of higher moisture content, the fluxes can be orders of magnitude lower than if you have a thin layer of low-moisture content.

Emanation is a factor in this, too. So that is the amount of radon that actually gets into the four spaces and isn't captured by the material itself during decay that could be available for transport. And emanation factors are variable from material to material and condition to condition.

The radon flux can be very strongly influenced by the presence of a thin layer of high saturation material, like a clay barrier, which is what is done in the mill tailing program to try to mitigate radon fluxes. It depends on that you can

maintain that layer in a moist state. So, if you put a clay layer in and you are confident that you can keep it moist, then you will greatly knock the radon fluxes down.

Then this general line of thinking also applies then to a human site. Human sites don't have nearly the problems with radon as an arid site does because they have much more moisture in their system naturally. But it can be very variable from site to site.

So overall in this analyses the approach we took to try to a broad screen, one of the things, we looked at uncertainty in properties like moisture content and, therefore, diffusivity that would affect radon. We took an approach where we had a very dry site that was persistently dry for the whole analysis, so out to a million years. Not realistic at all. And we also had an endpoint that was a very human site or a moist site that stayed moist throughout the whole analysis period. And then all sorts of points in between.

When you do the analysis that way, you identify the stressor, the potential stressors to the outcome but you over emphasize the tails of the distribution. So the reality is much more focused in

the center but it is an easy way to identify something that can be a key variable in the analysis. In this case, the moisture content of the system. But we know that in performance assessment calculations, upscaling is very important.

So upscaling is related to if you take a point measurement of a value or a couple of measurements of something that is spatially and temporally variable, they might not be representative at all of the long-term average condition, which is what you need for this sort of risk calculation. So the screening calculation identifies okay, this can be something that can drive your results but you really have to do a site-specific evaluation knowing something about the temporal and spatial variability of say the moisture in the system to get an idea of the risk at a particular site.

So the analysis identified the endpoints and the potential range of outcomes and that is why we tried to say in the paper pretty clearly, you shouldn't take these results and extrapolate them to a particular site because this was done for a certain regulatory analysis purpose. It wasn't done for a site-specific evaluation which you would need to come about the analysis in a different way.

So that is kind of how we handle climatic conditions or potential range in climactic conditions, which affects both the radon at the top level there and then also the next one, the groundwater transport is affected by the infiltration rate, the moisture content in the system, the distribution coefficients, the solubility. All of those parameters are site-specific. All of them in the analysis were uncertain.

In the case of distribution coefficients and solubility, we set up a look-up table that was a function of pH carbon-8 and the moisture content in the system to represent variability and distribution coefficients for uranium, and lead, and thorium, and all the other things in the decay chains and the solubility.

MEMBER BLEY: You have got me curious after this discussion. The picture you showed us earlier went out well beyond a million years in some of your calculations. Your discussion of the endpoints of very dry and moist sites and looking in between makes sense to me. Your referencing that you have to do it for specific sites makes me nervous because no one knows how these kind of parameters are going to change over a million year time period.

MR. ESH: Yes.

MEMBER BLEY: So, I am much more comfortable with looking at the extremes and seeing where you could end up between them than hints that somebody ought to do a site-specific study, which makes me think you have missed maybe the key factors. Could you say something about that?

MR. ESH: Yes, and that is a good point and I agree with it.

I think what I am trying to convey is that the risk that you estimate from screening analysis where you try to represent the endpoints can be quite a bit different then the more central tendency values that might represent the actual site.

MEMBER BLEY: You had said something that you looked at varying time periods of different conditions. And when you do that sort of thing, do you tend toward the center, or does that get rid of the extremes over the long period of time?

MR. ESH: Yes. If you have -- it depends on the variability, of course. But for something like say radon transport, it is, I believe, like a harmonic mean type of calculation. So, the layer that you have that if you have a layer that you can maintain persistently wet in some manner or another, either due to environmental conditions, or the geology, or the

10:41:07 type or what have you, then that can damp out the effects that you may see from the environmental variations say with like climate.

So you might have -- and this is why depth is important. Because as you go deeper in the unsaturated zone, those effects of the near surface climate variation are minimized or at least reduced. And we couldn't help to, in this sort of evaluation that we did in a few month's time frame, get into all the explicit details that would influence these type of calculations. But we did, I think appropriately identify what those would be that would influence a site-specific calculation.

So I don't know if that answers your question or not.

MEMBER BLEY: It does to a fair extent. I guess the screening calcs might be more comforting to me than something site-specific that tries to model these things with any precision.

MR. ESH: Yes. Well, generally for these types of analyses we expect that you, in the site-specific evaluation, you can try to incorporate uncertainty in variability in some sort of reasonably conservative way, if in fact you know what that is. So, it requires you to identify what say the driver is

and in what direction it drives it. Sometimes the minimum or maximum are not at the endpoints but there are some intermediate points. So you have to do these types of analyses to know how your problem is working and then you can go about saying, okay, once I know how it works, how do I do my analyses to deal with that.

Well, the site specific evaluation, where I say you do need to consider uncertainty and variability, you do need to do it in a reasonably conservative way and you do need to not stick your head in the sand and say, if I have to do this long-term evaluation, my conditions are static and they are never going to change.

We don't expect that people try to speculate about maybe man's influence on the climate and those sorts of things, which tend to be a source of vigorous debate right now especially. But we do expect that if you have to do a long-term evaluation, that you look the natural cycling of climate and how that would be expected to affect your site.

So like in Arizona, in the Arizona desert right now where I was just reading about this the other day where they had the big meteor impact, the famous crater there, the Barringer crater, I believe

it is, today that is very arid and almost like desert-like conditions. Fifty thousand years ago, they believed that was more like a grassland and wooly mammoths and things like that inhabited that area.

So, if you have to do a long-term evaluation, you at least need to acknowledge that in this case for radon, if your moisture content is higher, your risks are probably lower. Maybe for groundwater, it goes the other way. If you have more moisture in the system, your risks go up. But those sorts of effects can't be ignored when you go out to the long-term. If you are looking at a typical commercial low-level waste facility and you say most of the activity is gone in hundreds of years, well then those environmental changes you wouldn't expect would be very large over that sort of time frame.

I mean, when you start getting into long-lived waste, it becomes a bigger challenge. More uncertainty. But ultimately, as long as that uncertainty is assessed and communicated to the decision-makers, they should have the ammunition to make their decision, even if it still is uncertain.

MEMBER BLEY: Now all of this work you have done, I take it will find its way into Reg. Guides and standard review plans?

MS. YADAV: We plan to issue guidance associated with our rulemaking to help people figure out how to do, conduct the site-specific analysis.

MEMBER BLEY: But you are pretty well -- the analyses have all been completed now that you were planning to do or it is still in progress?

MR. ESH: We did analyses to support this step of the process and we anticipate if we need analyses in the actual rulemaking process, we will complete additional analyses. Those will be documented as part of the rulemaking process available for stakeholder review like your group and other public groups and what have you.

So, it depends on what sort of questions need to be answered in that rulemaking or what sort of basis needs to be provided to support the elements of the rulemaking. So I can't prejudge whether we will or will not need certain calculations or not.

MEMBER BLEY: Thanks.

MR. ESH: So, Priya, on that other slide, I will follow up on the last two bullets and then we can go on.

The third bullet down here, greater consideration of long-term stability needed, that should be obvious. For shallow disposal in the near

surface, the long-term stability is a requirement in the regulation. It becomes a bigger challenge as you go to longer and longer times because the processes that can create disruptive effects can be more extreme, as you get atmospheric and geologic change, I guess.

And the last bullet, the site-specific conditions can result in large variance in the impacts, I tried to talk to that some. A lot of these things are very non-linear in the effects that you see, based on the driving function. So, the site-specific values, whether it is at one end of a distribution or the other end of a distribution can greatly change the results that you get. And that is why we intend, as you indicated, to develop guidance to provide to people to help them deal with this site-specific variability and how they would go about assessing it at an individual site.

It is not an easy problem, though, this whole issue of upscaling and limited information and site-specific analysis. We kind of feel like it is, even though we are doing this in rulemaking in my branch, the Performance Assessment Branch, it is an issue that is a little more broad and that it could affect some of our other waste management and other

programs.

MR. McKENNEY: I just want to make this one point of more of a glossary -- sorry. Chris McKenney for the Performance Assessment Branch.

Just for a glossary term that we are using, when we talk about shallow disposal, we are talking about one to three meters of either cover or the waste is at one to three meters of depth. And when we are talking near surface, that is up to 30 meters. Just so that we have a clarity. There is a lot of times they are confused and people use the terms interchangeably but actually shallow is really shallow and near surface is the much more broad applicability.

So when we say it is possible because some could say that well you said it is challenging, but in the paper we said it was possible to dispose of depleted uranium in the near surface. Well, we are talking about a much deeper potential or broader disposal region.

CHAIRMAN RYAN: I think one comment just at this point, I think it is very helpful, and I heard it in the day-long workshop in Bethesda which was very good as well. There are kinds of things you were talking about, David, about what can impact these

longer range type calculations. Like, if you have a moisture layer of X and that will really do a good job for radon over a longer haul than not having it, for example. Those kind of insights I think are really important for you. And then you have teased out of the modeling exercise you have done, that is very, very helpful. So, I would almost offer the idea that emphasizing what those insights are about how system elements behave and interact over these longer timeframes would be real helpful.

MR. ESH: Well one of the key issues and messages that we got from the workshop was whether what are the expectations for period of performance and we are going to address that in our rulemaking. But is really a policy decision and I would say, in my opinion, it is even somewhat of an ethical decision. What are the responsibilities to manage this type of material? How does management of this type of material compare to other industrial metals? You know, what are the expectations that you are placing on the management of the risk from this material? I think those are decisions that are much about my pay grade. But I certainly have opinions about it and will provide input to the decision making process but ultimately, those are high level policy decisions that

need to be made.

MEMBER BLEY: Is radon the primary thing you have tracked or in the groundwater do you track many others?

MR. ESH: Yes, this was a multiple pathway analyses. So radon is a primary pathway at arid sites. The groundwater was a primary pathway at humid sites. And at all sites, if you dispose of it too shallowly, then we do an intruder evaluation in our low-level waste analyses. If the material is concentrated and somebody digs a basement into it or disrupts a large amount of it, it is a simple calculation to show that you can get some measurable risk from that sort of scenario.

So if you want to dispose of concentrated material, you need to keep it somewhat protected from disturbance, whether that is due to natural forces that disturb your disposal facility or human influences that disturb your disposal facility.

So in our low-level waste regulations right now in 61.7, in the concept section, Chris always reminds us of this when we have these discussions, when they developed the regulation, they said well we are going to have tables to limit the concentration, to determine the classes of different

waste. But you can always set inventory limits for a specific facility that you need to ensure that it is going to meet your criteria. And those inventory limits are generally applied to long-lived isotopes. In the case of the original low-level waste analyses, it was primarily things they thought would be mobile like technetium-99 and iodine-129, and carbon-14. But if you throw a bunch of uranium in there, it wouldn't be out of question that you may need to set inventory limits for uranium in order to meet your regulatory criteria.

So in a way it is new because uranium is not in the tables and was kind of only evaluated in a limited sense in the analyses. But the concept is not new. The concept is right there in the regulation that you need to look at your materials that you are disposing of and you may need to set limits for your facility to dispose of material.

CHAIRMAN RYAN: And I think you hit on an important point that the quantity disposed is often what drives the risk and not the concentration in the given waste packets. That is a convenient metric for health physics practice and for transportation but that is not the best metric, in my view, of looking at what is disposed.

MR. ESH: Especially for groundwater impacts.

CHAIRMAN RYAN: Right.

MR. ESH: Because it is the integration of, combination of the water flow rate, the source of material that you have, and in the case of many of the species we deal with, not necessarily the concentration of the material but the solubility in the liquid phase of the solution when it is released.

So you could have very high concentration in the source but only a limited amount comes out because of the solubility limits that may apply.

CHAIRMAN RYAN: So depleting the inventory ultimately would be the end of the risk. And so quantity again, sort of, drives the bus.

MR. McKENNEY: Right. Yes, the concentration limits were, the 61.55 was also generated in large part in Part 61 as a dependable thing for the generators to be able to look at. They knew in a package-by-package. Because they were going to be shipping things to a disposal site on a package by package basis. They needed to know what was acceptable, if a site said that they took this type of classic material.

CHAIRMAN RYAN: Sure.

MR. ESH: And it is more, in large part, for the generator, in large part.

CHAIRMAN RYAN: Well again, I think it is commendable that we are airing this whole discussion. So you understand, you are going back to the fundamental assessment of this, once disposed. And then a lot of that backs out operational concerns later.

MR. ESH: But with modern tools, I mean, I don't see why. Because in effect, if some of those limits you may have were to deal with practical and logistical considerations, with modern tools I think you may be able to deal with those practical and logistical considerations without imposing that approach of setting some concentrations based on a generic site and a generic analysis that apply to all. You might be able to use modern tools to track real time inventory and do real time updated assessments to allow material to be disposed of.

So I think there is the opportunity to reconsider the system going forward, although this is the system that we have today.

CHAIRMAN RYAN: I couldn't agree with you more.

MS. YADAV: Are there questions on the

technical analysis? We can get to more later, also.

So just to cover kind of what our SECY paper, the options we put forward to the commission. We put forward four options and these kind of increase in terms of the amount of resources required and the complexity required.

So our first option did not involve any rulemaking. And that was just to issue a generic communication, something like a regulatory issue summary, that would just clarify that the existing Part 61 has performance objectives that need to be met for all low-level waste disposal facility operators for all waste streams. So, all sites for all their waste streams have to meet performance objectives.

So our generic communication would just clarify that you have to meet performance objectives and that also you can't rely on this default provision to say DU is Class A waste, therefore, it is acceptable for disposal.

The second option was to modify our regulations to require a site-specific analysis for large quantities of DU. The third option was to classify DU, develop a generic waste classification and an associated concentration limit. So kind of put it in the ABC, greater than Class C current existing

framework, using Part 61 methodology.

And our fourth option was to re-evaluate and look at the entire waste classification framework for all radionuclides, not just uranium, and update using updated performance assessment methods, updated ICRP methodologies for all radionuclides, not just uranium. So, that obviously is the most resource-intensive option.

And recommended moving forward with option two, requiring a site-specific analysis.

What the Commission chose was actually to combine two of our options and they combined a two-tier approach. So, this is currently our path forward.

We are doing initial rulemaking, where we will specify a requirement to perform the site-specific performance assessment but the second part of our rulemaking is to budget, to reexamine the waste classification framework in the long-term. So that is kind of the most resource intensive option. So it is a two-step process. First, we are going to do the initial rulemaking to require the site-specific performance assessment an the second part is to do this comprehensive revision of the waste classification framework.

So right now, we are starting the initial rulemaking, clarify the requirement to meet performance objectives and specify the criteria for the site-specific analysis that we think need to go in the regulation, versus different things that Dave is seeing to now.

MEMBER BLEY: Let me interrupt you just so that I have got this straight.

MS. YADAV: Yes.

MEMBER BLEY: The rulemaking is now going to be aimed at the first piece, the site-specific analysis. The other piece is really your own research and study of what would be involved and maybe what would be the benefits and cost of moving ahead with a complete reclassification. Is that a rulemaking activity?

MS. YADAV: that will be a rulemaking activity. It is just further down. We are calling it long-term because it is not in the next three years. I kind of get to the schedule.

MEMBER BLEY: So it really is separated. You are going to do the first one --

MS. YADAV: First, yes.

MEMBER BLEY: Okay.

MS. YADAV: There is initial and long-

term. But in our SRM, we have directions to do both. We have to budget resources to do the second part because it is going to take a lot of resources. So the Commission directed us, you know, budget resources and figure out a plan to do that second rulemaking.

MEMBER BLEY: So your SRM really says we will redo the whole thing at some point in the future.

MS. YADAV: Yes.

MEMBER BLEY: It is not look at whether it is a good idea.

MR. McKENNEY: It is to look at, it is to budget for those at this time.

MEMBER BLEY: Yes, I just want to understand exactly what the steps are.

MR. CAMPER: Larry Camper, Direction, Division of Waste Management, Environmental Protection. The direction is to budget for this activity but then it goes on to describe a number of parameters that are to be considered. Current ICRP methodologies for example, and so forth.

So the implication is, and our belief is that we will proceed with rulemaking. But the SRM didn't say rulemaking literally but all indicators are there. So that is the assumption that we proceed under.

CHAIRMAN RYAN: So, Larry it is fair to say that you owe the Commission a plan, including budget and scope?

MR. CAMPER: We do, yes.

CHAIRMAN RYAN: Okay.

MS. YADAV: Thank you, Larry.

And then associated with this initial rulemaking, we plan to develop guidance that will be, you know, provide additional detail on how to do the site-specific analysis. Maybe we will provide some of the things, some of the insights that Dave has gotten in doing the screening model. Maybe if we have to do additional calculations, that would be included in that guidance. So that will be all available for public comment.

Now the backbone of this initial rulemaking as we see the role of performance assessment. So we see the performance assessment as a living tool that site operators and site regulators use to continually assess compliance with the performance objectives. So, when a site is initially licensed, an operator will kind of project what waste streams they expect to receive. And based on that, they assess their compliance with performance objectives but this performance assessment should be

continually updated with actual waste streams that are received. So the inventory needs to be updated, you know, the radionuclides actually received, and then continually need to assess compliance with these performance objectives.

So this is really the backbone of the initial rulemaking and we see this as the kind of risk management tool to see whether or not you are meeting your performance objectives.

These are the sites that we currently think are the most likely disposal paths for the suppliers of DU. We had three of these, or I guess two, disposal facility operators at our workshop, so we kind of got a range of opinions from site operators, as well as the state regulators because these are all the Agreement States. We heard viewpoints from Agreement State regulators regulating these sites.

EnergySolutions has two sites, one in Barnwell, one in Clive, Utah and the environments are very different for those two sites. But also we heard from Waste Control Specialists who was recently licensed in September 2009. So these are the facilities we see would be doing these performance assessments and updating them and reviewing them with

their site regulators.

MEMBER BLEY: Did you, this workshop was just recently?

MS. YADAV: In September, yes. We had one in Bethesda and one in Salt Lake City.

MEMBER BLEY: Have you received comments from --

MS. YADAV: We did. We had a comment period on a *Federal Register* notice that we issued in June and the comment period ended October 30th. So we received --

MEMBER BLEY: Are you going to talk about the comments later?

MS. YADAV: Yes.

MEMBER BLEY: Okay, I'll wait.

MS. YADAV: Okay. And then just a little bit more about the long-term rulemaking. Like Larry said, we have to budget resources but we do plan to eventually get to those long-term rulemaking. And so we are going to have a lot more public involvement because it is going to have a lot more public involvement because it is going to effect a lot more radionuclides than just uranium. So it is going to be a long process that we will have to plan carefully.

During this long-term rulemaking, we look

at all the radionuclides. We will have to look at conforming legislation and changes we need to make to legislation. And we also were directed to explicitly look at the classification for DU. So, the direction from the Commission says you know, definitely look at whether or not classification has to be changed.

We also were directed to consider a full range of alternatives. So, it is conceivable that we wouldn't end up with an ABC greater than Class C type framework after we go through our kind of analysis. So we will look at the international waste classification scheme and see if it is more appropriate to use than our existing framework. So, that is one potential outcome.

MEMBER BLEY: Is the international scheme substantially different from what we have?

MS. YADAV: Yes. Dr. Ryan probably doesn't --

MEMBER BLEY: That is why I asked.

MR. McKENNEY: Chris McKenney, PAB. The scheme is actually a little bit more general in some regards. What we would classify as low-level waste, they do have one another -- they have three categories, two which are on the boundaries of our Class A waste, one which is low-activity waste, which

would be a subponent of Class A waste, a small fraction of that. They also have another one which is intermediate level waste, which is waste that from their regards, needs to be disposed of at nine near surface disposal areas, some of which could be in our Class C criteria, depending on what country you are talking to.

But in general, our Class ABC is what cuts up and subdivides their class, their low-level scheme, what they call low-level waste. But they don't have criteria that their guidance is that waste classification on what waste is acceptable at a facility should be based on a site-specific analysis, based on the waste forms that would be accepted at that facility and the waste types and overall curie content.

So a nation, especially a nation that has multiple geologies or climates and what you could dispose of that one just disposal requirements or classification tables would not be practical and you should probably do it on a site-specific basis, rather than having an entire country based on a humid, for example, a humid classification table system, when you have both arid and humid sites.

MEMBER BLEY: Thanks.

MS. YADAV: It's kind of in the same direction that we are heading with the site-specific analysis.

These are dates and kind of directives from our staff requirements memorandum. We were directed to conduct a public workshop to discuss the issues associated with disposal of DU, issues to be considered in the rulemaking and the technical parameters that really need to be included in the site-specific analysis.

These are the dates, this is our current schedule for the initial rulemaking. So we committed to having a workshop in September and we actually ended up having two. Our next step is to have the technical basis document, regulatory basis document for the initial rulemaking done in September of 2010, so about nine months from now. And then have our proposed rule and our draft guidance document a year later in 2011 and the final rule in 2012.

So it depends on how our proposed rule is perceived and the kind of comments we get. But right now we are projecting the year we could get to the final rule.

So like I said, we had a workshop in Bethesda that Dr. Ryan attended and we had about 75

people attending there. And then in Salt Lake City, we actually had more people attending and considerably more public contents and media coverage and the public was very in tuned to the topic. So, it was good to have one out on the West Coast.

We thought it was an excellent format because we had a roundtable at each location that had a diverse group of stakeholders and viewpoints kind of from a spectrum of representatives. So, just to give examples, we had DOE as a generator at both workshops. We had LES as a commercial generator in Salt Lake City. We had EnergySolutions at WCS to represent disposal facilities at the workshops. We had academic experts, including Dr. Ryan, but then we also had people from universities that kind of just gave sort of an unbiased viewpoint on different things like radon and transport.

And then we also had public interest groups. We had HEAL and Snake River Alliance in Salt Lake City and then IEER and NEERS in Maryland and then we had state regulators. So the actual regulators of these facilities, you know, could kind of give us hands on their experience in regulating these facilities. So we had South Carolina and Maryland, we had Washington, Utah, and Texas, in Salt Lake City.

