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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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573RD MEETING

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS (ACRS)

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WEDNESDAY,

JUNE 9, 2010

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ROCKVILLE, MARYLAND

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The Advisory Committee convened in Room T2B1 at the Nuclear Regulatory Commission, Two White Flint North, 11545 Rockville Pike, at 8:30 a.m., DR. SAID ABDEL-KHALIK, Chairman, presiding.

MEMBERS PRESENT:

SAID ABDEL-KHALIK, Chair

J. SAM ARMIJO, Vice Chair

DENNIS C. BLEY

MARIO V. BONACA

MICHAEL CORRADINI

DANA A. POWERS

HAROLD B. RAY

MICHAEL T. RYAN

WILLIAM J. SHACK

MEMBERS PRESENT (Continued):

JOHN D. SIEBER

JOHN W. STETKAR

NRC STAFF PRESENT:

ROBERT ROCHE-RIVERA

JOSE PIRES

SYED ALI

DON DUBE

GOUTAM BAGCHI

GARY COMFORT

ANDREW CARRERA

ALSO PRESENT:

JOSEPH BRAVERMAN

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

(8:27 a.m.)

1) OPENING REMARKS BY THE ACRS CHAIRMAN

1.1) OPENING STATEMENT

CHAIR ABDEL-KHALIK: The meeting will now come to order. This is the first day of the 573rd meeting of the Advisory Committee on Reactor Safeguards.

During today's meeting, the Committee will consider the following: draft final regulatory guide 1.216, "Containment Structural Integrity Evaluation for Internal Pressure Loadings Above Design-Basis Pressure; two, discussion of topics for a meeting with the Commission; three, meeting with the Commission; four, proposed rulemaking on distribution of source materials to exempt persons and to general licensees and revision of general license and exemptions; five, preparation of ACRS reports.

This meeting is being conducted in accordance with the provisions of the Federal Advisory Committee Act. Ms. Zana Abdullahi is the designated federal official for the initial portion of the meeting.

We have received no written comments or requests for time to make oral statements from members

of the public regarding today's sessions. There will be a phone bridge line. To preclude interruption of the meeting, the phone will be placed in a listen-in mode during the presentations and Committee discussions.

A transcript of portions of the meeting is being kept. And it is requested that the speakers use one of the microphones, identify themselves, and speak with sufficient clarity and volume so that they can be readily heard.

1.2) ITEMS OF CURRENT INTEREST

CHAIR ABDEL-KHALIK: I will begin with some items of current interest. Duncan White joined the ACRS staff for a three-month rotational assignment as Branch Chief for Reactor Safety Branch B on May 24th, 2010.

He has been with the NRC since 1991. Prior to joining the ACRS staff, Mr. White worked as a senior materials and decommissioning inspector and license reviewer and regional states agreement officer in region I and most recently as Branch Chief for the Agreement State Programs Branch in FSME.

Mr. White received a Bachelor's degree in environmental science from Cook College, a Master's degree in radiation science from Rutgers University,

and is a certified health physicist.

Christopher Mehrvarzi recently joined the ACRS as a student engineer and summer intern. Mr. Mehrvarzi is a junior at Virginia Tech, where he is pursuing a Bachelor's degree in mechanical engineering.

He will be working with ACRS senior technical adviser Dr. Hossein Nourbaksh on developing an historical perspective on ACRS review of the PWR sump performance issue.

Welcome aboard.

(Applause.)

2) DRAFT FINAL REGULATORY GUIDE 1.216

CHAIR ABDEL-KHALIK: At this time we will go to item number 2 on the agenda, "Draft Final Reg Guide 1.216, 'Containment Structural Integrity Evaluation for Internal Pressure Loadings Above Design-Basis Pressure." Dr. Shack will lead us through that discussion.

Dr. Shack?

2.1) REMARKS BY THE SUBCOMMITTEE CHAIRMAN

MEMBER SHACK: Okay. Our Subcommittee for Regulatory Policies and Practices met on May 19th. We heard a presentation from the staff on the draft final reg guide 1.216.

This is a new regulatory guide that's intended to be applied to new light water reactor designs to demonstrate containment structural integrity as it relates to predictions of the ultimate pressure, internal pressure, capacity, the capacity to withstand a hydrogen burn associated with severe accidents, and Commission expectations for containment performance during severe accidents.