We had two days. Each one was two days. And we first covered, kind of for a day and a half, we covered technical topics associated with the site-specific analysis. So we had, you know, kind of an hour-long session on each of the things that you guys are asking about; period of performance, exposure scenarios, radon, you know, geochemistry, waste forms, that kind of thing. And then we talked a little bit about the long-term rulemaking and how we plan to deal with the waste classification of DU in the long-term. And then we had kind of a session on other considerations, people asking questions that kind of didn't fit into any of the other buckets but an example would be, how do you handle DU. You know, if your rulemaking isn't done until 2012, do you have any guidance on what to do with DU until 2012? You know, so what guidance do you have for the states?

We are not going to be done until 2012 but then the Agreement States really have three years to adopt conforming regulations, so that would be 2015. So there were a lot of questions kind of in general on that stuff.

So just a summary of the comments we received. We actually have 33 kind of different types of comments and they are actually available on our

website. So if you go click on this link, this is a website we developed just for the public workshops. It is the unique waste streams website.

And we PDF'd all the comments and made them available. They are all in ADAMS but it is easier kind of to go to our website if you want to see them all together. And they included, actually 230 postcards with four different versions of comments from individuals in Idaho about the AREVA enrichment facility. So the PDF is about 700 pages but about 500 pages of that is just postcards that are kind of the same message.

And so I will just get into kind of a summary of the comments that we got, mostly from the workshops. But the written comments were consistent with the feedback we got from the workshops.

A major theme or a question that we asked the panels were what do you think needs to be identified in the regulation versus what should be identified in guidance and the major difference being whatever is identified in the regulation is legally enforceable and, depending on the compatibility assigned, you don't have a lot of leeway to defer from what is identified in the regulation; whereas in guidance, there is a lot more leeway in terms of

deferring form the guidance.

The feedback that we got, kind of three major lines of comments that we got, that we heard from people needed to be identified in the rule. The first was period of performance. There was kind of a spectrum that we heard. For example, Texas told us that they already have on their regulations a requirement to look at peak dose for a period of performance and so they are concerned about whatever we do affecting their peak dose requirement.

But a majority of the panel thought it would be appropriate to have kind of what we have in NUREG 1573, which is actually a two-step process. It sets a point of compliance at one time frame. So for example, in NUREG 1573, ten thousand years is suggested to be appropriate for most types of waste streams as a point of compliance period of performance. But then it sets a second period of performance for looking at kind of through a site environmental evaluation longer term impacts and being able to kind of assess those impacts and build those into the design of your facility.

So provide those impacts to decision makers but not necessarily use that endpoint, for example, a million years for DU, maybe even beyond a

million years for peak dose to look at, you know, in an environmental type evaluation to look at those impacts.

And the majority of the panel actually liked that two step approach that we have in NUREG 1573. So that kind of gets at some of the uncertainty things that you were kind of concerned about for the longer term period of performance.

The other comment we got was that the intruder dose limit right now that is only identified in guidance should be put in the regulations. So several comments commonly 500 millirem per year, that specific dose limit should be in regulations.

And then we got a comment that not only should the requirement to perform the PA be in the regulations, which we had intended but also a requirement to update the PA at a certain frequency, at a certain interval. So an example was maybe every five years to have a requirement to re-evaluate your waste streams, reassess your compliance and performance objectives.

CHAIRMAN RYAN: Wouldn't that just get to the inventory question?

MS. YADAV: What?

CHAIRMAN RYAN: I mean the inventory every

five years seems like a waste of calculations.

MR. McKENNEY: No this is more of as you are operating, is there anything required in the requirements to go back and say are they getting the waste that they had projected when they got their, whichever previous licensing action they did. And are there anything, it is sort of like a tickler for them to actually do something. Obviously, if they are going to get something completely different than what they previously analyzed, they should be forthright in redoing or doing some sort of scoping analysis to say do they need to redo the analysis at that time but is more of a--

CHAIRMAN RYAN: Those two are widely inventories. I could see those being ticklers but not the calendar.

MR. McKENNEY: Right, yes.

CHAIRMAN RYAN: Unless there is some environmental change. If there is a damn that is knocked down up river and I have got a new flowing anticipator. But you know, it is the modeling parameter conditions of inventory and all the environmental stuff should kick off the change rather than the fact that five years has gone by or whatever.

MS. YADAV: Right, yes.

MR. ESH: Yes, I agree that it wouldn't be of much value if nothing much changed and your inventory was not materially and you required somebody to do a new calculation. That is not really going to help anybody. I think what would need to be careful in doing would be identifying something that could potentially be significant, whether it is in inventory space or in other technical space that may change something that would trigger you to do an update to your evaluation.

CHAIRMAN RYAN: And you could almost tie it to the kinds of sensitivity analysis they did for the application to say, you know, in these areas based on your own sensitivity analysis.

MR. ESH: Say for instance, that you had a bench in your cover that you were using to reduce infiltration and you took some long-term credit for that barrier and then you got new research that said maybe those covers don't perform nearly as expected. Well, that may be a type of technical trigger to go back and say do I need to re-evaluate this disposal activity.

MS. YADAV: Right. So we could word it that depending on the waste inventory you receive or at a minimum of five years. We just want to ensure

that people are actually looking at their inventory and updating it based on their inventory and I think it is missed.

MR. McKENNEY: Yes, in large part, this requirement would be largely like what we have about procedures and other things. Are we saying they need to be at least reviewed to say whether they need to be updated on an annual basis that we have like in Part 20 or we have in guidance on Part 20, where we have more of a tickler that you do a review to say do you need to update, rather than saying though shalt update on a certain time period.

MS. YADAV: Right. We just need to evaluate.

MR. McKENNEY: It could go into those sort of things where you go back and look at this, you know, you review to say is there a new research that affects any of your sensitive parameters since the last time you updated your PA. And it being more of a review to see whether you need an update, whether that is on a calendar basis --

CHAIRMAN RYAN: That is a fairly slow moving clock. So I mean, an interval of five or ten years, somewhere in that range, it might not be too bad.

MR. McKENNEY: Right.

MS. YADAV: And then the major comment we got for what belongs in guidance is actually specific details about exposure scenarios. People wanted the most flexibility in terms of being able to design exposure scenarios within a reasonable bound. I mean, we also got a comment from HEAL that they don't think it is appropriate to say there is, I don't know if Dr. Ryan is going to agree with this, but they didn't think it was appropriate to say no intruder is going to exist at the site. They thought that it would be important to say an intruder analysis is needed at the site but not necessarily describe the specific details in regulation.

CHAIRMAN RYAN: Yes, I think that is a fair comment. You know, the intruder scenario that digs up irradiated hardware and grows his food in it. That doesn't seem reasonable to me. So, I think risk-informed intrusion scenarios, I certainly think makes sense. Now how do we risk informing the intruder? I think we have to do a little homework to think through what is reasonable. Some kind of external exposure scenario may seem really appropriate. But you know, agricultural intruder and squatter resident, and drinking water through the

disposal cell and all of that, this doesn't fly.

MS. YADAV: Right.

CHAIRMAN RYAN: I mean, it doesn't make any physical sense to me. And I recognize that that was done in a day and time when bounding scenarios were kind of the thing to do because calculational power just wasn't what it is today. So, and I don't mean that as a criticism so much as I recognize it as the limit of calculational power at the time that was done in 1975, when it started.

So I think realism and risk-informed thinking about what we are really trying to accomplish here in terms of risk assessment is that we are at a really good place to do that in earnest than come up with something that I think would be a lot better.

MS. YADAV: Yes, we also got a comment from, for example, the State of Washington, that they don't have any basements in Washington. Their houses don't have basements. So they don't want to be told how specifically to design their radon scenario, for example. So, people seem to want to have the most flexibility on exposure scenarios.

CHAIRMAN RYAN: But again, whether they have them or not for a particular location or site, just having the allowance that they can use realism to

describe what is a reasonable range of events, activities, whatever it might be seems, you know, some places agriculture on the surface is very likely. In some places it is not likely at all. So an agricultural scenario might mean nothing in one place and everything in another.

So, having that flexibility you mentioned, I think, is the real key point to make.

MS. YADAV: Okay. Some additional comments we received. We asked the panel, we said this rulemaking is intended to apply to significant quantities of depleted uranium. How should we define significant quantities? You know, try to get input on what people thought significant quantities were. And we actually got feedback that we don't need to spend a lot of time or energy defining the term significant. You know, is it 10 nanocuries per gram? Is it 100 nanocuries per gram? But instead to just kind of whole scale require a performance assessment for all the waste streams received at a facility and that performance assessment will dictate how many, the quantity of waste acceptable for each type of radionuclide at that facility.

CHAIRMAN RYAN: One question I don't know the answer to and I kind of struggle with and maybe

you have some insights is, how much of this depleted uranium is DU metal, which is pure stuff, uranium oxide in pure form, or everything else is dilute waste?

MS. YADAV: I think most of it is going to be the oxides from DOE.

CHAIRMAN RYAN: Or metal.

MR. ESH: No. It depends on the generator. So, we had a representative from the Department of Defense.

MS. YADAV: Right.

MR. ESH: Their depleted uranium is metal, primarily and lots of large pieces of metal. And I would agree wholeheartedly that the risk from a large block of metal may be substantially different than micron sized powder in some dispersible form. I mean, you do have to consider the chemical and physical form of the material, too. It can't all be lumped into one bin of depleted uranium.

CHAIRMAN RYAN: So for the risk assessment, I would say that let's try and abandon this curies per cubic meter business of 61 and get what I think are some risk metrics. Metal, oxide in a pure form, or oxide in a dilute matrix. Those are the three that --

MEMBER SIEBER: Or UF6, which is --

CHAIRMAN RYAN: Or UF6.

MEMBER SIEBER: Well, that brings up a lot of questions because there should be nothing in the rule that dictates what the chemical or physical form should be. However, the analytical techniques to determine what its impact is for various time periods should take into account the chemical and physical form of it.

UF6, there is millions or maybe not millions, thousands of cylinders of UF6 sitting around in storage in various places. And UF6 is supposedly a solid at room temperature. You know, a modest amount of heat will turn it into a gas and perhaps UF6 is not the right chemical form. And in addition to that, there are different physical forms that one could use to sequester the material so that it doesn't travel in groundwater or go off into the airstream. So the rule should not dictate or have built into it an assumption as to chemical and physical form.

So that if somebody would decide I am going to run an oxide plant from the UF6 cylinder because the oxide supposedly is more stable in long-term storage, that that is a possibility as a way to lower the requirements for the storage capability but

do some preprocessing and think first of the expense up front.

CHAIRMAN RYAN: I think you are on the right track, Jack. The technical document that Priya described earlier, that would be a great place to say well we think that these five major uranium forms should be evaluated in the performance assessment because they likely have different properties in a range of environment. So they are metal, UF6, U308 or any other form of dilute matrix.

MEMBER SIEBER: UO2.

CHAIRMAN RYAN: You know, UO2, whatever it might be. And now you have kind of bracketed the problem in a way that is real helpful to those that are going to struggle with the PA to go with it. So I would again, kind of get away from curies per cubic meter in this case and go more to a structure of describing materials that will get into the performance assessment scheme that the staff is working on.

MEMBER SIEBER: Well, to me that is a key issue. And even in geologic history, there are deposits that were supposed to have been critical at one time millions of years ago in Africa. And if you look at the fission product, traces from that geologic

deposit, they didn't really get all that far.

CHAIRMAN RYAN: All the information, it is helpful to the question.

MEMBER SIEBER: Yes, this is a chance for me to get a Ph.D. or at least a handshake.

MS. YADAV: Okay. Similarly, we asked the panel, you know, we were thinking maybe we could broaden this rulemaking to include other things that might considered unique like depleted uranium that weren't included in 1980 documents. You know, how should we define unique waste streams? What else do people see on the horizon that might be different, like DU?

And we got comments back that rather than trying to kind of anticipate what might be unique right now, it is more appropriate to just require a PA for all the waste streams that are coming into a facility and then address those waste streams on a case-by-case basis, instead of trying to develop regulations for something that we don't really know the specific characteristics of.

So, and we also got a comment that it is kind of an overreach during this initial rulemaking to try to figure out what might be unique and to assume that everything would be classified as Class A and

that it would be appropriate for near surface disposal.

So kind of the feedback we got is no need to define the term "significant quantities" or to define the term "unique waste streams." So we got that feedback at both panels and actually in a lot of the written comments we received.

MEMBER BLEY: Did you get any strong resistance to the idea of site-specific performance assessments?

MS. YADAV: No. Not that I heard. Did you guys hear anything like that?

MR. ESH: This is Dave Esh. I do believe there are some groups have some skepticism about that type of approach because of, say for instance, if you moved away from concentration limits and you allowed site specific analysis to determine disposal, well then, you are relying on that analysis to determine what is appropriate at the site, the numbers, curies, quantities, etcetera. And they have skepticism about that, about the groups that are doing it, or the oversight of those calculations. It does require stronger, independent oversight if you are relying more on site specific analyses, whether that is through NRC or state regulators or what have you.

Because there are things that can be done in those calculations, not with negative intent but maybe inadvertently that you would want to make sure that you evaluate thoroughly when you take that sort of approach.

MR. McKENNEY: Some of the commenters in the state of Utah specifically mentioned the fact that in the generic form, like for the long-term rulemaking, if we were to move to that as a whole and get rid of the classification tables, they were very concerned about the fact that they had only signed up for Class A waste for disposal and that by going to a full PA, how would they not get the higher activities that they said that they didn't want in the first place? And that was one of those concerns, if you look at the broad scope, we didn't get that much on the depleted uranium specific asking a performance assessment because people realize, I think in large part, including the activist groups or the interested members of the public that since there hasn't been an analysis directly for their site, that they should probably do one, then that is probably the most practical way to deal with it.

But for the broad one that they were concerned about for like all the other radionuclides,

too that maybe by doing a site-specific analysis, they maybe then say that that site is good enough to take other higher activities than they take now.

CHAIRMAN RYAN: Thanks. But it is not all that hard with modern tracking and calculational tools to make a relationship between concentration and arriving waste packages under some classification table and how that adds to the inventory for the PA. That is fairly straight forward. So, you could go in either direction on that. You could go from a PA and say well if we are going to have X years of operation and some rough number packages for the year, you can get to a concentration under a number of schemes. So you know, allowing that might not be a bad thing. But again, I think the focus is on the risk of being related to the inventory is really a great foundation for anywhere you want to go.

Mike Lee.

MR. LEE: I've heard reference to NUREG 1573 and a lot of talk about PA. Can you briefly, are you thinking along NUREG 1573 types of PAs or RESRAD?

MR. ESH: In terms of what we would do or what we would expect for these types of analyses?

MR. LEE: Yes, the latter.

MR. ESH: Meaning the question being would

NRC develop a tool that everybody uses or just the level of sophistication of the analysis?

MR. LEE: I would presume the staff would say here are the attributes of an acceptable PA.

MR. LEE: Yes, on work that we have done on probably analogous waste disposal problems such as our work and waste incidental to reprocessing reviews or even in decommissioning reviews for complex sites, we try to develop regulatory requirements and associated guidance that are most efficient. So, they provide the requirements you need to meet and guidance about how you can meet those requirements without being prescriptive and specific about how you get from Point A to Point B.

So, my answer to your question is, I think we would allow licensees to use whatever models and tools that they need to use to evaluate their problems but we would communicate the generic elements and/or detailed specific elements related to using those sorts of tools. So we may have review requirements related to model uncertainty and data uncertainty and those sorts of things. And if they do a probabilistic analysis, then we will talk about peak of the mean and number of realizations you need to demonstrate stability and all those sorts of things that come

along with those analyses.

MS. YADAV: Okay. This slide, the first couple of bullets were raised by the public interest groups. There was still at both workshops, there was some concerns that shallow land burial may not be appropriate for large quantities of DU and that geologic disposal, and specifically it was mentioned disposal in salt ore bodies should still be evaluated. So we got several comments along those lines. A lot of those post cards had those kind of messages on there.

We also got interest in publicly releasing our screening model that we developed for the SECY paper, so we are going to try to respond to that. And also publicly releasing our regulatory basis document, which typically is not a public document. It is kind of an internal process that the responsible division gives to our rulemaking division to start the rulemaking process.

But we got interest from public control groups to make that publicly available so that they could comment on our basis, what the basis is for the rulemaking.

MR. CLARKE: Priya, before you change that slide -- Jim Clarke, Vanderbilt University. Looking

at the top bullet, shallow land burial, I can't help but be reminded that we have about 20 years or so Title I uranium mill tailing sites. They were designed with radon barriers, using a methodology to meet performance objectives. They are not maybe depleted uranium but they are uranium tailings. It seems to me like it is very similar, if not, you know analogous or whatever.

Where do they fit in to all of this? Is that part of this?

MR. ESH: Well, as I indicated earlier about period of performance, I believe it is a policy decision. Yes, your example is similar in many respects. It is different in one primary one in that if you generate large quantities of depleted uranium, it is very concentrated in the uranium compared to the tailings. So that moves you on a technical difficulty scale. It slides you. You have a bigger risk that you are trying to mitigate. That is the primary difference.

In terms of the -- the other difference is that the depleted uranium as generated is relatively free of the daughter products, initially, and at longer times, it gets the secular equilibrium or some sort of pseudo-secular equilibrium. The tailings are

already in secular equilibrium. So if you design your tailings disposal facility for the concentrations of materials that you have today, those concentrations aren't going to be significantly different 500 or 1,000 years in the future from that.

MR. CLARKE: Okay. The other thing I guess I would add is we have two decades of experience with the assistance with the cover designs --

MR. ESH: Yes.

MR. CLARKE: -- and how well they are performing. That might be --

MR. ESH: Well one thing that I have found interesting was this idea that the depleted uranium, like I don't know what my ability to think outside the box is, okay, on this problem. But if I am not looking at it as an NRC engineer and I am just looking at it as an individual, I say, well, do you want to apply requirements and standards to the limitation of uranium in the environment that maybe you aren't apply to zinc or lead or some other material that society is using for beneficial uses and you get waste or byproducts from.

I think you have to be careful that you don't develop some sort of expectation and standard for uranium because it is radioactive that maybe you

aren't doing throughout the rest of your management processes and programs.

But I don't know how able I am to think that way as an NRC engineer. I certainly have as an individual.

MR. CAMPER: A comment, if I might -- Larry Camper again -- to Dr. Clarke's comment, something I wanted to say. I want to make a minor comment but an interesting observation about this slide.

The term shallow land disposal is a term of art that became used during the workshop. Our term is near surface disposal, meaning up to 30 meters deep. So the term shallow land is a term that was repeatedly used particularly in Utah by those who had the concern that you see there.

So, just a clarification.

CHAIRMAN RYAN: Thanks for the clarification, Larry.

MR. ESH: And the comments that we received, to be clear, some people felt that near surface disposal may not be appropriate, that even with 30 meters to work with, maybe you shouldn't put this material in near surface. But I personally would argue that there is a big different for these sorts of

problems based on the analysis that we did from one meter to 30 meters. And from location in Nevada to a location in West Valley, New York, there is different stability profiles, different disruptive processes that may impact those facilities and different environmental conditions that would favorably or unfavorably effect the long-term stability.

The United States is a very diverse country in terms of what you have to work with from disposal options and I think we need to recognize that in the process.

MS. YADAV: Yes, I think the majority of the comments from the public interest groups were saying that contrasting shallow land burial to deep geologic disposal, so thousands of feet below the surface. So not really our definition in our SECY paper of one to three meters, but they are just contrasting shallow to geologic disposal.

Another concern that was raised is just how compatibility is assigned and implemented. So that is a factor that we are going to have to really consider when we develop our regulations is the amount of flexibility the states are going to need in their regulations.

So we realized in this process that not

only is 61.55 going to have to change but we might have to change some other sections of Part 61 to address some of the comments that were made at the workshop. So for example, if we are going to put the intruder dose limit in, we will probably revise Section 61.42 with the performance objectives to put in this concept of updating the PA at a certain frequency or having a trigger of different waste streams, different radionuclide inventories to update the PA. We would probably modify the sections that address technical analysis, the requirements for technical analysis. And then also we think we might have to add a little bit more explaining kind of concept language in the concept section, 617 to kind of add a little bit more detail about how different waste streams might need enhanced disposal methods.

So for example, the commission issued an order during the LES proceedings where they said the NRC might receive license applications involving disposal of radioactive waste requiring either enhanced near surface disposal methods or intermediate land disposal methods and that it is the intent of Part 61 to be able to handle this kind of flexibility for these different kind of license applications. And really the bottom line for disposal is meeting the

performance objectives.

And so even though detailed technical criteria may not be established for these different types of waste streams, that criteria can be developed on a case-by-case basis. So we think the concept section might just need to have more language like that explaining that there is going to be different types of waste streams that could be addressed on a case-by-case basis.

CHAIRMAN RYAN: One thing I just didn't come up with at the Bethesda that your slide makes me think about is I would suggest to you that 61.50, the disposal site suitability requirements for land disposal need to be revisited, too.

If you read through those, some of those are very general and generic to the point where it is hard to understand what I would do to demonstrate compliance with that or if I even could. You know, I will pick on one. The disposal site shall be capable of being characterized, modeled, analyzed and monitored. What does that mean? What we have talked about today is oh, now I know what it means.

So, if you are revising your technical basis document, it may suggest some updates to these very vague siting criteria. So I would urge you to

add that to your list of sections that you need to add to your deliberations. I think if we are citing that, it would requiring a lot of stuff because it has kind of come out of your analysis efforts and I think that would be good to revisit all of them. And it is A through whatever it is. It goes on through 11 criteria.

And the interesting part is that there is a reserve section on disposal section on disposals sites for other than near surface land disposal.

But I really hope you capture that because that would be a real added benefit to the work you are doing.

MS. YADAV: The next couple of slides are kind of where we are going immediately, our next steps. There was a call at both workshops, primarily at the Salt Lake City workshop of us issuing some kind of interim guidance more quickly than 2012. So we are thinking in the next three to six months, that we could definitely issue some kind of interim guidance that will help disposal facility operators, Agreement State regulators in terms of in this interim period, you know, just kind of reiterate what guidance is out there and kind of reiterate some policies on period of performance, exposures scenarios, radon, that kind of

thing. So that is one of our next steps is to issue some interim guidance.