It references and relies on other reg guides that specify acceptable approaches for ensuring containment integrity for design-basis conditions, a familiar analysis.

During that May 19th meeting, the staff presented some of its responses to questions and comments that they had received from our consultant: Bozidar Stojadinovic. And these are primarily directed at clarifications in the language.

The staff's response to that guidance contained some changes they had proposed to make in the reg guide that would address the comments. And we expect the final version of the reg guide would contain these changes.

I'll call upon NRC staff, Robert Roche-Rivera of the Office of Research, to begin.

MR. ROCHE-RIVERA: Thank you, Dr. Shack.

2.2) BRIEFING BY AND DISCUSSIONS WITH

REPRESENTATIVES OF THE NRC STAFF

MR. ROCHE-RIVERA: Good morning. My name is Robert Roche-Rivera. And today I will be presenting on reg guide 216, 1.216, on containment structural integrity evaluation for internal pressure loading above the scientific pressure.

Here with me is Jose Pires and Joseph Braverman. Jose and I are from the Office of Research. And Joseph Braverman is our contractor from BNL for this effort.

The agenda for this presentation today includes background, objective, and description of regulatory guide 1.216.

In regards to the background of this regulatory guide, this new regulatory guide, as Dr. Shack mentioned, is intended to ensure appropriate and consistent implementation of regulatory criteria related to structural integrity of the containment for beyond design-basis pressure loadings. The guidance in this regulatory guide is deterministic in nature and is intended to be applicable for new light water reactors.

Part of the motivation for this regulatory guide was to complement and consolidate guidance

pertaining to containment structural integrity evaluation for internal pressure loadings above design-basis pressure.

Specific aspects addressed in this guidance include the prediction of the internal pressure capacity above design-basis accident pressures of containment structures, containment structural integrity evaluation elated to combustible gas control, and also containment structural integrity evaluation related to the prevention and mitigation of severe accidents.

Additional motivation for this regulatory guide was based on the issues identified during licensing reviews. Some examples of these issues identified during licensing reviews includes that some of the applicants were using internal pressure loading for the combustible gas generation inside containment equal to 45 psig, without the consideration of pressures generated by a 100 percent fuel cladding-water reaction.

Also, we received questions regarding what were the severe accidents and what criteria should be considered for the evaluations of containment structure and integrity in order to address the containment performance goals, Commission's

performance goals, identified in SECY-93-087.

Here for your reference, we're just showing the time line for this reg guide. Things that I would like to highlight from this time line, we received the public comments on February 2009 nd we conducted a public meeting on October 2009. During this time frame, we formed the working group to address these public comments and the evaluation of the public comments and also taking into consideration some of the recommendations from the staff consulted, of course, in the preparation of the draft guide.

Today we are having this meeting here for the full Committee. And the expectation with regards to having this regulatory guide publicly available is to have it by July 200.

So this regulatory guide includes three regulatory positions. The objective is to provide guidance on methods acceptable to the NRC staff on predicting the internal pressure capacity for containment structures above the design-basis accident pressures, demonstrating containment structural integrity related to combustible gas control, and demonstrating containment structural integrity for an analysis that addresses the Commission's performance goals for the prevention and mitigation of severe

accidents.

Going over regulatory position 1, this is prediction of containment internal pressure capacity above the design-basis pressure. The purpose of this regulatory position is to provide an acceptable method for predicting the internal pressure capacity for containment structures above the internal pressure for the design-basis LOCA.

Now, this pressure capacity is one at which the structural integrity is retained and the failure leading to a significant release of fission products does not occur.

This regulatory position is intended to be consistent with sections of the SRP. The pertinent sections are listed here for your reference: 3.8.1 and 3.8.2.

Some of the aspects addressed by this regulatory position include staff expectations regarding the use of a nonlinear finite element analysis to evaluate the containment response. And also the staff expectations regarding the use of a simplified method include strain limits for the evaluation and concrete failure modes near discontinuities.

Regarding the simplified evaluation,

again, the regulatory position is intended to be consistent with SRP sections with the only difference of validation and clarification listed here for your reference; that is, your position regarding the verification of concrete shear and axial compression failures and also clarification for the people who strain includes the strains associated with initial prestressing and the strains associated, plus the strains associated, with pressurization. We're also defining the global free field hoop strains for the prestressed containment.