We plan to have a meeting to demonstrate our SECY model to the public, just kind of let people come in have a public meeting and demonstrate some of our assumptions and let them ask questions to kind of address that call that we got at the workshop.

We plan to continue our communications with the states on low-level waste issues but also respond to any requests for technical assistance in terms of reviewing performance assessments that are submitted by their licensees. You know, just offer Dave and his team to kind of review any performance assessments that come in.

We plan to incorporate kind of everything we talked about today into our regulatory basis document, which is the next step in our rulemaking. And then issue a short summary of the key messages that we heard from the workshop on our website.

So, that is all I have. Any more --

CHAIRMAN RYAN: Ta-da!

MS. YADAV: Ta-da! Any more questions? I made it!

CHAIRMAN RYAN: We'll start with Jack. Anything else?

MEMBER BLEY: No. I thank you for a very excellent presentation and a good response to all of our questions. I appreciate it.

MR. CLARKE: Yes, thank you.

CHAIRMAN RYAN: I guess the one question that comes to my mind is is now a good time to maybe write a letter and offer our insight to the full committee and have you give them a short briefing on this and offer them a letter to go forward with.

I think a letter from my perspective would be very positive in that you have gone through an information gathering process and have developed some concepts and ideas that sounds like you will have them developed in about a year or so. So the fall of 2010 and that we would suggest we would kind of defer a technical comment until we see that document in a follow-up briefing and that it could interact on more of the details. And maybe catch of couple of comments we offered about waste form and concentrations and the siting criteria and a few of those things to maybe add to deliberations. But I think that is about where it would be.

What do you think of that idea? Is that okay?

MS. BUBAR: Yes. This is Patty Bubar. I

just have a question. The letter would go to the full committee?

CHAIRMAN RYAN: Yes. We would prepare it for their consideration and we would ask you to come and give a brief summary. Not a lengthy presentation like we did today but maybe a half hour just to say here is what we reported and we would suggest to the full committee that we have a draft letter for their consideration to take up and approve or not approve or modify.

MS. BUBAR: I see. Okay. Thank you.

CHAIRMAN RYAN: That would occur at the February meeting.

MR. CAMPER: Let me ask you a question, Mike. Larry Camper again. And maybe you just said this but I want to make sure. The task of the staff is there will be a requirement for a site-specific performance assessment.

CHAIRMAN RYAN: Right.

MR. CAMPER: There will be an identification of the parameters to be evaluated an then there will be guidance. Really of course, the idea is that we would ensure that performance assessments are done in a consistent manner.

I think a great utility for the staff and

the interacting staff would be, as we develop those parameters and we develop that guidance to be able to talk that with you and get --

CHAIRMAN RYAN: Absolutely. I could see subcommittee meetings to do that down the line. And we are not at the stage where that is mature enough to --

MR. CAMPER: Of course.

CHAIRMAN RYAN: -- to talk about and line them all up but that is coming.

MR. CAMPER: But at some point, it would be of great utility and interest to us.

CHAIRMAN RYAN: But I think our effort and I am sure there will be a short letter, is to advise the full committee of where we are in this topic and then advise the Commission, through a letter form the whole committee, to say we are on track and here is our plan forward working with the staff on these issues.

MEMBER SIEBER: Will the guidance occur coincidentally with the rulemaking or is that going to occur afterward?

MR. McKENNEY: Yes, one of our new, not necessarily new, but our policy is just to have the draft guidance available with the rulemaking and the

final guidance available with the final rule, so that we don't have a lag time for the licensees or applicants of any type of rule that they see the guidance at the same time as the rulemaking so that they can make credible comments in both ways of both the guidance and not only the rule words but how it would be effectively implemented so that they can do both.

MEMBER SIEBER: Yes, I think it would be difficult, at least for me, to make a judgment on a proposed rule or a framework for a proposed rule without seeing the concepts of guidance that would accompany it. I would suggest that perhaps that would be the next step for a letter from us because right now all we can say is you have done a good job so far, go ahead.

CHAIRMAN RYAN: Yes, and I think that is the carpenter --

MEMBER SIEBER: And there is no means to deal with it.

CHAIRMAN RYAN: Right. It sounds like it might be late summer of 2010.

MR. McKENNEY: We would probably be, what you are talking about is in the technical basis document when we are done with that. And again, we

are considering still whether we are going to make that public. So it may change the type of meeting we would have with you on that. But that technical basis will go into both trying to split and talk to our rulemaking group about what we would like to see in the rule and what we would be developing guidance to accompany that. And that would be in the technical basis document, which would lay out the concept of how we are going in both ways over the next year, which is when we develop the actual rulemaking and draft guidance.

CHAIRMAN RYAN: Yes, and I think we are just kind of going to explain it to the full committee and to the Commissioner what our understanding in the process and we think go forth and do good instead of answer right now.

Okay? So we will proceed on that basis and we are not going to have a January full committee meeting, so I am guessing this will be scheduled at the February full committee meeting for a half hour or so briefing and maybe 40 minutes of their consideration of the draft letter in the letter writing session in February. Okay?

With that, we are at the appointed hour, so I will adjourn the session and we will return at

1:00 p.m. for our next session. Thank you all very much.

(Whereupon, at 11:47 a.m., a lunch recess was taken.)

A-F-T-E-R-N-O-O-N S-E-S-S-I-O-N

(1:04 p.m.)

CHAIRMAN RYAN: So I will call the meeting to order and open the record. And we are going to hear a presentation about the proposed Revision 2 to Reg. Guide 4.11, Terrestrial Environmental Studies for Nuclear Power Stations from Mr. J. Peyton Doub. Welcome, sir.

MR. DOUB: Thank you. I guess I will go ahead and start the presentation. And if anyone has a question, feel free to ask me and I will do my best to answer it.

CHAIRMAN RYAN: Great.

MR. DOUB: Try to bear with me. I am in the middle of some dental work. So, if I am speaking with a little bit of a lisp, I do apologize.

CHAIRMAN RYAN: Well, we sympathize and appreciate the fact that you are here under those circumstances. They are always tough but thank you for coming.

MR. DOUB: Any how, let's get down to Reg. Guide 4.11. Reg. Guide 4.11 is one of the NRC Regulatory Guides. The Regulatory Guide series, as I am sure most of you are familiar, has been developed by the NRC to provide guidance, licensees, and applicants on implementing certain parts of the NRC

regulations. So, they are very useful to the applicants and very important that the Reg. Guides provide appropriate direction to the applicants. And good Reg. Guides, in turn, makes the staff's job easier because they provide direction to the applicants and help ensure we get the information we need to do an effective review.

Reg. Guide 4.11 is kind of unique. It is one of the few of the environmental Reg. Guides that addresses a specific resource area, terrestrial ecology, rather than a specific planning element of the licensing process. Regulatory Guide 4.11 was first published in July 1976 and it was revised one year later in August 1977 and hasn't been revised since. So it is now more than 32 years old. So, the time has come to revise Reg. Guide 4.11.

Reg. Guide 4.11 addresses terrestrial ecology study over the life cycle of nuclear power plants. So it runs through the entire life cycle from siting through licensing, construction, operation, monitoring and decommissioning.

Reg. Guide 4.11 covers terrestrial ecology. I have had a number of people ask me why Reg. Guide 4.11 doesn't include aquatic ecology, the fact is that Regulatory Guide 4.11 was developed

specifically to address terrestrial environmental studies but no companion guide was ever developed to develop aquatic ecological studies.

Proposed Revision 2, I drafted it actually more than a year ago, one of my first assignments here at the NRC and I had it internally approved and it was issued as Draft Guide DG 4016. So, the existing Reg. Guide 4.11 is available on the Agency website under Reg. Guide 4.11, Rev. 1 and my proposed Rev. 2 is available on the agency web page as Draft Guide DG 4016. So, if you want to see --

CHAIRMAN RYAN: I think all the members have seen both in preparation for this meeting.

MR. DOUB: Okay. So both the existing and the proposed are available.

Regulatory Guide 4.11 does not directly address how terrestrial ecology sections are written in the Environmental Reports prepared by license applicants. That direction is provided as a part of Reg. Guide 4.2. However, Reg. Guide 4.11 does serve to indirectly improve Environmental Reports by identifying how to prepare the terrestrial supporting studies that go into the applicant's Environmental Reports.

So on the next slide, I tried to show in a

table the relationship between Reg. Guide 4.11 and some other NRC environmental guidance documents that are available. Specifically, Reg. Guide 4.2 covers a preparation of Environmental Reports, the applicant's Environmental Reports that are prepared and submitted with license applications both for new reactors and/or for re-licensing. Reg. Guide 4.2 covers terrestrial ecology and all of the other environmental resource areas that must be addressed in Environmental Reports.

So Reg. Guide 4.11 is unique to terrestrial ecology; whereas, Reg. Guide 4.2 covers the entire Environmental Report process.

CHAIRMAN RYAN: So it includes terrestrial ecology.

MR. DOUB: Including terrestrial ecology.

CHAIRMAN RYAN: Is the reference 4.11 is the place to go to get it?

MR. DOUB: No. Reg. Guide 4.11 addresses the studies and analyses that support the Environmental Report, --

CHAIRMAN RYAN: That is not my question.

MR. DOUB: -- but not actual preparation of the Environmental Report. No.

CHAIRMAN RYAN: Does 4.2 call out 4.11 as a place to go for that guidance?

MR. DOUB: Presently, no. But one of the objectives, and I will get to this in a minute is for Reg. Guide 4.11 to use consistent terminology and cross citations with Reg. Guide 4.2 and NUREG 1555 to provide consistency among these interrelated environmental guidance documents.

CHAIRMAN RYAN: This may be a dumb guy question but if Reg. Guide 4.2 is kind of a global Reg. Guide for preparation of Environmental Reports for a nuclear power station, I would think that one of those elements would be terrestrial environmental studies that are called out in 4.11.

MR. DOUB: It is but Reg. Guide 4.2 provides virtually no specific guidance on the supporting studies and analyses that go into -- Reg. Guide 4.2 strictly covers how the Environmental Report is written but not the analytical effort that underlies the terrestrial ecology data that is presented in the Environmental Report.

CHAIRMAN RYAN: Okay.

MR. CLARKE: It is also quite old as well, '76. Is that right? Am I looking at the right one?

MR. DOUB: Yes, Reg. Guide 4.2 is also currently being revised.

MR. CLARKE: Okay, that is helpful.

MR. DOUB: It is being updated. NUREG 1555 is the Environmental Standard Review Plan that the Agency staff follows in reviewing the applications that are submitted in preparing environmental impact statements. The Environmental Report submitted by the applicant is not the Environmental Impact Statement. It is an environmental data document. And the NRC staff uses information from the Environmental Report to prepare an Environmental Impact Statement.

So the technical basis for the Environmental Impact Statements that we prepare is NUREG 1555. We commonly call those the ESRP or Environmental Standard Review Plan.

So there is kind of the hierarchical relationship between Reg. Guide 4.11, which is very specific to terrestrial ecology and the terrestrial ecology supporting studies and analyses that underlie the applicant's environmental report. Then Reg. Guide 4.2 covers the applicant's environmental report. Then NUREG 1555 covers how we, the NRC staff, reviews the environmental report and prepares an environmental impact statement.

So the obvious question is why are we revising Reg. Guide 4.11 now? Well, --

MR. CLARKE: Can we back up a second page

and move to that slide?

MR. DOUB: Absolutely.

MR. CLARKE: You said Mike's question was does Reg. Guide 4.2 direct you to Reg. Guide 4.11, the answer was no but Reg. Guide 4.2 is being revised.

MR. DOUB: And it will.

MR. CLARKE: And it will.

CHAIRMAN RYAN: And it will point to 4.11.

MR. DOUB: Yes.

CHAIRMAN RYAN: Okay.

MR. DOUB: And 4.11 will also point to 4.2.

CHAIRMAN RYAN: Got you. So that is on your agenda to make them --

MR. CLARKE: It will point to 4.0 of 4.016, I guess. Is that what you are calling yours?

MR. DOUB: I'm sorry?

MR. CLARKE: The one you have prepared is 4016?

MR. DOUB: You know the way, apparently the way Research is handling this, and a representative from Research is here, is the draft revision is assigned a Draft Guide number.

MR. CLARKE: That will eventually go back to 4.0. Okay.

MR. DOUB: Yes, at this point in time, the 1977 Rev. 1 is still the official version of Reg. Guide 4.11. So not until we put DG 4016 out for public comment and then the Agency officially adopts it, will it become Rev. 2 to Reg. Guide 4.11.

MR. CLARKE: Understood. Thank you.

MEMBER BLEY: Back in the beginning you pointed out there was no companion on the aquatic side. Is one in preparation now?

MR. DOUB: To my knowledge, no.

MEMBER BLEY: No?

MR. DOUB: No. However, a number of people in NRO have stated that it would be good to develop a companion Reg. Guide for aquatic ecology.

We discussed this internally within NRO and we decided we didn't want to cover both terrestrial and aquatic because that would be a very lengthy and cumbersome Reg. Guide. So we would like to keep 4.11 as covering terrestrial ecology and ideally at some time in the future, it would be nice to develop a new Reg. Guide that would cover aquatics.

MEMBER BLEY: So right now applicants don't really have any guidance from staff on the aquatic?

MR. DOUB: That is correct. All they have

is what is in Reg. Guide 4.2, which is very generic and broad.

MEMBER BLEY: Okay.

MR. DOUB: Also, without Reg. Guide 4.11, they would have nothing, virtually nothing on terrestrial ecology. And because Reg. Guide 4.11 is more than 32 years old and out of date, it is largely obsolete and offers very little to the applicants.

MEMBER BLEY: Okay. I haven't read the old one, okay?

MR. CLARKE: But while we are on this topic, you are addressing portions of the aquatic environment; for example, wetlands. And I think the distinction you made was you are not addressing submerged --

MR. DOUB: Correct.

MR. CLARKE: -- aquatic environment. Does that mean there will be a separate Reg. Guide on the rest of the aquatic environment that you are not --

MR. DOUB: I cannot say that there will be a separate Reg. Guide on aquatic ecology. I will just say that I and some other people within the NRO staff have expressed interest in the future development of a Reg. Guide but that is going to have to be a someday thing.

So why revise Reg. Guide 4.11 now? Well, in the past 32 years there has been an virtual explosion in the terrestrial ecology knowledge base. A lot more is known about terrestrial ecology now than was known in 1977. That is true in most scientific fields. Even more importantly since 1977, there has been dramatic changes in federal and state regulatory policies for terrestrial ecology. In other words, what is considered important in management of terrestrial ecological resources now is quite different from what was considered important in 1977.

In 1977, the key environmental statutes that directed regulation of terrestrial ecological resources such as the Clean Water Act and the Endangered Species Act were quite new. The Endangered Species Act dated from 1973, I believe and the Clean Water Act in 1972. So, those statutes were largely in their infancy in 1977 but now they have significantly matured.

(Sound of a cell phone.)

MR. DOUB: Was that something on my part?

MEMBER BLEY: No, no.

MR. DOUB: Maybe a little bit of music to fill in.

MEMBER BLEY: Just a fanfare.

Just for me, are there Memoranda of Understanding or something that puts NRC in this role of examining impacts on the ecology? There is nothing in the law that I can think of that sets up NRC that gives them that authority.

MR. DOUB: That's correct, except for the National Environmental Policy Act or NEPA.

MR. COLEMAN: That is the driver for all of this.

MR. DOUB: It requires the NRC as its federal agency --

MEMBER BLEY: Okay, that's fine.

MR. DOUB: -- to evaluate the environmental impacts of its proposed actions.

And one thing that has been rather controversial over the last couple of years has been what is the direct action that the NRC is performing? Is it building a power plant or issuing a license for only building a certain portion of the power plant? This is not something that is in the scope of Reg. Guide 4.11, except to say that Reg. Guide 4.11, you know, Reg. Guide 4.11 directs applicants in preparing the background terrestrial ecology studies and the analyses that are necessary to prepare an environmental report that will allow the NRC staff to

perform an analysis and direct in cumulative environmental impacts of licensing activities of new reactors and re-licensing existing reactors.

Another reason is that terrestrial ecology survey methodologies substantially changed since 1977. A lot of procedures that used to involved setting out plots now involve using plotless techniques that are faster and simpler. So there has been, essentially a technological evolution in terrestrial ecology since 1977. And specifically, the NRC staff is known as the considerable variability in how the current realm of COL applicants have addressed terrestrial ecology in their environmental reports. Some go into more detail than others.

Now obviously a lot of that, there is a lot of site specific considerations as to how detailed the terrestrial ecology analysis has to be for a given application. But we have recognized that there is a need for fostering increased consistency among the application.

Also, and we talked about this just a few minutes ago, we need to develop consistent terminology with the other environmental regulatory guidance, specifically Reg. Guide 4.2 and NUREG 1555. Another point which was also brought up a few minutes ago is

we need to define the terrestrial aquatic boundary, simply because this Reg. Guide covers the terrestrial portion but it does not cover the aquatic boundary.

And also we have this no man's land, the wetlands, which is the transitional zone between aquatic and terrestrial. Do we view that as aquatic or do we view that as terrestrial? Not important. What is important is to make sure that we analyze impacts to wetlands and that we not overlook them.

So the objectives, therefore, for this Rev. 2 to Reg. Guide 4.11 is to update Reg. Guide 4.11 to reflect current scientific knowledge in state-of-the-art of terrestrial ecology, make Reg. Guide 4.11 consistent with Reg. Guide 4.2 and NUREG 1555. We did not set out to outline step-by-step procedures for performing terrestrial ecological analyses. However, we wanted to identify data sources and methodologies that exist in the scientific literature and regulatory literature and direct readers of Reg. Guide 4.11 where to go to find those procedures.

We wanted Reg. Guide 4.11 to have a certain amount of specificity but we wanted it also to be general enough that it would not need to be revised every couple of years. After all, this hasn't been revised since 1977. So, it is very likely that once

we finalize this, then it, too, may last more than 32 years before a Rev. 3 comes along. So we wanted to make this a robust enough document that it would not become obsolete as the knowledge base and regulatory policy change, as they know we will over the next several years.

I will take just a minute. Some of you may be wondering what is ecology and what is terrestrial ecology. I provide a definition here that one would get in any Biology 101 or Ecology 101 classes. This is from the Ecological Society of America. What I want to emphasize though is that ecology is a scientific sub-discipline of biology. So it is parallel to like botany, zoology, genetics, and other biological specialty disciplines.

Ecology is a technical field with its own definitions, principles, scientific literature, and models. It is oftentimes used in the media as a synonym for environmental policy. Like many people will say that Green Peace is concerned about the ecology of the Pacific Ocean. It is not. It is the Environmental Policy of how the ocean is managed. Ecology is a quantitative discipline of biology that basically analyzes the relationship between living organisms and their physical environment. It is not

environmental policy.

And then the second part of the equation is what is terrestrial ecology. Obviously, as would stand to reason, terrestrial ecology encompasses normally dry lands, which are oftentimes referred to by ecologists as uplands, plus wetlands that support emergent but not submerged vegetation.

Now, I did have a little bit of debate with one of the other aquatic ecologists as to what ought to be considered terrestrial versus aquatic. Everyone was in agreement that streams, rivers, lakes, and open waters are certainly aquatic and dry lands are certainly terrestrial. Wetlands are a transition zone and we decided that if the wetlands support emergent vegetation, that is vegetation that for at least a portion of the year is vertically erect and stands out from the surface of the water, is taller than the surface of the water, then those wetlands would fall within the scope of terrestrial ecology.

If however, it is an open water environment with just submerged aquatic vegetation, which can oftentimes occur in water that is three, four, three to five feet deep, then that would rightfully remain in the realm of aquatic ecology.

The wetlands have been a controversial

issue. This is the official regulatory definition of wetland that is recognized by the Corps of Engineers and Environmental Protection Agency. As you probably know, wetlands are a special aquatic site, impacts of which require a permit from the Army Corps of Engineers with oversight from the Environmental Protection Agency. This is the official definition of wetlands.

Then, why include wetlands in Reg. Guide 4.11? One of the favorite things I like to do as a wetlands scientists is to show people pictures of wetlands that don't look real wet. For example the picture in the upper right-hand corner is a wetland near my house. And I can tell you that while it is bone dry in that picture which was taken in August, in May, it typically has 12 inches of water.

The picture in the lower right-hand corner is of a cypress swamp that you can actually see the water marks on the trees where more than two feet of water is present at this site at certain times during the year. But if you look at the picture now, it is dry.

So, wetlands are indeed transitional between aquatic and terrestrial settings. There is aquatic properties to wetlands and there is

terrestrial properties to wetlands. Vegetation and soils in wetlands with emergent vegetation, remember that vegetation that is erect and emergent or is taller than the surface of the water, more closely resembles terrestrial than aquatic vegetation.

Most terrestrial wildlife can readily and easily move between upland and wetland settings; whereas aquatic wildlife, especially fish, generally tend to remain only in the aquatic settings. Wetlands dominated by emergent vegetation not only look like uplands from the ground, they usually are also very hard to resolve in uplands and aerial photography. So it is very difficult to tell from photographs whether something is a wetland or a terrestrial setting. And it can even be difficult, as these pictures show, when you are on the ground.

Indeed, the field of wetland mapping or wetland delineation as we call it, is a very specialized field requiring very specialized training. It is not a simple process. The boundary between uplands and wetlands is not intuitively obvious. However, the boundary between wetlands and the submerged aquatic settings is generally intuitively obvious.

MEMBER BLEY: I take it there must have

been some arguments about whether this should be in within the guidance or not.

MR. DOUB: I wouldn't say that the arguments were heated. They were just kind of friendly.

MEMBER BLEY: You seem to be defending them.

MR. DOUB: Yes. Probably the best defense is that we have a Reg. Guide 4.11 that covers terrestrial and we should go ahead, because we have got it, go ahead and include wetlands because wetlands are extremely controversial.

As you probably know, on most of the new reactors, the Army Corps of Engineers is a cooperating agency with the NRC in the environmental impact statements. And the reason they are is that the Army Corps of Engineers has to issue a Section 404 permit, commonly called a wetlands for the construction activities of the new reactor. So the Army Corps of Engineers or a cooperating agency is principally interested in wetlands. They are also interested in aquatic and upland settings as well but they are principally interested in wetlands.

Now, giving you a brief overview of the new Reg. Guide 4.11, the basic organization of Rev. 2,

of the Reg. Guide 4.11 generally parallels the basic organization of Rev. 1, or the existing Reg. Guide 4.11. We being with, we basically go through the entire life cycle of a nuclear power plant. We starting with siting and we go to baseline investigations at the site. We then get into identification of important species and habitats. And I will get into what important means in just a minute.

Then we get into the impact analyses that are necessary to analyze the impacts in construction and operation of the power plant. We get into ecological monitoring that may be necessary over the operational life of the power plant. And finally, there are terrestrial ecological considerations that are necessary at decommission of the power plant. So, we cover the full life cycle of the power plant, as does the existing Reg. Guide 4.11.

So starting with siting support. I initially kind of glossed over when I initially prepared my first version, first draft of Reg. Guide Rev. 2 or DG 4016, I kind of glossed over siting. And at the same time, we were having a lot of problems with a lack of good siting information provided by applicants in the current round of applications. So a number of us, ecologists on the staff, decided that

including information on terrestrial ecology data during the siting process would be very important, very useful to applicants.

So we have a greatly expanded consideration of terrestrial ecology in the siting phase of a project than I originally intended to have. But I think it is a good thing that we cover siting.

As you know, when we review applications, when we consider, when we look at alternatives, we look at site alternatives. We also look at technology or energy type of alternatives, such as using coal, or other fossils or wind, you know, other technology besides nuclear, and we looked at heat dissipation and cooling alternatives.

Siting support involving terrestrial ecology is principally for evaluating alternative sites. At the present time, EPRI has a siting guide that all the applicants choose to use, although it is not mandatory. The proposed Reg. Guide 4.11 will reference the EPRI siting guide but does not require that the applicant use it. The EPRI siting guide has been in use for several years and provides a logical step-by-step process for narrowing a field of sites down from a very broad area through a large number of potential sites down the candidate sites and finally

to a handful of alternate sites that receive detailed analysis. And terrestrial ecology is one of the elements that has to be considered in the evaluation of the alternative sites.

As opposed to the terrestrial ecology analyses that are typically done at the proposed site, at the siting stage, terrestrial ecology data is what we call reconnaissance data. It is generally information that is readily available or can be obtained through the windshield of a car.

The guidance that we offer in Reg. Guide 4.11 is in the sources of easily obtainable reconnaissance data that applicants can readily obtain with relatively low effort and cost and yet provides useful data for siting. None of these data sources existed in 1977. So none of them are pointed out in the existing Rev. 1 to Reg. Guide 4.11.

So, some of these sites include the U.S.G.S. topographic maps. The U.S. Fish and Wildlife Service have developed national wetland inventory maps, which are basically large-scale maps of wetlands across the country. These are generally at a rough scale but they are good for planning purposes.

Some states such as Maryland, New Jersey, and Florida have developed state wetland maps. The

U.S. Fish and Wildlife Service has developed, under the Endangered Species Act databases, the rare threatened and endangered species that is defined under the Endangered Species Act. And most states have natural heritage programs that list both federal and state listed rare threatened and endangered species that occur in specific geographic regions of the states, usually counties, sometimes portions of counties.

Most counties have soil surveys. They are most useful in not only characterizing the soils but also the habitats associated with those soils, in particular wetlands. Flood insurance maps are available that show floodplains, floodplain habitats are quite different in character than upland habitats. There are other federal and state land use maps available. For example, the Florida land use, land over maps are very useful and are used with both recurrent Florida applications for Levy County and Turkey Point. And also the USDA has its National Agricultural Program of aerial photography images that are quite useful.

What I want to emphasize in Reg. Guide 4.11 is the availability of these and other sources and where to go to obtain them, not to provide a

comprehensive list of all the sources that are out there because that is going to change with every year.

Moving on to baseline investigations. Baseline investigations are characterizing the site of a new reactor before the reactor is built. My own experience, I have been with the NRC for 187 months. Before I came to the NRC, I worked with Tetra Tech, an environmental consulting company and were performing terrestrial ecology baseline investigations for Calvert Cliffs. In fact, the picture I have here is right where one of the sediment ponds is going to go for Calvert Cliffs.

So I prepared a flora study, fauna study, rear plant survey and a wetland delineation for the Calvert Cliffs site. These were four baseline investigations that the applicant paid me to prepare before they submitted an application to the NRC. So, had a non-obsolete version of Reg. Guide 4.11 been available to me at that time, it would have been most useful. Unfortunately, we didn't have a useful version of Reg. Guide 4.11 available.

So in a sense, as the preparer of the new version, updated version of Reg. Guide 4.11, I am trying to think, what would I have liked to have had when I was preparing these studies between 2006 and

2008.

So the baseline, you know, I spent a fair amount of time in Reg. Guide 4.11 discussing how some of these baseline investigations can be put together.

Question?

CHAIRMAN RYAN: Sorry, you have to come to the microphone and say who you are and make your comment.

MR. BAYSSIE: Mekonen Bayssie. I am from the Branch of Research. I manage this particular guide.

You mentioned at the beginning you said you were going to define what terrestrial and aquatic environments. Wouldn't it be kind of wise to have the wetlands and terrestrial probably maybe have one guide? It looks like, you know, some of the staff that you are talking about, it looks like they cross over. And maybe the guide, it doesn't seem to be that big to be that complicated.

MR. DOUB: Actually, I think it would be a good idea to expand the name. You know, it says terrestrial environmental studies for nuclear power plants to call it terrestrial and wetland studies for nuclear power plants. But I was told by other staff members that they wanted to keep the title the same.

CHAIRMAN RYAN: Let's go on. We have a number of slides to get through and time is marching on.

MR. DOUB: Okay. These are, this slide is just a list of some of the types of baseline investigations that are commonly done by applicants. I will point out that in the case of Clavert Cliffs, they prepared separate reports and then when they wrote the environmental report, they cited these background reports as their data sources.

Some applicants don't prepare the reports prior to the environmental report. They simply do the technical efforts that would be covered by these investigations and then report the data for the first time in the environmental report. Other, like Calvert Cliffs, I provide an example of the cover of one of the reports that I prepared. This was the rare plant survey for Calvert Cliffs and they prepared in the stand alone reports. And other applicants have done the stand alone reports as well. Like I said, some applicants don't.

Habitat identification and mapping is the most basic of terrestrial ecology baseline surveys that are done. Usually applicants do a very good job of developing a working map of terrestrial habitats on

the applicant's site. One thing that I would like to see them do, though is there is a wide diversity of naming conventions that applicants use to refer to the terrestrial habitats. In the future, when an analyst may want to examine cumulative impacts from multiple projects, they are going to have to kind of translate all of these different names. Like something might be "meadow" in one environmental impact statement and "old field" in another one, referring to the same type of habitat. So, it would be nice if Reg. Guide 4.11 directed applicants, not requiring them, but directed them to try to reference their habitat names to one of the recognized published sources of terrestrial habitat names that are out there and available.

CHAIRMAN RYAN: Have you done that --

MR. DOUB: No, they don't.

CHAIRMAN RYAN: -- in the revision?

MR. DOUB: The revision does recommend that they tie the names to one of these sources.

CHAIRMAN RYAN: Okay. Well, that's fine.

MR. DOUB: We also encourage a sliding scale for habitat mapping. We encourage the greatest detail for habitats that are going to be impacted right on the site and then progressively less detail for habitat adjacent to the site in what we call the

vicinity of the site, which is a six-mile radius, and the region of the site, which is a 50 mile radius.

In terms of describing habitat, we want applicants, we do get a lot of variability in the technical detail that we receive from applicants when they describe terrestrial habitat. Ideally, the habitat description should discuss the dominant vegetation. It should list plant and animal or flora and fauna species that are actually observed in the habitats.

It should not the presence of invasive species. Invasive species are essentially weeds, non-native species that become rampant and displace native species. Examples are Melaleuca in Florida and Japanese honeysuckle in this area.

Terrestrial habitats function within an integrated landscape. And the position of terrestrial habitats within the landscape, what we call the landscape biogeography, is important in assessing the value of habitats to wildlife and potential impacts to wildlife. And then also terrestrial habitat descriptions should describe existing natural and human-induced effects. And these requirements are out of Reg. Guide 4.2 and NUREG 1555 as well.

Like I said, one of the objectives is to

foster consistency between Reg. Guide 4.11 and Reg. Guide 4.2 and NUREG 1555, something that the existing Reg. Guide 4.11 does not do.

And fauna studies, I prepared flora and fauna studies for Calvert Cliffs and other applicants do likewise for the other sites that we are currently reviewing. In some cases these are reported as background reports and other cases directly in the environmental report. But they identify species occurring in and potentially occurring in each terrestrial habitat. It is important that the effort be proportional to potential impacts that we want the applicants to focus their effort on where environmental impacts are actually going to take place, rather than simply describing habitats for large areas that aren't going to be affected.

Although Reg. Guide 4.11 does not outline specific technical protocols that must be followed, we do provide direction to sources of existing technical protocols that are available for performing terrestrial analyses. These protocols usually involved visiting predetermined plots, transects, or routes. One thing we definitely want to try to encourage is multiple visits to the sites at different times of the year. NUREG 1555 requires visits during

each season, generally fall, winter, or spring, and summer but we get a lot of variability from applicants in terms of whether they visited the site once, twice, or four times over the course of a year. So we would like Reg. Guide 4.11 to encourage multiple visits during each distinct season.

MEMBER BLEY: Can I ask you something?

MR. DOUB: Yes, sir.

MEMBER BLEY: The way you are presenting this is very much the way I read the draft Reg. Guide. And it is "encourage," you may get this, you can go here for information. Most Reg. Guides I am familiar with provide one way you can meet the requirements and minimize your chance of problems and getting approval if you follow the way that is in the Reg. Guide.

It seems, and I may be missing the point, never having done one of these kind of studies, it just seems very tutorial. It is very informative as you read it. I am not sure it would tell me which of the things it points to are the things the staff really wants to see when one of these come in. And is it really that way or am I just kind of missing the boat a little bit?

MR. DOUB: Well, actually other staff that reviewed this for me thought that this was too

specific, that they actually didn't want it to be a cookbook.

Unfortunately, ecology as opposed to engineering, you know, as I said ecology is a scientific discipline with its own vocabulary, formulas, models but it is not quite as procedural as various forms of engineering are.

MEMBER BLEY: That's fine. What I am getting at --

MR. DOUB: It is very site specific as to what would be most appropriate for a given site.

MEMBER BLEY: -- somebody has to submit an application and in that application, they have to include an environmental impact statement. And this seems --

MR. DOUB: Environmental report.

MEMBER BLEY: Environmental report. This seems more like background information that I would find in a Reg. Guide rather than as much guidance but I might be, you know, go ahead. Don't hang on this. It seems to me it is not.

And I don't think it is an engineering versus ecology difference. It seems to me a style difference in the writing.

MR. CLARKE: It seems there is another

piece to it.

CHAIRMAN RYAN: Hang on just a second.

MR. CLARKE: Oh, I'm sorry.

CHAIRMAN RYAN: I'm sorry, go ahead. He's first. You're second.

MR. CLARKE: I'm first? Okay. It seems there is another piece to this, too, and you bring it out in your draft. And that is, that these folks will be working with the NRC, they will working with the state, they will be working with other people. And you do suggest that they inform themselves about how these agencies like to see these things done. Because there is some judgment and there is some flexibility. I don't think that is bad but I think that may be one of the reasons that it may not be as specific as --

MEMBER BLEY: That's a real good point, yes. Because you are really satisfying multiple organizations and agencies.

CHAIRMAN RYAN: Yes, there is a whole, I mean, there could be states and specific things that go beyond the federal Reg. Guide that come into play as well.

Sir?

MR. MASNIK: That's pretty much what I wanted to say.

CHAIRMAN RYAN: All right. You have to tell us who you are and use the microphone.

MR. MASNIK: I am Mike Masnik. I am an aquatic ecologist with the staff.

CHAIRMAN RYAN: Thank you.

Again, I am looking at the time. You are going to have to pick up the pace.

MEMBER BLEY: Sorry for the interruption. Go ahead.

CHAIRMAN RYAN: I want to leave time for our questions and discussion at the end.

MR. DOUB: In addition to identifying and describing the habitat, Reg. Guide 4.11 will encourage applicants to discuss the suitability of those habitat for wildlife. And I get into some of the technical criteria that one can use to evaluate the value of a given terrestrial habitat for wildlife.

We talked about wetlands. Wetland delineations are a highly controversial procedure because it drives how applicants can use property. The impacts for wetlands are directly regulated by the U.S. Army Corps of Engineers under the Clean Water Act. And as I said before, the Army Corps of Engineers is our cooperating agency for all of environmental impact statements so far for new

reactors.

The Corps of Engineers, since 1987 has promoted this Corps of Engineers wetland delineation manual. It is commonly called the 1987 manual. There was a brief period that they came out with a manual in 1989 and that proved so controversial that they went back to the older manual and they have used it ever since.

This manual has been in the news, controversial. A lot of property rights groups don't like the idea that wetlands are regulated at all. And they tried to manipulate the wetland delineation process to try to exclude as many areas as being wetlands are not. So the ability to define the boundary between uplands and wetlands, as I said before, it is not intuitive. It is quite technical and it is politically controversial.

So the Corps of Engineers has required that this manual be used and all their applicants have used this manual in the current round of applications.

CHAIRMAN RYAN: And I think this is a good example like Dennis was asking about is if I am going to do the wetland delineation, I now know I need to use the Corps of Engineers Wetland delineation manual.

MR. DOUB: Correct.

CHAIRMAN RYAN: And I am directed to that specific document to do that part.

MEMBER BLEY: If I don't do that, I am going to have to do a lot of justification.

CHAIRMAN RYAN: Oh yes, you will have to come up with a whole lot more to not use it.

MR. DOUB: Right. And rather than attempt to paraphrase the manual, we simply refer users to the manual.

CHAIRMAN RYAN: Perfect.

MR. DOUB: It is also very important, as you probably know, there has been a lot of controversy over which wetlands the Army Corps is allowed to regulate under the Clean Water Act. Initially, they attempted to regulate all wetlands. In some cases, courts have ruled that certain wetlands that are not directly adjacent to other wetlands or to aquatic features or what they call non-jurisdiction wetlands. So now when applicants do wetland delineations, they have to identify for the Corps of Engineers both what they call jurisdiction wetlands that the Corps has jurisdiction over and non-jurisdictional wetlands the Corps of Engineers does not have jurisdiction over.

Even though they are non-jurisdictional from the viewpoint of the Corps. of Engineers, these

are still habitats. These are still terrestrial or wetland habitats that need to be defined. So, there has been questions from a number of applicants. Do we have to address non-jurisdictional wetlands in an environmental report? So Reg. Guide 4.11 will provide direction that because non-jurisdictional wetlands are terrestrial habitats, we still need information about them, even though the Corps will not require a permit to impact them.

Also, the Corps of Engineers performs what is called a jurisdictional determination in which until a few years ago, jurisdictional determination was the process by which the Corps of Engineers went out and verified wetland delineations to make sure they are done properly. In the last few years as a result of some court decisions, they revolved into a process where the Corps of Engineers not only verifies that a wetland delineation was done properly but they also distinguish jurisdictional from non-jurisdictional wetlands.

So, we want to, in Reg. Guide 4.11, acknowledge the presence of non-jurisdictional or the possible presence of non-jurisdictional wetlands on sites and then have those evaluated as terrestrial habitats, even though they will not be apply to the

Corps. And we are trying to develop an Environmental Impact Evaluation Process that will serve the needs of NEPA separate from the Corps because some times the Corps may not be a cooperating agency with us.

Did somebody have their hand up?

CHAIRMAN RYAN: No. Keep going.

MR. DOUB: Originally, the attitude among wetland scientists were that all wetlands should be regulated alike. However, in recent years, certainly in the last 20 years, they have come out with a number of functional assessments of ways to evaluate the potential benefits of wetlands to society. I won't go into some of the technical detail but just point out that this list is 13, actually eight functions and five values that some wetlands can provide. Few wetlands provide all 13 of these functions and values but all wetlands are going to provide at least one of these functions and value.

In the current round of applications, we are seeing a lot of variability in how much applicants attempt to describe functions and values of wetlands. From the viewpoint of NEPA impact analysis, we need more information than just where wetlands are and whether something is a wetland or is not a wetland. We need to have information on what this wetland does,

why this particular wetland is itself valuable and how this wetland is a value compared to another wetland on the site.

So, we believe it is important, in order to do NEPA analyses to have information on wetland functions and values. So, the new Reg. Guide 4.11 will encourage applicants to use one of the available procedures that are published for identifying wetland functions and values. We don't specify one particular process they can use but we simply provide a menu and encourage them to choose one of these possibilities.

MEMBER BLEY: I am just trying to come to grips with what all this means. Just quoting you right on this stuff you are talking about out of the Reg. Guide, NRC does not directly regulate wetlands or issue permits for wetland impacts but it does consider impacts in jurisdictional and non-jurisdictional wetlands when making licensing decisions.

Practically, what does that mean to consider them when making decisions? They might withhold a license because of damage to some of the habitats? Is that what it is saying? It says we don't regulate it but will consider it in making licensing decisions.

MR. DOUB: NRC does not directly regulate

wetland impacts or impacts to other terrestrial or aquatic habitat.

CHAIRMAN RYAN: But that is immaterial to the fact that you are going to use it in a licensing decision.

MR. DOUB: Yes but we do, under the National Environmental Policy Act, have to evaluate the environmental impact of our licensing decisions.

MR. CLARKE: Yes. Again, I think that is the answer. You need this information to prepare the environmental assessment, the Environmental Impact Statement.

MR. DOUB: Correct.

MR. CLARKE: Maybe that would be a better way to say it?

CHAIRMAN RYAN: Here is the thing that is a little bit troublesome and some of the other wording that we will have in a few minutes and some we have talked about already. What an applicant wants to read is, what do I need to do and what goal am I trying to obtain. Real clear and simple.

The fact that you are going to use it in a decision-making process is important. And what exactly you are going to evaluate and how to make a decision is important to me. The fact that somebody

else regulates something similar may or may not be important to me.

But this is a guide of how I am going to meet an NRC requirement.

MR. DOUB: This guide does not address, does not inform the applicant to meet the Corps' requirements, the Corps of Engineers' requirements.

CHAIRMAN RYAN: We need to say that right up front. What are you trying to do? You are trying to use data the applicant provides on terrestrial ecology to decide what? If they are going to get a license or not.

MR. DOUB: To evaluate potential environmental impacts.

CHAIRMAN RYAN: Well, what if there is an environmental impact that you don't like? Are you going to deny the license? So the ultimate decision is to either grant or deny a license or some form of -- I am trying to understand. It is a little soft and mush to me what we are going to use this for.

MR. MASNIK: First of all, NEPA is a requirement to evaluate the potential impact so that alternatives can be considered. Okay? Now, there is a possibility that during the licensing process the Atomic Safety and Licensing Board Panel could put

restrictions on the utility to do certain things. Okay?

So, there may be in the licensing process a requirement based on the potential impacts associated with the --

MEMBER SIEBER: In fact what you are doing is preparing a statement that describes the extent to which you comply with the National Environmental Policy Act. And the granting of a license is accompanied by an opportunity for here. This provides the Commission's position with regard to the impact of the facility versus what the law is, which is NEPA, and I think that is the way it works.

Then the Commission makes the final decision, 99 percent of the time based on the outcome of the ASLB hearing on the subject. So, it is not a straight forward thing where you list, here is what you have got to do and then the staff runs in and evaluates that and says they did it or they didn't. It is more of a judgment call based on NEPA.

MEMBER BLEY: And it is almost, the way I am hearing it, is it we are meeting the requirements to get down on paper what these impacts are so if perhaps someone wants to intervene, if they have a basis for it, --

MEMBER SIEBER: They could contest it.

MEMBER BLEY: -- they could contest it. That's really it. Are you providing the information that the law requires you provide in the proper way?

It is not a direct licensing issue. It might lead to some conditions but more getting the story straight.

MR. CLARKE: The licensing decision is the major federal action that requires the environmental impact statement. So the decision to grant the license is what we are talking about. And that decision has to be accompanied by an environmental analysis, which is codified in an environmental impact statement. Now, if you have environmental impacts, you can still go forward. You know, the law doesn't say you have resolve.

MEMBER BLEY: It just says you have to identify them.

MR. CLARKE: But there are areas where you might encourage alternatives or mitigation or something like that.

MEMBER SIEBER: The idea is to not make a judgment about the environmental impact but to analyze it. And these are the ground rules for analyzing it and writing it down so that it can become part of the

decision process, which is adjudicatory in nature. That is my understanding of what we are doing here.

And so what you are doing --

MR. DOUB: Rather than taking it as ground rules, it is guidance, technical guidance.

MEMBER SIEBER: Yes, you are setting the rules to do the analysis but not making the judgment as to whether the analysis meets NEPA or not.

CHAIRMAN RYAN: To me guidance is kind of a magic word. Guidance is something I have to do or not do. I mean, I can choose to do it or not.

MR. DOUB: And these are not mandatory. That even once Reg. Guide 4.11 is published, applicants will not have to use it.

CHAIRMAN RYAN: Right. But by the same token if I have got half a brain in my head, I am going to probably follow this guidance.

MR. DOUB: Right.

CHAIRMAN RYAN: So in fact, I don't think there would be an applicant that wouldn't follow the guidance.

MEMBER SIEBER: Well, the guidance is set out to conform to what the staff intends to review.

CHAIRMAN RYAN: Right.

MEMBER SIEBER: If you are outside of

that, then it is quite possible that the requirements that are set out --

CHAIRMAN RYAN: Yes, because you could be outside of the wheelhouse if you are not --

MEMBER SIEBER: Yes, and the staff is not going to make a decision to write it down. And so here comes all the RAIs that say, you know, how do you meet these provisions. And sooner or later, you are going to end up in the Reg. Guide or pretty close to it.

MR. DOUB: Okay, let's continue on. Next, we want to get into -- once you do the baseline investigations, we need to get into identification of important species and habitats.