Information in regulation to regulatory position 1 of this regulatory guide should be reported on section 3.8 of the FSAR.

Regulatory position number 2 is combustible gas control inside containment. The purpose of this regulatory position is to provide an acceptable method to evaluate containment structural integrity to pressure loadings associated with hydrogen generation due to the reaction between fuel cladding and the water coolant.

This position is where we are addressing one of the issues, sample issues, mentioned before in discussing the reaction where some of the applicants were using 45 psig without the consideration of the

fuel cladding-water reaction. And basically we're also complementing regulatory 1.7, which provides acceptance criteria.

Acceptance criteria is at service level C and factor low cladding water requirements of the ASME code for steel and concrete containment, respectively. It's unacceptable where it establishes the limit for this evaluation. It's considered acceptable by the staff.

The clarification regarding the load is that the load that should be used for this evaluation consists of that load plus the higher of the two cases listed here for your reference, which is pressure arising from fuel cladding-water reaction; hydrogen burning; and post-accident inerting, if applicable; or 45 psig. For this evaluation, we reference the method indicated in regulatory position 1 as acceptable for conducting the evaluation, of course, taking some exceptions as indicated in the regulatory guide.

VICE CHAIR ARMIJO: What is the reason for picking the higher of those two pressures? If you calculate the 100 percent fuel cladding-water reaction and get a pressure from that and it's less than 45 psig --

MR. ROCHE-RIVERA: Yes.

VICE CHAIR ARMIJO: -- you still require that they use the 45 psig. And I was wondering why.

MR. ROCHE-RIVERA: This is the criteria that has been considered acceptable by the NRC staff. And it was also included in the regulations, actually.

MEMBER SHACK: I think that is one thing to point out here, that in this case the acceptance criteria are set somewhere else, both this case --

VICE CHAIR ARMIJO: That is in a rule somewhere?

MEMBER SHACK: Yes. You know, in this case it's the rule. In the next one, it's Commission policy SRMs. And so this is really telling you how to address that guidance.

MR. BRAVERMAN: This is Joe Braverman from BNL.

I think that the concern was that you are supposed to use the hydrogen pressurization itself, but the concern was if the applicant develops pressurization that's too low, that I guess the Commission and staff --

MEMBER SHACK: They want it to be higher.

MR. BRAVERMAN: -- found value not to go lower. Also, this specific guidance is in reg guide

1.7. So we're just being consistent with what is in there now.

VICE CHAIR ARMIJO: So this is just a straight conservatism?

MR. BRAVERMAN: Yes. The problem --

VICE CHAIR ARMIJO: The highest pressure you can get is whether it's calculated or given to you.

MR. BRAVERMAN: Well, it's calculated, but you make sure if that calculated number is too low, that the applicant utilizes at least 45 because in one of the applicants for design certification, they misinterpreted reg guide 1.7. And they just went to 45 psi directly. So this reg guide --

VICE CHAIR ARMIJO: That was in error. But let's say they did the calculation properly and they came up with 30 psig, --

MR. BRAVERMAN: Right.

VICE CHAIR ARMIJO: -- they reacted to all the cladding possible. I still don't understand the logic of forcing them to use 45 when the number assuming it was done correctly was 30. And you're just saying it's a given.

MR. BRAVERMAN: That's right.

VICE CHAIR ARMIJO: Okay. A deterministic

--

MEMBER SHACK: It's not the concern of this reg guide.

MEMBER CORRADINI: Well, can I just get a clarification, though, Bill, or from some of the staff? I don't understand. Is it that the rule states 45 or that you simply want to be consistent with other reg guides? Because I am kind of with Sam on this.

If I have a new design and by the way of the design, there is no way based on this as the reason to get to some pressure, there's no way to get to that pressure, why have that as a lower bound?

MEMBER SHACK: Well, right now --

MEMBER CORRADINI: Why can't the lower bound be 100 percent metal-water reaction with hydrogen burning?

MEMBER SHACK: Yes.

MEMBER CORRADINI: I guess that was kind of Sam's question.

MEMBER SHACK: Yes.

MEMBER CORRADINI: But I guess I don't appreciate how the interplay of this is with other reg guides and the rule. So can you kind of explain that to me.

MR. BRAVERMAN: Go ahead.

MR. ROCHE-RIVERA: I mean, the one thing, as he mentioned, yes, we want to be consistent with regulatory guide 1.7. But I must say that this limit was also incorporated in the rule at some point.

MEMBER CORRADINI: So the rule states 45?

MR. ROCHE-RIVERA: Yes, specifically applicable to operating reactors.

MEMBER CORRADINI: Okay. Okay. But I thought this was for --

MR. ROCHE-RIVERA: Yes. For new reactors, the rule states an exemption. Again, the staff still considers that 45 psig to be an acceptance criteria for this evaluation.

CHAIR ABDEL-KHALIK: Why is that?

VICE CHAIR ARMIJO: I just don't understand that, you know. It's just arbitrary.

MEMBER BLEY: To be acceptable is different than this is the opposite that says you manage to allow us to be acceptable. Maybe there is another way to be acceptable.

MR. PIRES: If I may say, the main clarification here was not that people were, applicants were, going below 45 psig. The main issue here that was being clarified was that the applicants

were just using 45 psig when 100 percent fuel cladding-water reaction was actually higher than 45. And they thought that by using 45, that it would be sufficient. That was the issue that arose during refuels.

MEMBER CORRADINI: Okay. But let me just postulate. So I want to make sure I understand this because let's say somebody comes up with a new design that we have yet to see in some sort of certification and they come up with a containment design that given their core size, given their --

MEMBER SHACK: The containment is not steel-clad.

MEMBER CORRADINI: Or something, yes.

MEMBER SHACK: Something, right.

MEMBER CORRADINI: Then 45 becomes a problem because it has no basis. So that's why I guess Sam's question --

MR. PIRES: Yes. I understand the question. And I get probably we need -- that's why I mentioned what you said before. It probably needs clarification. Our concern, what we were trying, the loophole that we were trying to close was when the fuel clad interaction was actually higher than 45 psig.

MEMBER CORRADINI: Right.

MR. PIRES: And it was started to use only 45. But I think we have to take into consideration this recommendation that when it is demonstrated, that it is less.

VICE CHAIR ARMIJO: It may be that it never can be less. Maybe 45 was never conservative enough.

MEMBER BLEY: I just took a look at the rule, though. The rule has the 100 percent reaction. It doesn't have anything about the --

MR. PIRES: Yes. The rule was it was in the rule under part 50, but part 52 makes an exception for new reactors of the 45 psig as being required. So I think when we tried to clarify the point, we probably went into this territory that was not intended.

VICE CHAIR ARMIJO: Yes. If this reg guide didn't even mention the 45 psig and just stuck with a properly calculated pressure, assuming 100 percent reaction, that should be clear to everybody and technically correct.

MR. BRAVERMAN: But right now there is a reg guide that discusses the 45 psig and --

VICE CHAIR ARMIJO: For operating reactors

I thought.

MR. BRAVERMAN: The rule is not operating reactors. The 1.7 is applied to --

MR. ROCHE-RIVERA: It's applied to --

MR. BRAVERMAN: -- to all. The 1.7 applies to all.

MEMBER CORRADINI: Then you ought to change 1.7.

VICE CHAIR ARMIJO: Yes, change 1.7. It just seems arbitrary. And it may be that it has no practical significance because maybe the actual pressures are higher than 45 all of the time. So why mess around with 45?

MR. PIRES: And that was the motivation, but we understand your point.

MEMBER SHACK: Okay. But I look at it a different way. I mean, obviously they put that in as a kind of a backstop for a kind of a minimum defense-in-depth thing that you are going to do this calculation of the post-accident inerting, the hydrogen burning.

There are always uncertainties associated with those calculations. You want a certain minimal containment capacity, 45 psig. So, I mean, look at it as a defense-in-depth measure that --

MEMBER RAY: Strange words coming from you, Bill.

(Laughter.)

VICE CHAIR ARMIJO: I think it is a way of putting conservatism in that's not really very enlightening. I think you could say calculate the pressure and put 10 percent margin on top of that or 20 percent.

MEMBER SHACK: Well, until you actually assure yourself that you understand the uncertainties, all of those are arbitrary, as is the 45 psig.