Important species and habitats is something that the NRC specifically defines. If you use the term important species outside the NRC, nobody knows what you are talking about. It is an NRC term.

But the way the NRC has defined important species in NUREG 1555, is that it includes federally listed threatened and endangered species; species and habitats proposed for federal listing; state listed and state rare habitats; bald and golden eagles; recreationally valuable species; species essential to survival of the other species; biological indicator

species; national and state wildlife refuges; wetlands; and invasive species.

A lot of applicants seem to think that important species is a synonym for threatened or endangered species. It actually encompasses a lot more. If we as a staff are going to use NUREG 1555 to review and application and prepare an Environmental Impact Statement, we need information from the applicants about all of the important species that meet the definition set out in NUREG 1555.

CHAIRMAN RYAN: I am not familiar with this term of art. What is recreationally valuable species? Is that hunting and fishing kind of things?

MR. DOUB: Exactly.

CHAIRMAN RYAN: All right.

MR. DOUB: So we have seen considerable variability among the current crop of applications as to how much information they provide on important species and habitats beyond those that are the threatened and endangered species.

So if Reg. Guide 4.11 doesn't provide the guidance to the applicants on what terrestrial species meet the definition of important species, then we are going to continue to get a lot of variability. So we want to try to get some standardization in what

information the applicants provide us about important species.

The reason the NRC identifies important species is so that we can focus the subsequent effort on those species. We want the applicant to perform a necessary amount of analysis but not excessive amount of analysis. In other words, we need to get the information on those species who are most relevant to our decision-making process without a lot of superfluous information about species that aren't relevant to our decision.

The process of identifying important terrestrial species will focus the scope not only of the applicant's ER but also the EIS. It will assist both the applicant and the NRC in complying with the Endangered Species Act and other regulatory requirements. And the species that are identified as important are also going to be those that may have to be monitored over the operational lifetime of a power plant.

Once we have done the baseline investigations and we have identified using the information in the baseline investigations, we have identified the important species. Then we need to analyze the impact. What is going to happen to these

resources once the license is granted and construction and operation of the power plant can begin.

Impact analyses, just like the baseline analyses, can either be prepared as stand alone reports or the data can be directly presented for the first time in the environmental report. Reg. Guide 4.11 encourages impact analyses to be based on the best available baseline data, whether site specific or from various published sources. And we provide some direction to the sources but we don't limit the sources.

Reg. Guide 4.11 will encourage that all impact analyses be clearly supported by data and logic and as quantitative as practicable and necessary to make decisions. Just like in the baseline studies, Reg. Guide 4.11 will encourage the use of methodologies for models that are widely accepted by scientific authorities and other experts in the field. And it will discourage the use of experimental or unproven methodologies, assumptions or models.

Reg. Guide 4.11 will also encourage the use of best professional judgment to avoid unsupported speculation and opinions.

Some examples of some of the common types of impact that terrestrial ecology impact analyses

that maybe necessary for a power plant, include the loss of habitat; noise impact on wildlife; impacts of displacement of wildlife from habitats on the site to habitats adjacent to the site; the potential for birds, and bats, and other flying wildlife to collide with the new structures in construction and operational phases; the potential for wildlife to be electrocuted by the transmission lines, substations and other electrical structures associated with a nuclear power plant; and also the potential for a cooling tower drift to impact, to adversely impact vegetation in terrestrial habitats surrounding a power plant.

The specific needs for impact analyses, just like baseline characterizations are highly site-specific and project-specific. Reg. Guide 4.11 will not outline a cookbook set of procedures for impact analyses but, instead, will try to set a framework for helping the applicant identify what analyses are necessary to provide the information that the staff will need to do an effective review of environmental impacts from a proposed project.

Once the impact analyses are done, then ultimately the plant will be built in the operational phase, and there may be monitoring requirements. In

the first round, the power plants, the NRC sometimes specifically directed as license conditions what ecological monitoring had to be performed. More commonly today, this monitoring will be required by other regulatory agencies, such as the U.S. Army Corps of Engineers and the U.S. Fish and Wildlife Service.

I have been told that it would be kind of rare for the NRC to actually directly issue a license condition requiring terrestrial monitoring but it is possible. But more than likely, applicants will have to do this monitoring in order to comply with other regulatory requirements.

Monitoring today could commonly be part of their wetland permit from the U.S. Army Corps of Engineers. It may be part of the biological opinion that the U.S. Fish and Wildlife Service issues under Section 7 of the Endangered Species Act. There may be other conditions in federal and state permits. There may be mitigation measures that the NRC staff develops as part of the EIS that then have to be complied with. And then expected rarely, there may actually be an NRC license condition.

Finally, in the case of decommissioning, terrestrial ecology is certainly a factor in making a decision to approve decommissioning of a power plant.

Once that nuclear power plant is no longer needed, there is going to be a need to restore the site to functioning terrestrial habitats, presumably functioning in a way similar to how the habitats functioned before the site was disturbed.

There was a need for baseline data, so the baseline studies that are performed at the time of the initial application may prove very valuable many decades later, when the plant goes to decommissioning. And there may be a need during decommissioning process to disturb additional land adjacent to the site or on the site in order to accomplish the objectives of decommissioning.

So, I will conclude this presentation by simply noting some of the future direction that I see potentially happening as a result of revising Reg. Guide 4.11.

So as I said, proposed Revision 2 of Reg. Guide 4.11 is currently on the NRC website as Draft Guide 4016. It will eventually be issued for public comment. Once we get public comments, we will revise Draft Guide 4016 to incorporate the public comments. And of course, any comments that have been received today or received in the near future from you all will of course be considered in the revision of Reg. Guide

4.11.

Ultimately, the NRC will adopt and publish what will be Rev. 2 to Reg. Guide 4.11. Once Rev. 2 is published, the NRC staff will encourage applicants to use Rev. 2 to Reg. Guide 4.11 but, like other regulatory guides, they are guidance and are not mandatory.

Once applicants start to use Reg. Guide 4.11 in a hypothetical future round of applications, I guess would be the third round of applications, the staff should be evaluating whether Rev. 2 to Reg. Guide 4.11 is actually working or not. So we should monitor how Reg. Guide 4.11 is improving the process. Are we getting the information and not having to issue as many RAIs as we do at the present time? So we should evaluate how the Reg. Guide is actually working once it becomes implemented.

And then as I said before, at some point in the future, the staff should probably consider developing a companion regulatory guide that will address aquatic ecological studies.

So at this point, I will stop and take any questions.

CHAIRMAN RYAN: Dr. Clarke?

MR. CLARKE: Okay, Peyton, as I

mentioned, the subcommittee asked me to review your document and to provide some comments and I guess that is what you want me to do at this point.

I think it is clear that there is the need for a revised document is upon us. As you mentioned, new regulations have been either promulgated or significantly modified and a number of resources have appeared on the scene from other federal agencies and new approaches, methods, and tools, for the conduct of terrestrial environmental assessments have been developed and area available, since 1977.

I found your document to be very comprehensive and to contain a large amount of information that will be helpful to assessors of terrestrial environmental impacts that could result from NRC licensing activities for nuclear power stations.

I did have, I will say, three observations with some comments and some recommendations. And I will probably start out with my second one because the discussion was, I think still pretty fresh but I did not see in your document, in your draft, any reference to the national environmental policy act, either in the text or in the list of references. Given what I heard in our discussion today, I think you should not

only reference it but I think you really ought to provide a discussion and a clarification on NRC's role within the context of the National Environmental Policy Act that your role is making a decision that could have, that is a major federal action, using their words, that could have a significant impact on the quality of the environment. And therefore, this guidance is prepared for people writing license applications to assist them and you in meeting those overall objectives.

MR. DOUB: This would be up front?

MR. CLARKE: Up front, yes. I really think there would be merit to a several sentence maybe introduction as to what is driving all of this and where this regulatory guide fits into that.

So my initial recommendation is just that you should reference the Act but now I am convinced you have to really develop not only the Act but the NRC's role in complying with that Act and the role --

MR. DOUB: Can't I reference them to NUREG 1555 for more of the details on how the Agency --

CHAIRMAN RYAN: A short paragraph wouldn't hurt in the Reg. Guide and the reference would actually be the way I think we would recommend to do that.

MR. CLARKE: Because you had several questions today that I think were good questions that spoke to the need for an understanding of what your are doing, why you are doing it and how it is going to be used.

CHAIRMAN RYAN: You know, again, it is not the practitioners that I think about all the time when you read a Reg. Guide, but the public is reading this, too. So if they want to know what does the NRC think about this topic, they are going to read this. If you get that little bit of detail in it, as well as a reference to more detail, it really helps roadmap where things are.

Did you have some other specific questions?

MR. CLARKE: I did. I have two more.

CHAIRMAN RYAN: Please.

MR. CLARKE: I think you ended with a bullet on decommissioning and you do have in your introduction statement to the effect that this guidance could be helpful for other types of NRC licensing activities as well. I would suggest that you don't do that.

I would suggest that you make a distinction between this guidance if it is intended

for nuclear power reactors and that licensing decision, and the potential utility of the information. In other words, a distinction between the decision and the utility of the information. There is no doubt that the information you have developed will be extremely helpful in other kinds of licensing decisions.

And I am concerned that it might be confusing and maybe even misleading to try to package that in with --

CHAIRMAN RYAN: I would modify that a little bit and I would say take it out. I think it is most confusing to say this guidance may be useful in decommissioning or other fuel cycle licensing actions. It may be helpful or applicable? How?

And if you want to write guidance for other kinds of licensing actions, which follow different paths than reactors, for example, then you need to write the guidance in those context and not try and just have a tag line that says it might be good for this also. If I am a licensee or an applicant, I see it might be good for it, well I think it might not. I am done.

And it cheapens the reality that it has --

MEMBER SIEBER: What if you do it and it

doesn't pass muster?

CHAIRMAN RYAN: Yes, even worse. I really think it is very risky to try and casually tie the guidance in this guide to some other licensing act.

MR. CLARKE: Mr. Chairman, can I read my recommendation?

CHAIRMAN RYAN: Please. I'm sorry. Yes, go ahead.

MR. CLARKE: My recommendation: The staff should revise the document to clearly state that this guidance has been developed specifically for nuclear power reactors and delete statements that refer to potential use of the guidance for other types of licensing applications.

CHAIRMAN RYAN: Absolutely on track.

MEMBER SIEBER: Yes, Mike read that. That is why he is --

(Laughter.)

MR. DOUB: Are we keeping the part about decommissioning reactors, though? Because that was part of --

CHAIRMAN RYAN: To the extent that it is included in what is licensed, yes.

MR. DOUB: Yes, okay.

CHAIRMAN RYAN: But not the waste disposal

or other nuclear fuel cycle facilities.

MR. DOUB: Okay.

MEMBER SIEBER: Or the restoration of the site.

CHAIRMAN RYAN: This is the decommissioning of this reactor.

MR. DOUB: Correct.

CHAIRMAN RYAN: Not any other reactor and no other facility.

MR. DOUB: Well the title of the Reg. Guide says terrestrial environmental studies for nuclear powered stations.

CHAIRMAN RYAN: So you ought to say, instead of saying reactor, say this for nuclear power stations. Be very specific so it is clear you are not trying to tie it there.

MR. DOUB: Okay. So the scope should be limited to nuclear powered stations.

CHAIRMAN RYAN: Just what the title says.

MR. DOUB: Okay. I think it could get done.

CHAIRMAN RYAN: Unless it is thorough on the other ones.

MR. DOUB: It is not.

MEMBER SIEBER: But they are things in,

for example, decommissioning, that aren't in here.

MR. DOUB: Right.

MEMBER SIEBER: And so I would rather stick with your original comment.

MR. CLARKE: My third comment, we also touched up on it, particularly Dennis I thought had some real good questions that reflect this concern. I will just read it to you quickly.

In most cases, with respect to assessment activities that are recommended and/or encouraged, the verb "should" is used as is appropriate, I think to guidance. However, in a couple of cases, apart from references to the Clean Water Act where the requirements of this act are referenced, "must" is used. And I think you have to be careful with that because it may be intended but it is not clear in some cases. I didn't look like it was intended. Let me give you a couple of examples.

On page 16, it says, "Impact analysis must extend beyond quantifying the average of habitat losses. It must evaluate the effects of habitat losses on the distribution movement and reproduction of flora and fauna." Here, you know, maybe that is what you mean. Maybe you mean "must," you want them to do that.

MR. DOUB: I think I agree with you, it should be "should."

MR. CLARKE: Well, that is why I am raising it.

MR. DOUB: Yes, I probably should do a global search for the word "must." You know Regulatory Guidance is guidance. It is not must.

MR. CLARKE: You know, the two times you use it Peyton when you are referencing the Corps and the Clean Water Act, you are referencing the requirements of that Act and maybe it is appropriate, if you qualify it in that way.

I have a few more examples but we may not need them. Let me just skip to the bottom line in the interest of time.

CHAIRMAN RYAN: You can go ahead and do the other examples if you want. We have got time for that.

MR. CLARKE: Okay. On page 17 under bird and bat collision analyses, the second paragraph begins with "Impact analyses must discuss the potential effects on populations of migratory bird species colliding with any proposed structure exceeding the 200 foot threshold."

If this is in fact a regulatory

requirement, maybe must is appropriate.

MR. DOUB: No.

MR. CLARKE: However, it kind of struck me as more of a "should."

MR. DOUB: I agree with you. It should be "should" rather than "must."

MR. CLARKE: And the other case that I wanted to bring up -- and so we have got should versus must. We also have may versus can. And if we are using "may" within the context of to get permission, and we are using "can" to denote, this is what you could do. I think we have to be careful.

MR. DOUB: I may have used those two terms interchangeably. Which would you recommend, can?

MR. CLARKE: Let me give you an example. On page 10, it says, "Existing botanical and wildlife inventory data collected from the survey area may serve as a partial substitute for repeated fuel surveys in areas where the habitat has not changed substantially." Maybe "may" is appropriate there. Maybe you are saying that is okay, you can do that, rather than this is something that you might want to consider doing.

So again, I don't want to presume to know your intent. My recommendation is just that the staff

should review the document for consistency and intent, with respect to usage of "should," "must," "may," and "can."

MR. DOUB: Okay. I mean, "may" and "can" I kind of use as synonyms. Is there a legal distinction?

MR. CLARKE: When I was a kid --

CHAIRMAN RYAN: If you can do something, that means you have the ability to accomplish it. If you may do something, is permission to go do it.

MR. CLARKE: When I was a kid and said, can I go to the movies, my mother would say, yes, you can but you may not.

CHAIRMAN RYAN: I know we are picking on some words but sometimes these words are critically important to convey the right meaning.

MR. CLARKE: Well especially since this is guidance to industry from a regulatory agency. That is the reason, I think.

MR. DOUB: It is guidance but it is not requirements.

MR. CLARKE: Yes, and that is --

MR. DOUB: I think I will go with can because I don't want to imply that the Agency is giving them permission to do something in the Reg.

Guide.

MR. CLARKE: I just throw it back to you.

MR. DOUB: I am trying to bring up technical possibilities that are available.

MR. CLARKE: I would certainly encourage you to, you know, if you want to change all of them. There are only a few of them.

CHAIRMAN RYAN: And there is nothing with putting in a note to explain "can means" and then write down exactly what you mean.

MEMBER BLEY: There is another possibility, too. These four words, in some standards organizations have very precise meanings. I don't think NRC has ever adapted that. Most of your cans and mays you can dismiss. You can say information on this is available in this document. I think if you avoid the cans and mays you are probably better off.

CHAIRMAN RYAN: Yes.

MEMBER BLEY: And you can reword things to do that.

CHAIRMAN RYAN: Anything else?

MR. CLARKE: I had a couple of editorial comments also.

MR. DOUB: Is there a way that you can provide the editorial comments on paper?

CHAIRMAN RYAN: Well, we have him -- it will be on the record.

MR. DOUB: Okay.

MR. CLARKE: Well, I could give him this letter.

CHAIRMAN RYAN: Go ahead.

MR. CLARKE: Do you want me to read the editorial comments?

CHAIRMAN RYAN: Yes, please.

MR. CLARKE: These come under the heading of minor editorial comments and suggestion.

You have on the very first page and this is just place holder, insert date 60 days from issuance. Just be careful that you do that. I mean, it is just kind of --

MR. DOUB: That maybe a question for Research.

MR. CLARKE: -- leaped out at me.

MR. DOUB: That wasn't verbiage that I put in.

MR. CLARKE: And this is very minor but pages 13 and 14, your bottom line on 13 goes with your top line on page 14. If you can reformat that and put those together. I had to read it a couple of times to make sure. And again, these are very minor.

I thought on page 21 your list of items, I can't remember what the heading was. It was Roman numeral C.

MR. DOUB: Okay.

MR. CLARKE: Regulatory position. I thought that was a really good list.

MR. DOUB: Thank you.

MR. CLARKE: Again, you had some shoulds and musts in there.

MR. DOUB: Oh, okay.

MR. CLARKE: But I thought you might want to just put a lead-in statement to that.

And then on page 22, should regulatory analysis be labeled as Section E or is it part of Section D, implementation? Is it a separate section?

And then on your reference 13 and 14, you need to insert a line space.

MR. DOUB: Yes, unfortunately the guy from Research had to leave. That would be a question for him.

MR. CLARKE: It wasn't clear to me.

MR. DOUB: You know, Research developed a template for this.

MR. CLARKE: It looked like it would be separate section.

CHAIRMAN RYAN: Just look at the bold typing in the heading. It looks like the E is missing off of this one.

MR. DOUB: Okay.

CHAIRMAN RYAN: But that is fine. That is a minor fix.

MR. CLARKE: Yes, these are all pretty minor.

CHAIRMAN RYAN: Dr. Bley.

MEMBER BLEY: I had three areas. Jim has covered two of them pretty thoroughly and I liked all of his comments, especially with respect to the laws that apply. And "can," "may," "should," "must," I would just reemphasize, look at them all and make sure they are saying what you want.

Another word that was scattered through it and was scattered through your talk and that is "encourage."

MR. DOUB: Yes.

MEMBER BLEY: That one, I am not sure --

MR. DOUB: That one I like. I want to keep that one.

MEMBER BLEY: Well, be sure people know what you mean by that.

MR. DOUB: Okay.

MEMBER BLEY: What does it mean to encourage it? It doesn't mean anything to me if I am submitting something if there are no consequences to not doing it.

MR. DOUB: Well, Reg. Guide 4.11 is not a directive.

MEMBER BLEY: That's right.

MR. DOUB: I mean, applicants don't have to use Reg. Guide 4.11, even though it will be available to them.

MEMBER BLEY: No, they don't but most Reg. Guides, you don't have to use any of them, the truth is.

MR. DOUB: Right.

MEMBER BLEY: You can always do something else.

MR. DOUB: That is what I --

MEMBER BLEY: But they are usually pretty clear that if you do the things here, you have met most of what staff wants to see.

So "encourage," just be sure you like it where you have it. I would look at all of those again.

You have another phrase here that just seems kind of funny and I think I saw it in a couple

of places. And it is "Analysts should justify the method selected."

MR. DOUB: Yes.

MEMBER BLEY: Well they always have to do that. Right? So I don't know what it is in there.

Usually in the Reg. Guide, you don't have to justify them because you went to the Reg. Guide. So it seems kind of --

MR. DOUB: No, but if you select the functional assessment methodology, for example, there are two applicants in Florida have had logically chosen to use the functional assessment methodology that the state of Florida requires. And therefore, they justified it by stating that it is specific to the state of Florida, you know, required by the state and developed specifically for the state, that is a justification.

For somebody for a project in North Dakota wanted to propose using the Florida methodology, I would like to know why they chose the Florida methodology for citing in North Dakota.

MEMBER BLEY: Okay. It just seems unnecessary to me because if they don't do what you told them to do, they have to justify. No big deal.

The last one is the place you started,

just seems to me, it isn't comment on what you have done, I really found the Reg. Guide informative and I learned an awful lot reading it. And I think anybody would. I think it is a great document but I don't get why we don't have a companion document on aquatic.

MR. DOUB: Time and energy.

MEMBER BLEY: Well it has been a long times since 1979. It seem like it ought to be on the table somewhere.

MR. DOUB: Mike, can you provide some insight?

MR. MASNIK: We will take your comment back. I am an aquatic biologist so it would probably fall on my shoulders or close to it. So, it is something that needs to be done, I agree.

MEMBER SIEBER: Maybe we should have someone else take the comment back --

(Laughter.)

MEMBER SIEBER: -- if it is going to fall on your shoulders.

MR. DOUB: But I have been told that Reg. Guide 4.11 is going to stay terrestrial; that it would be a new Reg. Guide.

MEMBER BLEY: Well that makes sense.

MEMBER SIEBER: Well it turns out a lot of

the issues are aquatic in nature and so it becomes very important.

MR. MASNIK: We have had the same problems on consistency in reporting and the types of study. So there certainly is a need for it.

CHAIRMAN RYAN: You know, and a big part of power plants, let's face it, is the impacts on the aquatic system, and all the rest.

MEMBER BLEY: That is why they are where they are.

CHAIRMAN RYAN: That is why they are where they are, of course.

MEMBER SIEBER: I do have a question about the aquatics though. It seems to me that there are more local and state regulations on aquatic than on anything else. Because you have discharge permits and all kinds of issues that come up.

That one is going to probably be dominated by local and state restrictions, as opposed to the NRC or national guidance.

MR. MASNIK: Fundamentally, the issues are the same and that is good background studies that characterize the environment is necessary.

CHAIRMAN RYAN: And the ecology.

MR. MASNIK: And the actual regulation or

the imposition of monitoring stuff, that is typically a state requirement and we recognize that and we work with the state.

CHAIRMAN RYAN: Jack, do you have any comments or questions?

MEMBER SIEBER: I do have a question on the aquatic but I agree with everyone else's comments and I think this is a good effort. And the reason why I like it is because it puts structure around a process that sometimes resists structure and I would like to see that.

In the old days when we first started doing these, the EISs were sort of, in my opinion, were sort of all over the map and it depended on where you were and who the reviewer was as to how good it really was and whether it satisfied the need of providing sufficient evidence to show that you took environmental impact into account. So to me, this is a step forward.

CHAIRMAN RYAN: Indeed.

MEMBER SIEBER: And I have a couple of questions. One of them is, I think it is difficult to define a wetland because wetlands become dry lands and become wetlands, you know, it depends. Is there good definitions of that that are recognized beyond some

county or some state? And I notice that you had one about the depth of the water as to whether it was a wetland.

MR. DOUB: Yes, this is the federal definition for wetlands. Most states that regulate wetlands at the state level have adopted the federal definition. There are a few states, and Florida is a good example, that have their own state definition for wetlands that differ slightly from this federal definition.

MEMBER SIEBER: I am familiar with them not being consistent across the country.

MR. DOUB: More and more, they are becoming consistent but we are currently reviewing two applications for projects in Florida and both of them have to identify not only the federal wetlands but also the Florida wetlands.

MEMBER SIEBER: Okay.

CHAIRMAN RYAN: I have one last comment and one last question.

I want to just turn your attention to the first full paragraph on page two. At the end of that paragraph I think where it says "requirements for renewal of operating licenses for nuclear power plants and portions may also be relevant to nuclear reactor

decommissioning" and then the sentence that follows that, too, ought to be deleted.

MR. DOUB: Yes, that is --

CHAIRMAN RYAN: I just think this scope is for reactors.

MR. DOUB: Right.

MR. CLARKE: That was the intent of my comment. I should have been --

CHAIRMAN RYAN: Yes, so that is just I think to get that on the record for you to recall.

The other is, and this is just a general question because it is a science question I don't know the answer to, how tough is this to do at a site that is a green field site versus a site that has an existing plant or two? Does adding a plant become an easier process when you think about these requirements versus starting a new plant? I am guessing the answer is starting a new plant is tougher.

MR. DOUB: Well, actually it depends. Callaway, they were proposing to construct a new plant pretty much within the footprint of what had already been disturbed to build the existing plant.

But at Calvert Cliffs, they are actually taking a portion of the site that had been managed ever since the first to plants were built and then

they were going to be converting that to the new Unit III. So in that case, even though it is an existing site, from a terrestrial ecology point of view, it is basically like a green field site.

CHAIRMAN RYAN: So it is really a case-by-case kind of situation --

MR. DOUB: Case-by-case.

CHAIRMAN RYAN: -- as to whether you are starting as if it was a green field site or if is an addition to an existing site.

MR. DOUB: Correct.

CHAIRMAN RYAN: Great. Well, thanks. That is helpful.

Any other questions or comments? Okay. Thank you very much. It is has been an informative hour and a half. When I saw so many slides, I was hoping we would make it. We made it just fine. And I appreciate the participation by everybody.

And I think maybe we will write a short letter on this.

MEMBER BLEY: I think this deserves it.

MR. DOUB: Thank you for having me.

CHAIRMAN RYAN: Well thank you very much. And the way the process works, I am not sure if you are familiar with all of the details, but this is a

subcommittee of the ACRS. We will probably ask you to come back for a very short briefing, like 20 minutes, and then we will write a letter at the meeting where you give your presentation to the full committee about what this Reg. Guide is all about.

MR. DOUB: A condensed version of this?

CHAIRMAN RYAN: Condensed version. The staff will work with you on the timing and the time slot and so forth. Sometimes it depends on how much is going on at a given meeting and all of that. So, I am going to guess maybe February. So we will probably have a briefing from you in February, a short one.

MR. DOUB: Okay.

CHAIRMAN RYAN: And then we will have kind of a draft letter prepared and then advise the full committee on that draft letter and we will go from there. But I think you will hear many of the, you will see many of comments that we have given you today that is a comprehensive step up from the 1977 version. And we had a few comments on some of the grammar and tong and tack and details and all of that sort of stuff. But we will go forward from there.

MR. CLARKE: Mike, could I just mention something?

CHAIRMAN RYAN: Yes, please.

MR. CLARKE: Your presentation reminded me, it is not in my report, but under siting, one of your first topics, I think your first major topic was siting, there are regulations for siting under isn't it 10 C.F.R. 100? Should they be referenced in that section?

CHAIRMAN RYAN: Yes, it is safety.

MEMBER SIEBER: One hundred is radiation.

MR. DOUB: Yes, it is not terrestrial, I know.

MR. CLARKE: Okay.

CHAIRMAN RYAN: Very good. Anything else? Well again, thank you very much. We have appreciated the briefing. It has been very helpful and informative. Thank you very much.

MR. DOUB: Thank you.

MEMBER SIEBER: The only thing that was missing is there are no pictures of ospreys.

MR. DOUB: Oh, I have got some in my collection.

MEMBER SIEBER: Ospreys are important where I come from.

CHAIRMAN RYAN: Just, excuse me. We will close the record at this point.

MR. COLEMAN: Wait. Public comments?

CHAIRMAN RYAN: I'm sorry. Do we have any public comments? Don't close the record just yet. Any other comments from anybody in the audience?

Seeing none, we will call the meeting adjourned and we will close the record at this point. Thank you very much.

(Whereupon, the foregoing matter went off the record at 2:37 p.m., ending the session.)

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Protecting People and the Environment

Options to Revise Radiation Protection Regulations

SECY-08-0197
Update

Advisory Committee on Reactor Safeguards
December 15, 2009

Kimyata Morgan-Butler, Ph.D.
Office of Federal and State Materials and Environmental Management Programs

Background

- NRC staff previously briefed ACRS on staff plans in November 2008, and February, 2009
- Commission approved staff recommendation April 2, 2009
- Objective is to explore implications, as appropriate and where scientifically justified, of greater alignment with ICRP Publication 103.
- Given adequate protection, discussion is to focus on discerning the benefits and burdens associated with revising the radiation protection regulatory framework

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Outreach Activities

- Web Site publically available
- FRN published inviting inputs (72 FR 32198)
- Dedicated web address for comments
- FSME Newsletter (No. 09-1)
- Press Release (No. 09-078)
- All State Letter (FSME-09-025)

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Outreach Activities

- **Presentations to CRCPD, OAS, SNM, HPS, FCXT, ACNP, National SLO Conference, NEI, ASNC, ACMUI, AAPM, FL HPS/AAPM Fall Joint Meeting, NASA, 5th Asian Conference on the Evolution of the System of Radiation Protection.**

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Future Plans

- Looking to engage industrial radiography community, other industry segments, and public citizen groups
- Scheduled presentations to:
  - ISOE/EPRI ALARA Conference, January, 2010
  - RIC, March, 2010
  - CRCPD, April, 2010
- Starting discussions for facilitated round tables in the spring, 2010

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What Have We Heard?

- Wide range of views on major topics
- General support for increasing alignment with international recommendations and other national regulations to improve consistency and trans-boundary considerations
- General agreement that scientific information should be updated

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What Have We Heard?

- **Effective Dose**
  - Supportive of update
  - Questions on application of current rule
  - Impact of methodology on ability to comply with options for dose limits
- **Numerical Values**
  - Supportive of update
  - Recognition of schedule

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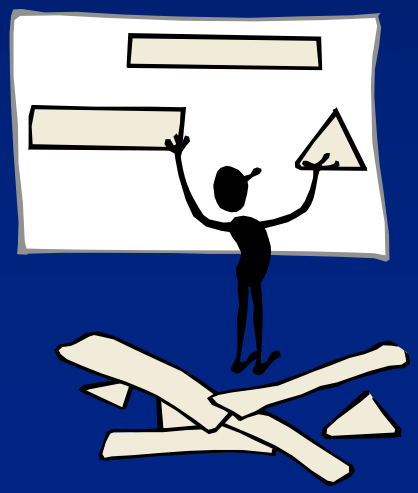
What Have We Heard?

- **Occupational Dose Limits**
  - **Many want limit to stay at 50 mSv/yr (5 rem)**
  - **A few comments to reduce limit**
  - **Certain groups of licensees continue to have individuals above 20 mSv/yr (2 rem)**
  - **Preference by some stakeholders to keep higher limit as legal boundary, and increase ALARA and perhaps constraints to reduce doses**



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What Have We Heard?

- **Dose Limits for Embryo/Fetus**
  - **Mixed feedback**
  - **Lack of data**
  - **Some options challenge limits of detection for monitoring**
  - **Nuclear Medicine labs prefer current limit for operational reasons**

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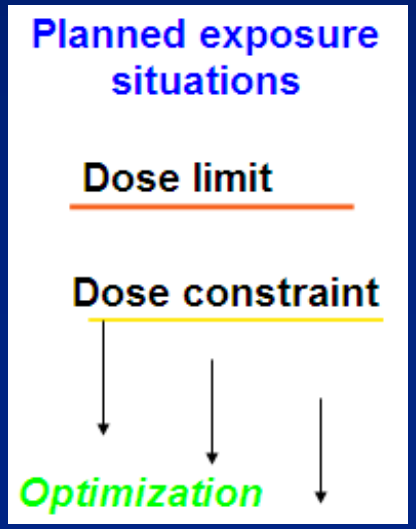
What Have We Heard?

- **Use of Constraints for ALARA planning**
  - Constraints not well understood
  - Most discussions still about the concept
  - Questions on inspection, compliance, reporting
  - Some stakeholders leaning to endorsement of constraint, and setting a value, to provide flexibility

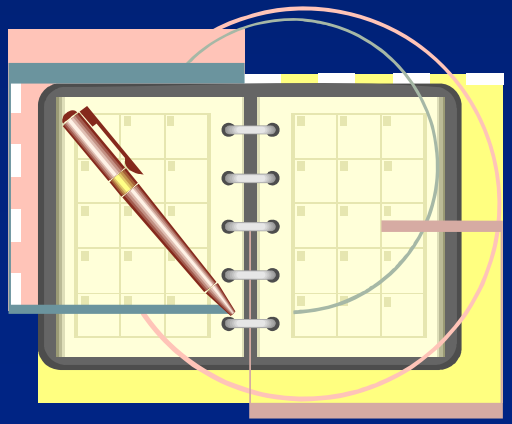


What Have We Heard?

- **Part 50 and Appendix I update**
  - **Staff has had ongoing discussions with industry reps as related to efforts on new reactor licensing**
  - **Industry supports revision to Part 50 and guidance**
  - **Industry to propose comprehensive recommendations**
  - **Industry has concerns: scope of revision, industry participation in effort, and how will revisions be implemented?**
  - **Industry will urge a revision of 40 CFR Part 190, as implemented under Part 20.1301(e) for reactors**
  - **NEI expects to issue a white paper in March 2010 with recommendations on realignment with ICRP 103**

Schedule

- 2010: Initiate detailed discussions, including possible workshops, on options and impacts
- Technical Basis support from RES for data needs
- Ongoing interactions with Federal Agencies and State Agencies
- Monitoring of international developments



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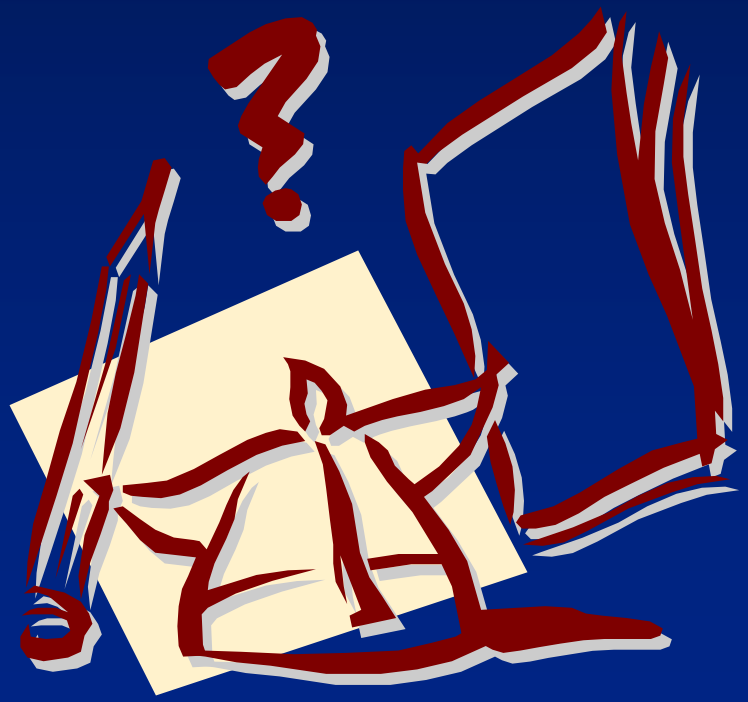
Questions ?

- **Web pages**

  http://www.nrc.gov/about-nrc/regulatory/rulemaking/opt-revise.html

- **Email Address:** regs4rp@nrc.gov



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Background Materials

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Effective Dose

- **NRC 10 CFR Part 20 expressed as Effective Dose Equivalent, applied (effective 2008) to both external and internal exposure**

- **Options:**
  - **No Change – TEDE**
  - **Express as TED**
  - **Allow use of either**
- **Implications:**
  - **Impact on records and reports?**
  - **Impact on compliance with limits (DDE vs. TED)?**

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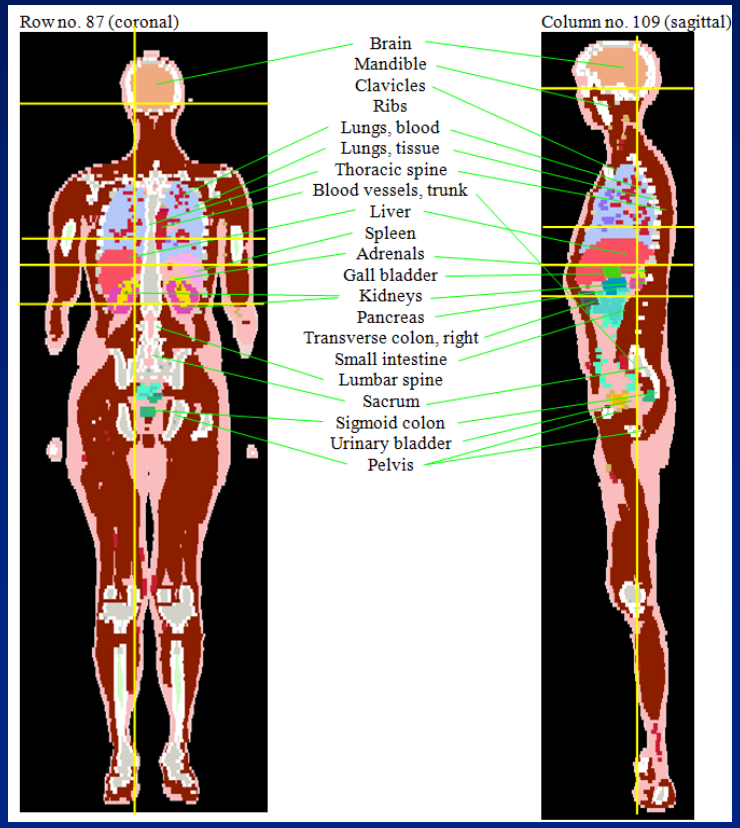
Numerical Values

- ICRP has provided updated Tissue and Radiation Weighting Factors (W_T, W_R)
- ICRP working on revised dose coefficients based on new values, models, decay data
- Options:
  - No Change
  - Update to new values
- Implications:
  - Impacts of timing?
  - Other implications?



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Occupational Dose Limits

- ICRP Recommendation is 10 rem over 5 years, with a maximum of 5 rem in any one year
- Part 20 limit is 5 rem per year
- Options:
  - No change: 5 rem per year
  - ICRP recommendation
  - 2 rem per year
- Implications:
  - Impacts of reduced values?
  - Impacts of increased recordkeeping?

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Dose Limit for Embryo/Fetus

- ICRP recommendation is 100 mrem after notification of pregnancy.
- 10 CFR 20.1208 is 500 mrem over gestation period
- Options:
  - No Change
  - ICRP Recommendation
  - Other single value, such as 50 mrem, after declaration
- Implications:
  - Impacts of reduced values?
  - Impacts of increased recordkeeping?

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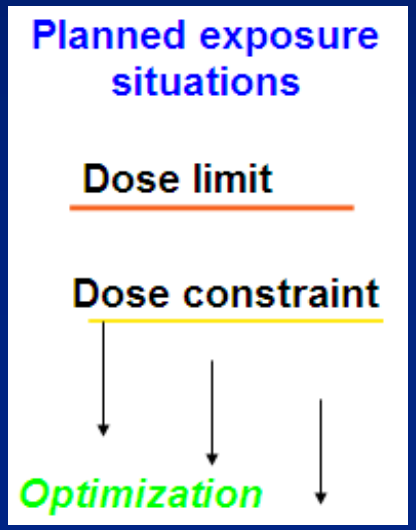
Constraints (1)

- ICRP recommends the consistent application of constraints as a tool in optimization of protection.
- Constraints are not to be limits.
- Part 20 already as a constraint for public exposure from airborne radionuclides from materials facilities.
- Many large licensees already use planning values in ALARA programs.



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Constraints (2)

- **Options:**
  - No Change
  - Require a licensee to use constraints as part of radiation protection program
  - Specify a numeric value licensee is not to exceed
- **Implications:**
  - Impacts to Programs?
  - Benefits in protection seen?
  - Relationship to Dose Limit?
  - Appropriate insertion of regulatory requirement?

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Moving Forward

- NRC staff is looking to engage stakeholders on the technical issues and options for resolution
  - What are YOUR thoughts on the technical issues?
  - What are the impacts of different options?
  - Are there other options that should be considered?
  - What other issues need to be put on the table?
  - What information is needed to make decisions?

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How Can We Work Together?

- NRC Staff would like to engage you on the issues.
- What suggestions do you have for meetings where we can have discussions?
- What arrangements can we utilize for ongoing interactions?

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Status of Rulemaking for Depleted Uranium and Other Unique Waste Streams

Presented to Advisory Committee on Reactor Safety

Priya Yadav, Project Manager
Division of Waste Management and Environmental Protection
December 16, 2009

Overview

- Background
- Commission Direction
- Rulemaking
- Summary of Workshops
- Next Steps

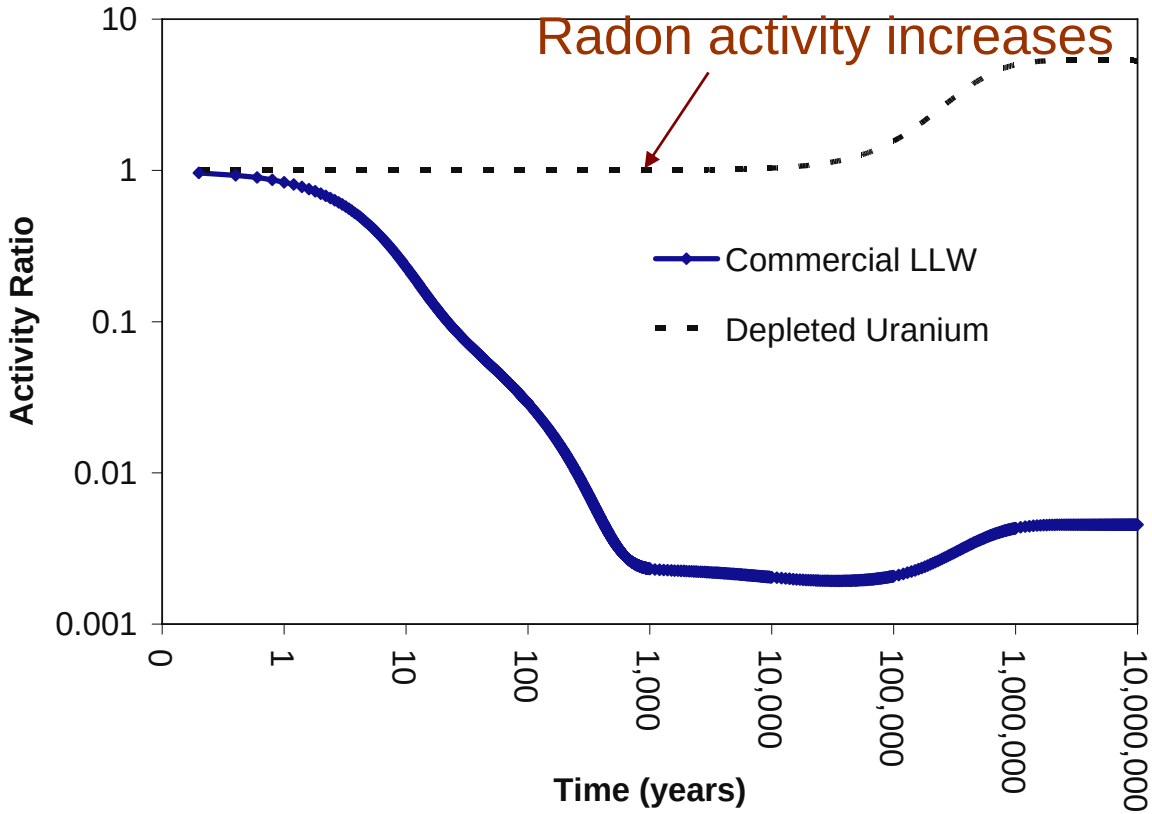
Background

- Significant quantities of DU:
  - “Unique waste stream”
  - Concentrations and quantities not commercially generated
  - Not considered in 10 CFR Part 61
  - Behavior over time
  - Mitigation Possible