CHAIR ABDEL-KHALIK: But it may prevent innovation in a sense. If you put this hard limit, it may prevent people from coming up with innovative designs that would limit the peak pressure.

MR. PIRES: Or maybe we could leave as it isn't done right, another except and if you can demonstrate with a small uncertainty that you can be below the 45 psig and demonstrating, including uncertainties, to your knowledge, is that you would be below 45 psig.

VICE CHAIR ARMIJO: Yes. They have to calculate this pressure to be acceptable. So once they calculate that pressure and you know what it is and it happens to be lower than 45, why would you make

them 35?

I'm not talking about where they're close. I'm talking about saying it with a big difference. I just don't understand it.

MEMBER POWERS: I don't understand it. It seems to me that the attraction of going directly to the 45 is calculation. The pressurized due to the hydrogen produced by fuel cladding is a difficult calculation to perform and to come away confident that you have gotten a reasonable bound on the system.

VICE CHAIR ARMIJO: If you don't have confidence in the calculation, why bother people with doing it? Pick the number: 45 or some number.

MEMBER BLEY: You must use it if it's higher. I mean, that's --

MR. BRAVERMAN: I think from my experience, most of the cases I recollect, it's always higher. But there may be --

MEMBER CORRADINI: I think you're right. For operating reactors, I think that's true.

MR. BRAVERMAN: And as far as innovation, the regulatory guide is an acceptable approach. They're always allowed to provide alternatives with sufficient justification, I suppose.

MEMBER CORRADINI: But, I mean, just

historically once you put a hard and fast number in there, with all due respect to the staff, innovation is not highly valued, then, right? If I can come up with a way -- I guess my only thought is if the rule says 100 percent cladding-water reaction, then the 45 strikes me as unusual. That's all.

MR. PIRES: The 45 was in part 50 and still is in part 50 but not part 52, does not have that. And probably the motivation was a similar plant because being a new reactor, there will probably be some room for innovation.

It seems to us that possibly leaving it as adding a statement that, to your knowledge, the confidence on the calculated number, if it is less than 45, it --

VICE CHAIR ARMIJO: I just think it is unnecessary, but that's just my opinion.

MEMBER POWERS: Let me ask you this question. If you're going to get rid of the 45, you're going to tell me how to do the calculation?

VICE CHAIR ARMIJO: Well, I'm assuming, yes, that they have --

MEMBER POWERS: I don't know how to do this calculation.

VICE CHAIR ARMIJO: If you don't know how

to do it, how do you expect licensees to come to do it? And why make them do it? Just specify a number and say, "Use that number." I mean, I don't understand it. You can't have it both ways.

MEMBER POWERS: Well, you can specify how to do the calculation. You can tell me to take the peak pressure, ignore steam inerting, and take thermodynamic limit. And I can do that calculation. And I guarantee for most containments, it will be over 45 psig.

VICE CHAIR ARMIJO: Yes.

MEMBER POWERS: If you tell me to do it in a realistic fashion, in which I say, "Okay. The steam pressure drops down to the combustible burning limit," and then you tell me I have to take a complete combustion, 100 percent complete combustion, and I can or cannot at your whim account for radiation heat transfer, I can also do that calculation.

But you've got to tell me something here or it becomes a very difficult calculation for me to do and, similarly, very difficult to read, to review. I mean, it can get very hairy. You can make that calculation extremely difficult to do.

MR. PIRES: It is possible that if a design is innovative to the point in which that

pressure would be less than 45 psig, that exception will be treated as a special case and come up via a regular review. So the staff would pay particular attention to that number. I think they would be called from that point of view --

MEMBER CORRADINI: I guess my reason, the only justification I can come up with to rationalize the 45, is what Dr. Shack suggested, which is I'm going to have a bottom floor that's defense-in-depth-related that is mechanistically uncoupled to anything.

So there might be something out there that I haven't thought of. And I want to make sure I've got some multiplier on design pressure. That's the only logic for having a floor that I can imagine.

MEMBER SHACK: Well, I mean to address -- as Dana said, you can make the pressure calculation, address all of the uncertainties, and address it that way or --

VICE CHAIR ARMIJO: But the way I read it is that even if they did it the way Dana said and did a really good job with uncertainties, and they came up with a number less than 45, this reg guide would say, "Use 45."