Increase burial depth

Install robust radon barrier

DU versus Typical LLW

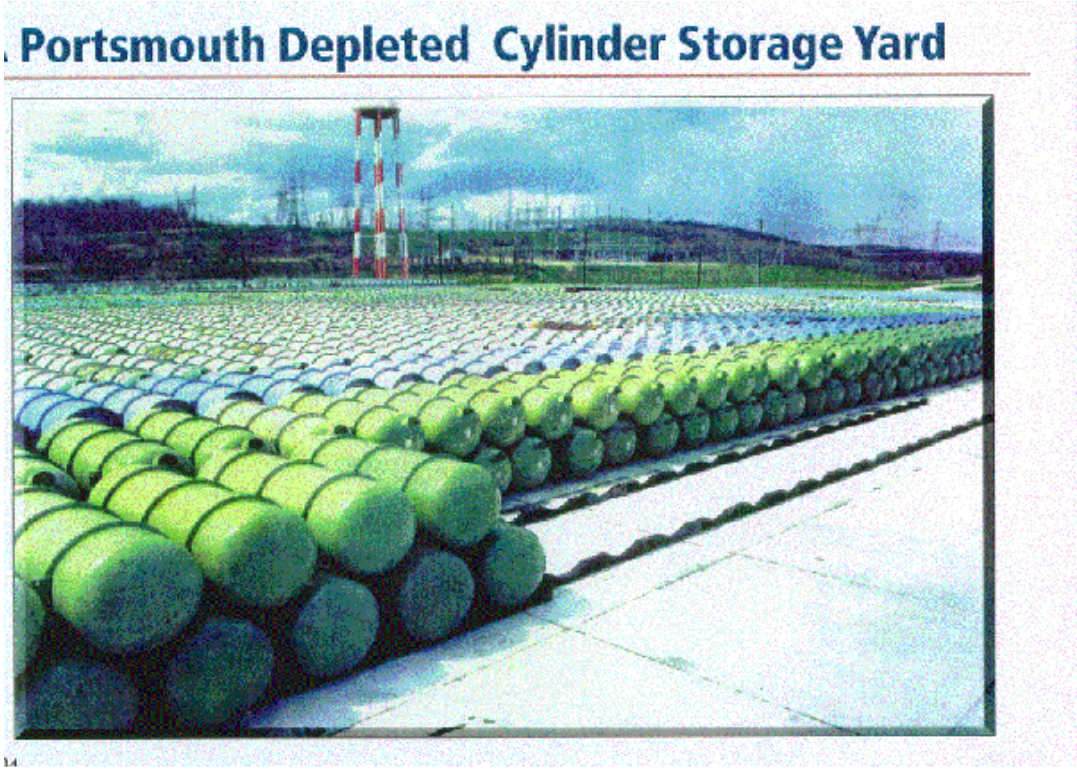


Background

- DU is currently Class A waste
  - Default provision in regulations
  - Assumed that only small quantities would be disposed
    - Approximately 6 MT
    - Draft Part 61 EIS 0.05 $\mu Ci/cm^3$
    - Specific activity of DU is 0.5 $\mu Ci/cm^3$

Current Situation

- Emerging commercial enrichment
- Significant quantities for disposal
- More than 1 million metric tons
- Planned DU shipments from SRS by DOE

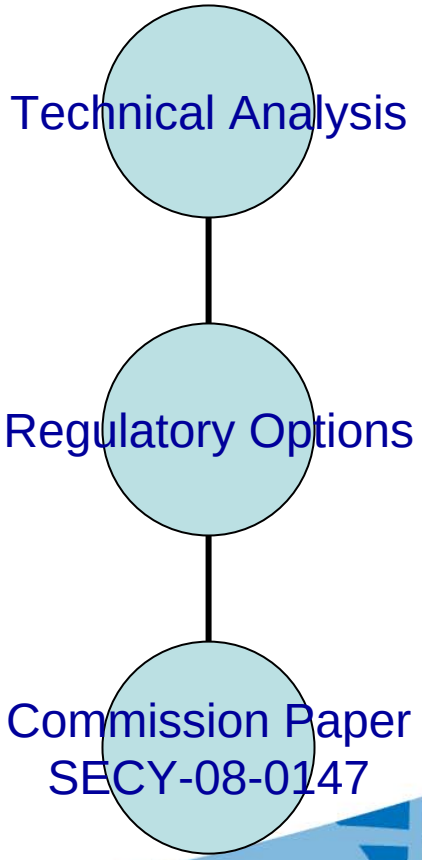


Commission Direction

- Memorandum and Order CLI-05-20, 10/19/05
  - Commission directed staff, “outside of the LES adjudication, to consider whether the quantities of depleted uranium (DU) at issue in the waste stream from uranium enrichment facilities warrant amending section 61.55 (a)(6) or the section 61.55 (a) waste classification tables.”

Commission Paper

- Range of options informed by Technical Analysis
- Provided recommendation
- Staff completed a Commission Paper – October 2008



NRC Analysis

- Screening model developed for SECY-08-0147
- Developed to examine key variables:
  - Period of performance
  - Disposal depth
  - Receptor types and scenarios
  - Site characteristics
- Performed probabilistic assessment
- Analysis methodology for unique waste streams consistent with original Part 61 analysis

NRC Analysis

- If radon is included, shallow disposal at an arid site is challenging
- For humid sites, the groundwater pathway can exceed the performance objectives
- Greater consideration of long-term stability needed
- Site-specific conditions can result in large variance in impacts

Options Evaluated

- Generic Communication
- Require site-specific analysis
- Classification of DU within existing classification framework
- Re-examine existing waste classification framework

Path Forward

- Commission chose a two-tiered approach
  - Site-specific performance assessment
  - Budget to re-examine the waste classification framework in the long-term

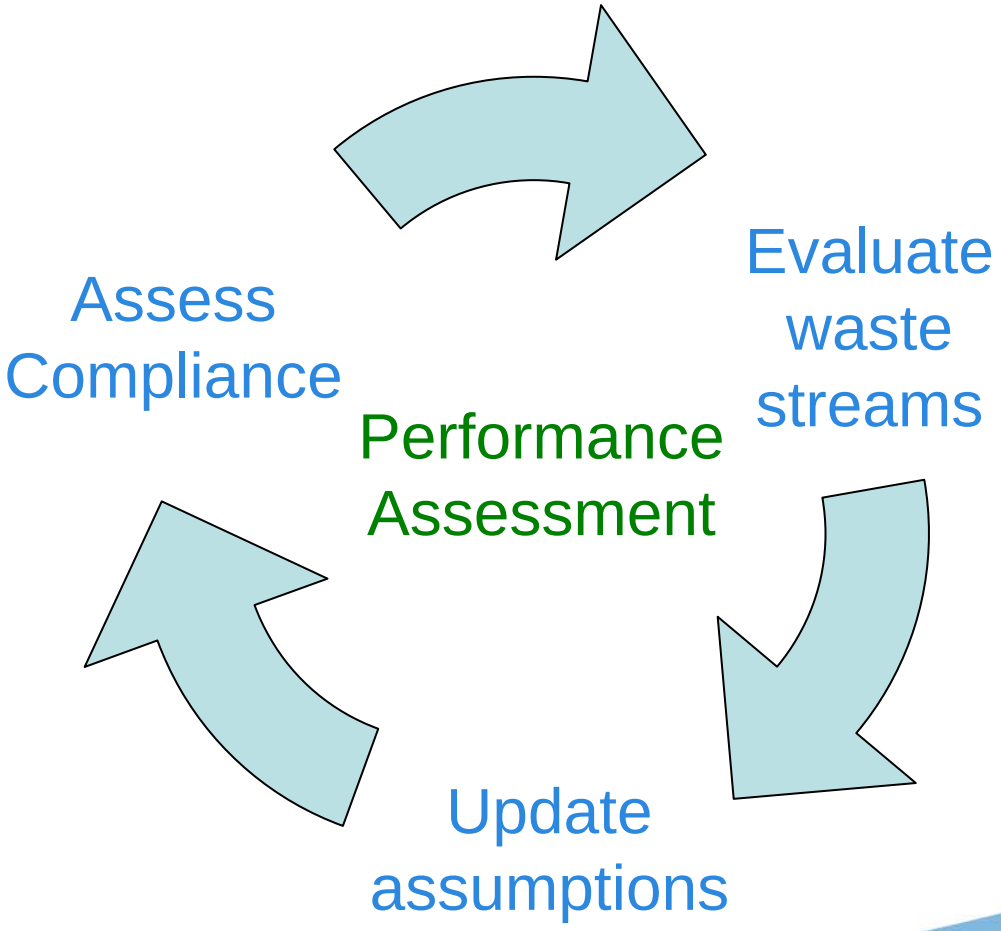
Site-specific PA + Re-examine framework

Initial Rulemaking

- Require site-specific analysis
- Meet performance objectives
- Specify criteria needed for analysis
- Develop supporting guidance

Site-specific PA

Role of Performance Assessment



Commercial LLW Disposal Sites

Operating facility

Licensed September 10, 2009

Facility	Waste	Compact Restrictions
Hanford, WA	Class A, B, C	11 western states in 2 LLW Compacts only
Clive, UT	A only	None, all US generators OK (NW and RM Compacts must approve)
Barnwell, SC	A, B, C	SC, NJ, CT only beginning mid-2008 (Atlantic Compact)
Andrews Cty, Texas	A, B, C and Federal Waste	Texas and VT only (Texas Compact)

Long-Term Rulemaking

- Risk-inform waste classification framework
- Change conforming legislation as needed
- Evaluate and revise waste classification tables
  - Explicitly address classification of depleted uranium
  - Consider full range of alternatives

Re-examine framework

Staff Requirements Memorandum

- Promptly conduct public workshop to discuss:
  - Issues associated with the disposal
  - Potential issues to be considered in rulemaking
  - Technical parameters of concern in the analysis
- Tasking response:
  - Workshop: September 25, 2009
  - Technical/regulatory basis document: September 30, 2010
  - Proposed rule and draft guidance: September 30, 2011
  - Final rule and guidance: September 30, 2012

Workshops Summary

- Two Workshops Completed
  - Workshop 1: September 2-3, 2009
    - Bethesda, MD
    - Approximately 75 people attended
  - Workshop 1: September 23-24, 2009
    - Salt Lake City, Utah
    - Approximately 90 people attended
    - More public comments and media coverage

Successful Format

- Roundtable Participants
  - Convened by facilitator
  - Diverse stakeholders and viewpoints
- Agenda
  - Technical topics
  - Long-term rulemaking: waste classification
  - Other considerations

Format

- Public comments
  - After roundtable discussions for each topic
  - Additional time on second day
  - Written comments submitted
    - 33 total comments from varying stakeholders
    - Including 228 post cards with four versions of comments from individuals in Idaho
- Transcripts and meeting summaries available
  - http://www.nrc.gov/about-nrc/regulatory/rulemaking/potential-rulemaking/uw-streams.html

Comments

- Identify in rule:
  - Period of performance
  - Intruder dose limit of 500 mrem/yr
  - Requirement to perform/update PA
- Identify in guidance:
  - Specific details about exposure scenarios

Comments

- No need to define a threshold for "Significant Quantities"
- No need to define the term "unique waste streams"
  - Address on a case-by-case basis through the PA
  - Do not "overreach" during the initial rulemaking

Concerns

- Shallow land burial may not be appropriate
  - Geologic disposal may be more appropriate
  - Disposal in salt ore bodies may be more appropriate
- Public release of the SECY screening model and regulatory basis document
- Compatibility assignment and implementation

Potential Changes to Rulemaking Scope

- Other sections of Part 61 were identified as needing revision:
  - Performance objectives (61.42) for intruder dose limit
  - Changes to requirements for technical analysis (61.12 and 61.13)
  - Conforming changes to concepts section (61.7)

Next Steps

- Development of guidance to use in interim
- Offer to demonstrate/explain SECY model to public
- Respond to any requests for technical assistance to States
  - Increased communication on LLW issues

Next Steps

- Incorporate public comments into development of technical/regulatory basis document
- Issue key messages from workshops on website

Questions?

Proposed Revision 2 to RG 4.11 Terrestrial Environmental Studies for Nuclear Power Stations

J. Peyton Doub, PWS, CEP
Environmental Scientist (Terrestrial Ecologist)
NRO-DSER-RENV

December 16, 2009 Presentation to ACRS

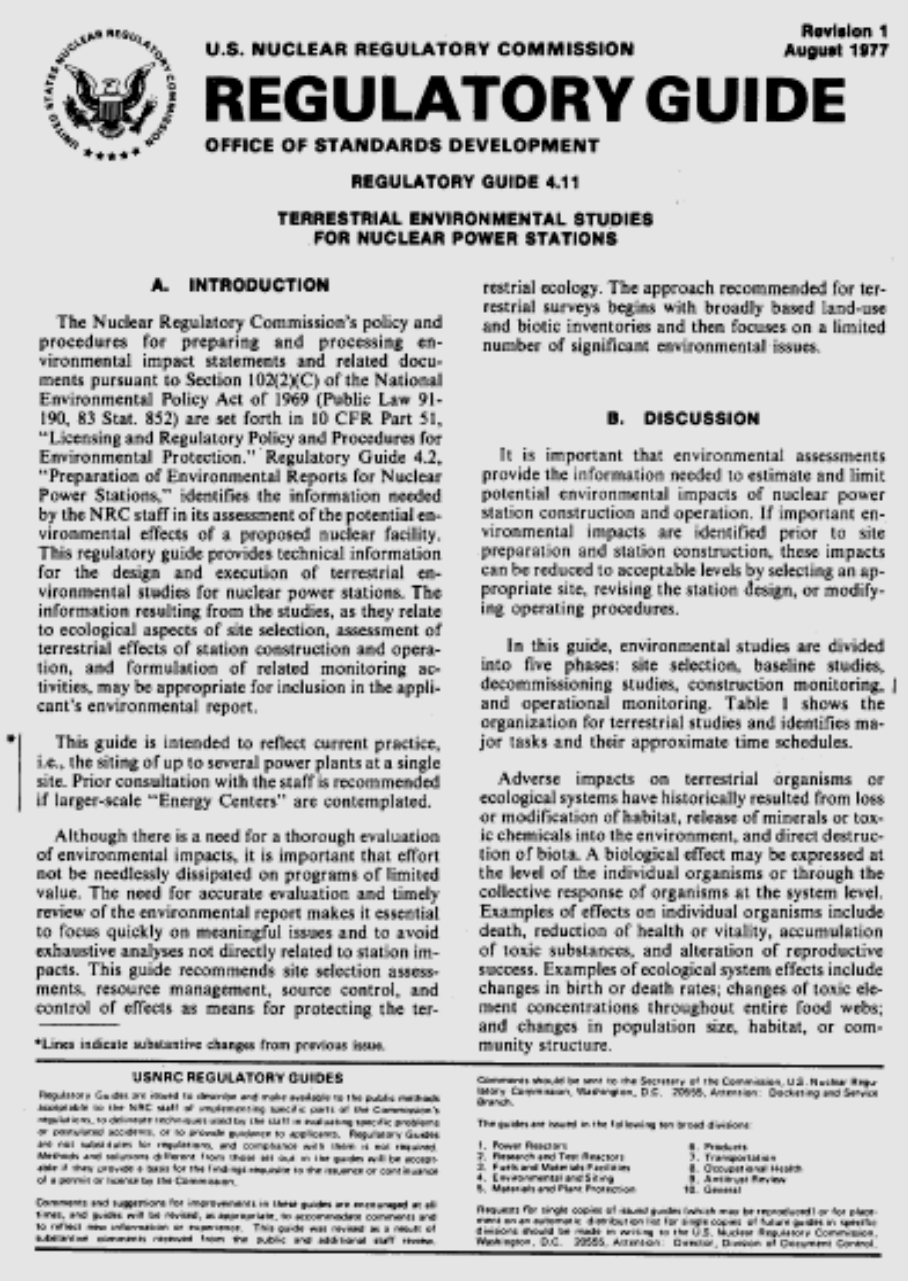
Regulatory Guides

From NRC Website:

The Regulatory Guide series provides guidance to licensees and applicants on implementing specific parts of the NRC's regulations, techniques used by the NRC staff in evaluating specific problems or postulated accidents, and data needed by the staff in its review of applications for permits or licenses.

Regulatory Guide 4.11 History

- First published: July 1976
- Revision 1 (latest): August 1977
- Addresses terrestrial ecological studies over life cycle of nuclear power plants
- Does not address aquatic ecological studies
- Proposed Revision 2: Internally drafted in 2009 as Draft Guide (DG) 4016.



U.S. NUCLEAR REGULATORY COMMISSION

Revision 1
August 1977

REGULATORY GUIDE

OFFICE OF STANDARDS DEVELOPMENT

REGULATORY GUIDE 4.11

TERRESTRIAL ENVIRONMENTAL STUDIES FOR NUCLEAR POWER STATIONS

A. INTRODUCTION

The Nuclear Regulatory Commission's policy and procedures for preparing and processing environmental impact statements and related documents pursuant to Section 102(2)(C) of the National Environmental Policy Act of 1969 (Public Law 91-190, 83 Stat. 852) are set forth in 10 CFR Part 51, "Licensing and Regulatory Policy and Procedures for Environmental Protection." Regulatory Guide 4.2, "Preparation of Environmental Reports for Nuclear Power Stations," identifies the information needed by the NRC staff in its assessment of the potential environmental effects of a proposed nuclear facility. This regulatory guide provides technical information for the design and execution of terrestrial environmental studies for nuclear power stations. The information resulting from the studies, as they relate to ecological aspects of site selection, assessment of terrestrial effects of station construction and operation, and formulation of related monitoring activities, may be appropriate for inclusion in the applicant's environmental report.

*This guide is intended to reflect current practice, i.e., the siting of up to several power plants at a single site. Prior consultation with the staff is recommended if larger-scale "Energy Centers" are contemplated.

Although there is a need for a thorough evaluation of environmental impacts, it is important that effort not be needlessly dissipated on programs of limited value. The need for accurate evaluation and timely review of the environmental report makes it essential to focus quickly on meaningful issues and to avoid exhaustive analyses not directly related to station impacts. This guide recommends site selection assessments, resource management, source control, and control of effects as means for protecting the terrestrial ecology. The approach recommended for terrestrial surveys begins with broadly based land-use and biotic inventories and then focuses on a limited number of significant environmental issues.

*Lines indicate substantive changes from previous issue.

B. DISCUSSION

It is important that environmental assessments provide the information needed to estimate and limit potential environmental impacts of nuclear power station construction and operation. If important environmental impacts are identified prior to site preparation and station construction, these impacts can be reduced to acceptable levels by selecting an appropriate site, revising the station design, or modifying operating procedures.

In this guide, environmental studies are divided into five phases: site selection, baseline studies, decommissioning studies, construction monitoring, and operational monitoring. Table 1 shows the organization for terrestrial studies and identifies major tasks and their approximate time schedules.

Adverse impacts on terrestrial organisms or ecological systems have historically resulted from loss or modification of habitat, release of minerals or toxic chemicals into the environment, and direct destruction of biota. A biological effect may be expressed at the level of the individual organisms or through the collective response of organisms at the system level. Examples of effects on individual organisms include death, reduction of health or vitality, accumulation of toxic substances, and alteration of reproductive success. Examples of ecological system effects include changes in birth or death rates; changes of toxic element concentrations throughout entire food webs; and changes in population size, habitat, or community structure.

USNRC REGULATORY GUIDES

Regulatory Guides are issued to describe and make available to the public methods acceptable to the NRC staff of implementing specific parts of the Commission's regulations, to delineate techniques used by the staff in evaluating specific problems or postulated accidents, or to provide guidance to applicants. Regulatory Guides are not substitutes for regulations, and compliance with them is not required. Methods and solutions different from those set out in the guides will be acceptable if they provide a basis for the findings requisite to the issuance or continuance of a permit or license by the Commission.

Comments and suggestions for improvements in these guides are encouraged at all times, and guides will be revised, as appropriate, to accommodate comments and to reflect new information or experience. This guide was revised as a result of substantive comments received from the public and additional staff review.

Comments should be sent to the Secretary of the Commission, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Docketing and Service Branch.

The guides are issued in the following ten broad divisions:

1. Power Reactors
2. Research and Test Reactors
3. Fuels and Materials Facilities
4. Environmental and Siting
5. Materials and Plant Protection
6. Products
7. Transportation
8. Occupational Health
9. Antitrust Review
10. General

Requests for single copies of issued guides (which may be reproduced) or for placement on an automatic distribution list for single copies of future guides in specific divisions should be made in writing to the U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Director, Division of Document Control.

Regulatory Guide 4.11

- Does not **directly** address terrestrial ecology sections in Environmental Reports (ERs) prepared by Industry (included in RG 4.2)

  However, RG 4.11 does serve to:

- **Indirectly** improve ERs prepared by Industry by identifying improved terrestrial supporting studies

Yellow-Crown Night Heron
Peyton Doub 2008

Relationship of RG 4.11 to Other NRC Environmental Guidance Documents

Document	Title	Function	Principal User
RG 4.11	Terrestrial Environmental Studies for Nuclear Power Stations	Provide guidance to Industry on the conduct of terrestrial ecology technical surveys and studies	Applicants
RG 4.2	Preparation of Environmental Reports for Nuclear Power Stations	Provide guidance to Industry on preparation of ERs submitted as part of applications	Applicants
NUREG 1555	Standard Review Plans for Environmental Reviews for Nuclear Power Plants	Provide guidance to NRC staff reviewing applications and preparing NEPA documents	NRC Staff

Why Revise RG 4.11

- Changes since 1977 in terrestrial ecology knowledge base
- Changes since 1977 in Federal and state regulatory policy for terrestrial ecology
- Changes since 1977 in terrestrial ecology survey methodologies
- Staff has recognized variability in how COL applicants have investigated terrestrial ecology
- Need consistent terminology with RG 4.2 and NUREG 1555
- Need to define terrestrial-aquatic boundary
- Need to address wetlands

Reddish Egret
Peyton Doub 2008

Objectives for Revision 2 to RG 4.11

- Update RG 4.11 to reflect current scientific knowledge and analytical practice.
- Make RG 4.11 consistent with other NRC environmental guidance, including RG 4.2 and NUREG 1555.
- Not outline step-by step procedures but identify sources of terrestrial ecology data and analytical methodologies.
- Be specific enough to be useful but general enough to avoid the need for frequent revision.
- Reflect the need for adequate terrestrial ecology data to support use of RG 4.2 and NUREG 1555.
- Not imply a need for greater effort beyond that currently needed for successful use of RG 4.2 or NUREG 1555.

Northern Mockingbird
Peyton Doub 2009

Ecology

- Definition

  Ecology is the scientific discipline that is concerned with the relationships between organisms and their past, present, and future environments. These relationships include physiological responses of individuals, structure and dynamics of populations, interactions among species, organization of biological communities, and processing of energy and matter in ecosystems.

  (Ecological Society of America Website: www.esa.org/aboutesa/)

- Scientific sub-discipline of biology (as are botany, zoology, and genetics)

- Technical field with its own definitions, principles, literature, and models

- Sometimes used incorrectly as synonym for Environmental Policy

- Tool used in Environmental Policy (as are other sub-disciplines of biology, chemistry, and physics)

Pileated Woodpecker
Peyton Doub

Terrestrial

- Encompasses normally dry lands (uplands)

Plus

- Wetlands supporting emergent (not submerged) vegetation

Planted Pine Forest
Peyton Doub 2008

Tidal Marsh
Peyton Doub 2008

Wetlands

Those areas that are inundated or saturated by surface or ground water (hydrology) at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation (hydrophytes) typically adapted for life in saturated soil conditions (hydric soils). Wetlands generally include swamps, marshes, bogs, and similar areas (40 CFR 232.2(r)).

Palustrine Emergent and Forested Wetlands
Peyton Doub 2008

Why Include Wetlands in RG 4.11

- Wetlands are transitional between terrestrial and aquatic settings.
- Vegetation and soils in wetlands with emergent vegetation resembles terrestrial more than aquatic settings.
- Most terrestrial wildlife move between upland and wetland settings, while fish can move only into inundated wetlands.
- Wetlands dominated by emergent vegetation can be difficult to distinguish from uplands in aerial photography.
- Delineation of wetlands requires experts to follow technical procedures to evaluate vegetation, soils, and hydrology on the ground.
- Wetland impacts are controversial and regulated by many Federal, state, and local statutes.
- No counterpart to RG 4.11 covers aquatic ecological studies.

Palustrine Forested Wetland Dominated by Red Maple
Peyton Doub

Palustrine Forested Wetland Dominated by Bald Cypress
Peyton Doub

Note: Although the U.S. Fish and Wildlife Service maps areas regularly inundated by up to 6.6 feet as “wetlands”, areas inundated too deeply to support emergent vegetation (generally more than 1-2 feet) are clearly “aquatic” and out of the purview of RG 4.11

Overall Organization of Proposed New RG 4.11
Organized by Terrestrial Ecology Analysis Category

- Siting Support
- Baseline Investigations
- Identification of Important Species and Habitats
- Impact Analyses
- Monitoring
- Decommissioning

Red-winged blackbirds
Central Maryland
Peyton Doub 2008

Overall Organization of Proposed New RG 4.11
Organized by Terrestrial Ecology Analysis Category

- **Siting Support**
- Baseline Investigations
- Identification of Important Species and Habitats
- Impact Analyses
- Monitoring
- Decommissioning

Proposed Site for Levy Nuclear Units 1&2
North-central Florida
Peyton Doub 2008

Siting Support

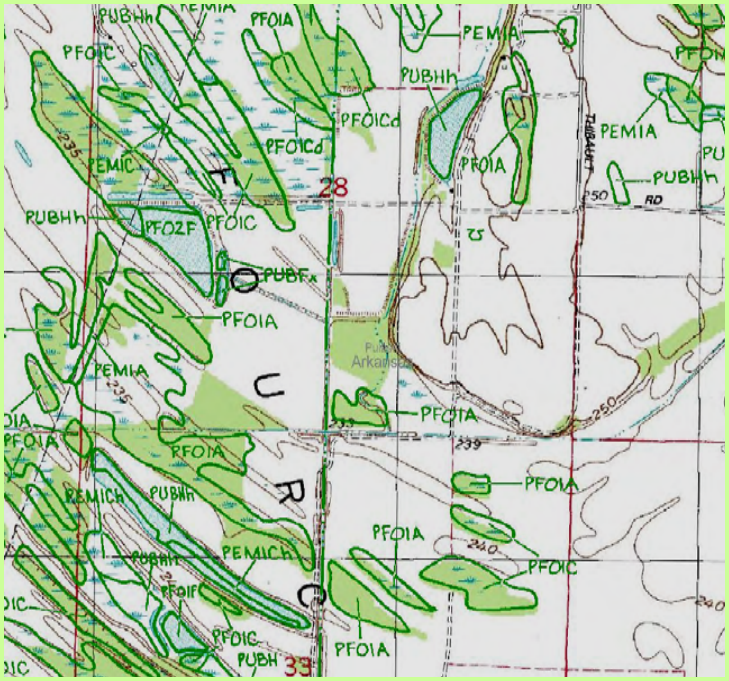
- Addresses role of terrestrial ecology in evaluating:
  - Site Alternatives
  - Energy Alternatives
  - Heat Dissipation Design Alternatives

- For site alternatives, follows terrestrial ecology considerations in each step of Electric Power Research Institute (EPRI) Report No. 1006878, “Siting Guide: Site Selection and Evaluation Criteria for an Early Site Permit Application,” issued 2002 (Ref. 7).

Crystal River Energy Complex Dec. 2008
Citrus County, FL
Peyton Doub

Emphasizes Use of Reconnaissance-Level Data Sources for Siting

- 7.5-Minute Topographic Maps
- National Wetland Inventory Maps
- State Wetland Maps
- Rare, Threatened, and Endangered Species Databases
  - Federal (U.S. Fish & Wildlife Service)
  - State Natural Heritage Programs
- County Soil Surveys
- Flood Insurance (Floodplain) Maps
- Federal, State, and Other Land Use or Land Cover Maps
- USDA National Agricultural Imagery Program



Portion of National wetland Inventory map
US Fish & Wildlife Service

Overall Organization of Proposed New RG 4.11
Organized by Terrestrial Ecology Analysis Category

- Siting Support
- **Baseline Investigations**
- Identification of Important Species and Habitats
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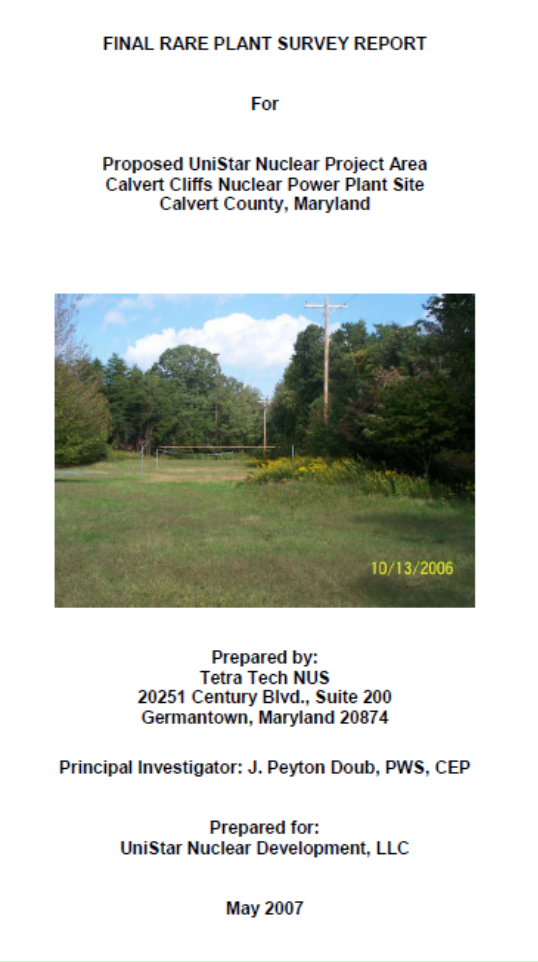
- Monitoring
- Decommissioning

Part of Proposed Site for Calvert Cliffs Unit 3

Peyton Doub 2006

Examples of Terrestrial Ecology Baseline Investigations

Investigation	Calvert Cliffs Example
Terrestrial Habitat Identification, Mapping, and Description	Included in Flora Survey Report
Flora Study	Flora Survey Report
Fauna Study	Faunal Survey Report
Wetland Delineation	Wetland Delineation Report
Wetland Functional Assessment	Included in Wetland Delineation Report
Identification of Important Species/Habitats	Rare Plant Survey Report Current Status of Two Federally Threatened Tiger Beetles at Calvert Cliffs Nuclear Power Plant



FINAL RARE PLANT SURVEY REPORT

For

Proposed UniStar Nuclear Project Area
Calvert Cliffs Nuclear Power Plant Site
Calvert County, Maryland

10/13/2006

Prepared by:
Tetra Tech NUS
20251 Century Blvd., Suite 200
Germantown, Maryland 20874

Principal Investigator: J. Peyton Doub, PWS, CEP

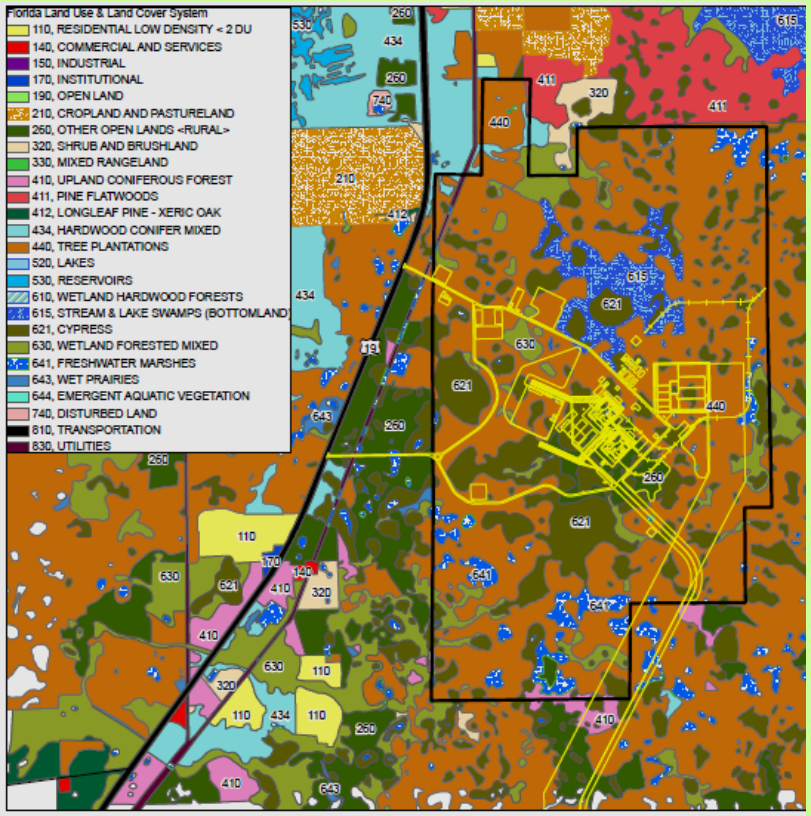
Prepared for:
UniStar Nuclear Development, LLC

May 2007

Habitat Identification and Mapping

- Tie habitat names to published classification system such as
  - U.S. National Vegetation Classification System.
  - U.S. Forest Service Forest Cover Types.
  - State Systems, such as Florida Land Use and Land Cover Classification System.

- Sliding Scale for habitat mapping detail
  - Areas subject to land clearing or grading.
  - Areas subject to less dramatic impacts such as noise, salt drift, fogging, and icing.
  - Vicinity and Region.



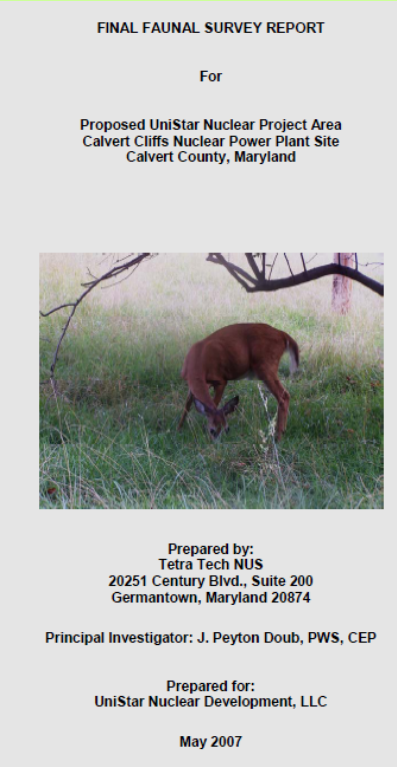
Portion of Terrestrial Habitat Map
Levy County Units 1&2 COL
Progress Energy 2008

Terrestrial Habitat Description

- Vegetation
- Flora and fauna lists
- Presence of invasive species
- Landscape biogeography (e.g., wildlife travel corridors)
- Existing natural and human-induced effects

Upland Mixed Forest
Peyton Doub 2008

Flora and Fauna Studies



FINAL FAUNAL SURVEY REPORT

For

Proposed UniStar Nuclear Project Area
Calvert Cliffs Nuclear Power Plant Site
Calvert County, Maryland

Prepared by:
Tetra Tech NUS
20251 Century Blvd., Suite 200
Germantown, Maryland 20874

Principal Investigator: J. Peyton Doub, PWS, CEP

Prepared for:
UniStar Nuclear Development, LLC

May 2007

- Identify species occurring in, or potentially occurring in, terrestrial habitats.
- Effort proportional to potential impacts.
- Follow published technical protocols.
- Usually involve visiting predetermined plots, transects, or routes for measured periods of time.
- Multiple visits timed to coincide with expected seasonal occurrence.
- Must be performed by qualified individuals – may require multidisciplinary teams.

Poison Ivy
Peyton Doub 2008

Cattle Egret
Peyton Doub 2008

Suitability of Terrestrial Habitats for Wildlife

- Food sources such as hard mast (nuts), soft mast (berries), grain and small seeds, and foliage (browse).
- Standing dead trees (snags) with and without cavities.
- Downed dead trees, limbs, and other woody debris.
- Trees with exfoliating (flaking or peeling) bark (favored by certain bats and small birds).
- Trees near shorelines (favored by bald eagles and water birds).
- Small ground depressions that trap rainwater (used by many amphibians).

Great Egret
Peyton Doub 2008

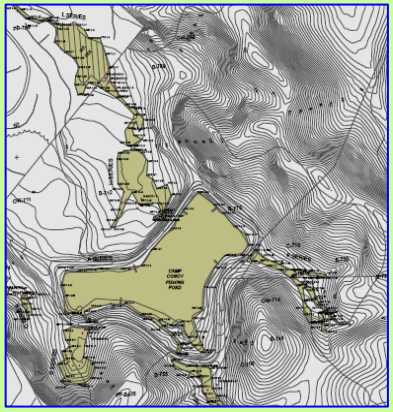
Wetland Delineations

- Follow *Corps of Engineers Wetlands Delineation Manual* (“1987 Manual”) and applicable regional supplements.

- Serve multiple objectives
  - Should identify all wetlands, even ones regulated under Federal or state statutes. All wetlands are ecological habitats that provide habitat for terrestrial and/or aquatic wildlife and may be of other hydrological and/or social value.
  - Some impacts to some wetlands (termed “Jurisdictional Wetlands”) require permits from U.S. Army Corps of Engineers under Section 404 of the Clean Water Act.
  - Some impacts to some wetlands may require permits from state or local agencies.

- Are performed prior to, but separate from, applications for wetland Jurisdictional Determinations (JDs) by federal or state agencies.

Wetland delineation flags at Calvert Cliffs Nuclear Power Plant site
Peyton Doub 2008



Wetland delineation map
Calvert Cliffs Unit 3
Environmental Report
Unistar, 2009

Wetland Functional Assessments

- Function: physical, chemical, or biological activities that directly benefit society or the environment

- Values: indirect social benefits such as aesthetic qualities or availability for recreation

Palustrine Emergent Wetland
Peyton Doub 2008

Examples of Common Wetland Functions and Values

Groundwater Recharge and Discharge	Functions
Floodflow Alteration	
Fish and Shellfish Habitat	
Sediment Toxicant, and Pathogen Retention	
Nutrient Removal, Retention, and Transformation	
Production Export	
Sediment and Shoreline Stabilization	
Wildlife Habitat	
Recreation	Values
Education and Scientific Value	
Uniqueness and Heritage	
Visual Quality and Aesthetics	
Threatened or Endangered Species Habitat	

Red-winged Blackbird
Peyton Doub 2008

Overall Organization of Proposed New RG 4.11
Organized by Terrestrial Ecology Analysis Category

- Siting Support
- Baseline Investigations
- **Identification of Important Species and Habitats**
- Impact Analyses
- Monitoring
- Decommissioning

Bald Eagles mating
Peyton Doub 2008

Identifying Important Species and Habitats As Defined by NRC in NUREG 1555

- Federally listed threatened or endangered species and critical habitats
- Species and habitats proposed for Federal listing
- State-listed and state rare species and habitats
- Bald and golden eagles
- Recreationally valuable species
- Species essential to survival of other important species
- Biological indicator species
- National and state wildlife refuges
- Wetlands
- Invasive species (Note: the goal is avoiding the spread of invasive species)

Gopher Tortoise burrow
State (Florida) Threatened
Peyton Doub 2008

Identifying Important Terrestrial Species

- Focuses scope of subsequent terrestrial ecological studies
- Focuses scope of applicant's Environmental Report (ER)
- Focuses scope of NRC's Environmental Impact Statement (EIS)
- Assists applicant and NRC with environmental regulatory compliance
- May serve as basis for terrestrial ecological monitoring

American crocodile
Federal Endangered
Peyton Doub 2008

Great White Heron
Florida Species of Special Concern
Peyton Doub 2008

Phragmites australis
Invasive plant species
Peyton Doub 2008

Overall Organization of Proposed New RG 4.11
Organized by Terrestrial Ecology Analysis Category

- Siting Support
- Baseline Investigations
- Identification of Important Species and Habitats
- **Impact Analyses**
- Monitoring
- Decommissioning

Existing Calvert Cliffs Transmission Line
Peyton Doub 2007

Terrestrial Environmental Impact Analyses

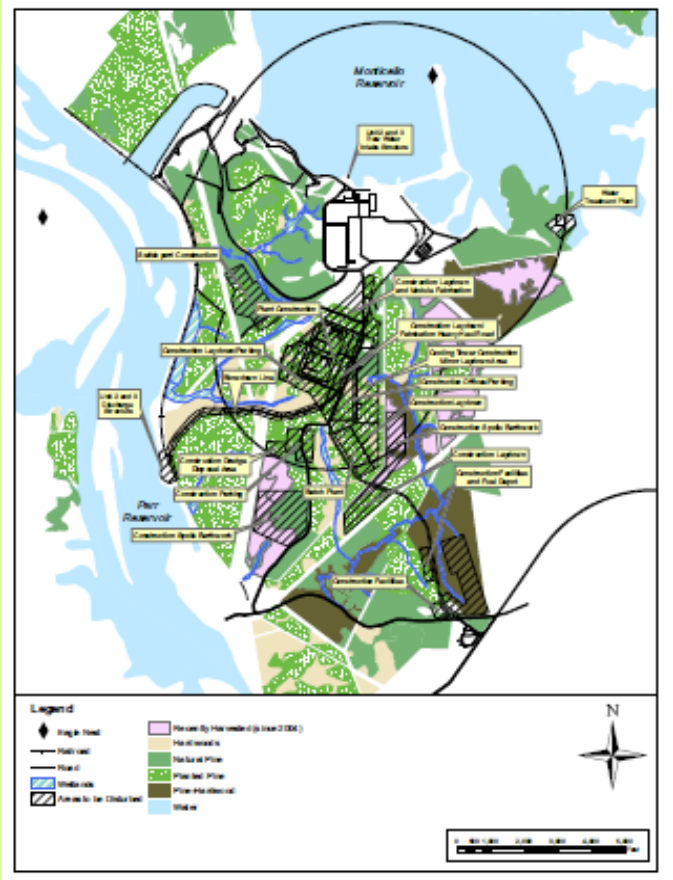
- Can be initially presented in stand-alone reports or directly included in Environmental Report Chapters 4 or 5.
- Should be based on best available baseline data whether site-specific or from published sources, agency files, or communication with regional experts.
- Should be clearly supported by data and logic.
- Should be as quantitative as practicable.
- Should use methodologies or models that are widely accepted by scientific authorities and natural resource regulatory agencies.
- Should avoid use of experimental or unproven methodologies, assumptions, or models.
- Should employ the best professional judgment and avoid unsupported speculation or opinion.

Site Preparation Work for Proposed New Vogtle Reactor

Photo Source: http://www.internal.nrc.gov/news/nrcreporter/2009/slide-show/summer-progress.html

Examples of Common Terrestrial Ecology Impact Analyses for Proposed Nuclear Plants

- Habitat Loss Analyses
- Wildlife Noise Impact Analyses
- Wildlife Displacement Analyses
- Bird and Bat Collision Analyses
- Avian Electrocution Analyses
- Cooling Tower Drift Analyses



Habitat Impact Map for Proposed V.C. Summer Units 2&3

Photo Source: South Carolina Electric & Gas
COL Application for Proposed VC Summer Units 2 and 3
Part 3 – Environmental Report, Revision 1

Note: Specific needs for impact analyses are highly project-specific.

Overall Organization of Proposed New RG 4.11
Organized by Terrestrial Ecology Analysis Category

- Siting Support
- Baseline Investigations
- Identification of Important Species and Habitats
- Impact Analyses
- **Monitoring**
- Decommissioning

Inactive Bald Eagle Nest
Peyton Doub 2007

Terrestrial Ecological Monitoring

- Need for monitoring of terrestrial ecological conditions over construction and operations period can be based on:

  - Conditions in permits under Section 404 of Clean Water Act (U.S. Army Corps of Engineers)
  - Conditions in Biological Opinions under Section 7 of the Endangered Species Act (U.S. Fish & Wildlife Service)
  - Conditions in other Federal and state natural resources permits
  - Mitigation measures in EIS
  - NRC license conditions (expected rarely)

- Most terrestrial ecological monitoring requirements will be established and overseen by the U.S. Fish & Wildlife Service and state and local natural resource agencies

Transmission Line Right-of-Way
Peyton Doub 2008

Overall Organization of Proposed New RG 4.11
Organized by Terrestrial Ecology Analysis Category

- Siting Support
- Baseline Investigations
- Identification of Important Species and Habitats
- Impact Analyses
- Monitoring
- **Decommissioning**

Black Vulture
Peyton Doub 2006

Terrestrial Ecology Analyses in Decommissioning

- Long-term planning
- Restoration of site to functioning terrestrial habitats
- Need for baseline data prior to initial site disturbance
- May require disturbance of naturally vegetated land areas outside of former operational area

Future Direction

- Issue proposed Revision 2 to RG 4.11 (as DG 4016) for public comment.
- Revise DG 4016 to incorporate public comments.
- Publish Revision 2 to RG 4.11.
- Encourage future applicants to use Revision 2 to RG 4.11.
- Evaluate how well Revision 2 to RG 4.11 improves terrestrial ecological data included in future application packages.
- Consider development of companion RG addressing aquatic ecological studies.