MR. PIRES: Well, I guess the reg guide

would say that, but Joe said if they can demonstrate that there is another approach to do, to take into account these issues, that can be accepted.

The reg guide is not a requirement. It is a guidance of one acceptable approach. And I would think that using innovative design, that will go below that threshold. That will be handled with special considerations.

CHAIR ABDEL-KHALIK: But back to the point that Dr. Powers raised regarding the difficulty of performing such analysis, where do applicants get clear guidance on what acceptable assumptions they can make in performing such analyses?

MR. ROCHE-RIVERA: For analyzing the cladding-water reaction, you mean?

MR. PIRES: Reg Guide 1.7 is the regulatory guide that addresses combustible gas controls. And that aspect of this issue, the combustible gas control, is addressed probably on regulatory guide 1.7. It's not in the scope of this regulatory guide, but 1.7 is a comprehensive regulatory guide and is related to combustible gas controls. That will be the guidance.

MR. BRAVERMAN: Yes. This reg guide is primarily for the structural evaluation once these

pressures are defined. So it was not supposed to cover that.

CHAIR ABDEL-KHALIK: I understand that is the concern, but the point was made earlier that if that analysis is to be done and if appropriate accounting for uncertainties was to be made and if that is to show that the final pressure is less than 45, then perhaps you would allow that in the structural analysis.

My question is the opposite. If you were to do the analysis, do you also require them to account for uncertainties prior to performing these structural analyses if the pressure was higher than 45?

MR. PIRES: In principle, you would do that analysis according to the guidance in 1.7 and the criteria in the regulatory guide. We would expect the ten-year analysis presented, that assessment of the uncertainty that is involved.

MR. ALI: May I? This is Syed Ali from the Office of Research. May I add something?

I think we have structural people here. We are not in a position to answer your question --

CHAIR ABDEL-KHALIK: Thank you.

MR. ALI: -- as to how the hydrogen

combustion analysis is done. It is just not our area. I think what we can get from this instance, to go back and again check to make sure that 45 psi is not in the rule. And if it's in the rule, it's only for the operating reactors and not for the new reactors.

And if that is the case, if you can confirm that, then give some option for the licensees to do an appropriate analysis for the hydrogen combustion considering all of the uncertainties. And if they can show that that is less than 45 psi, then they can use it. It's probably justified. I think that's what we can take from this.

VICE CHAIR ARMIJO: Yes. It just seems like it's --

MEMBER SHACK: Well, I think we can wait for a report from the ACRS.

VICE CHAIR ARMIJO: I am just saying --

MEMBER SHACK: There are various opinions.

VICE CHAIR ARMIJO: I am just telling you it just seems like we're asking them to do something that apparently is very difficult to do, do this calculation, go through all the steps. And when you're finished and if you get an answer that is less than 45, well, you just waited a lot of time. Use 45.

So what is the purpose of the calculation?

If we don't have confidence in the calculation, then we shouldn't ask them to do it. Pick a number.

MR. PIRES: If they don't feel that -- we can put it a little bit the other way around. That is, if they don't feel that they are sure of their calculations, certain of their calculations, they have the 45 psig to solve where it came to.

And essentially the tie-in to 1.7 is for the load definition. It is essentially for this. And that is where the 45 psig comes from.

CHAIR ABDEL-KHALIK: I think a lot of views have been expressed about this. We discussed this long enough. Let's move on.

MR. PIRES: Okay.

CHAIR ABDEL-KHALIK: Thank you.

MR. ROCHE-RIVERA: So the information related to this regulatory position in the context of this regulatory guide should be presented in section 3.8.

Regulatory position number 3. This is Commission's severe accident performance goal. This guidance associated with the regulations are listed here in Commission's performance goals in SECY-98-087. This guidance basically focused on the acceptance criteria when evaluating severe accidents. Regulatory

guide 1.206 endorses the SECY paper and respective SRM. And it specifically says in regulatory 1.206 that "The review associated with meeting the regulations listed above should specifically address the issues identified in SECY-90-016 and SECY-93-087."

The purpose of this regulatory position is to provide an acceptable method for an analysis that specifically addresses the performance goals identified in SECY-90-016 and SECY-93-087 and related SRMs for containment structures in nuclear power plants under severe accident conditions.

So if a reference is the text from the SECY and including the text is the identification of two time frames, there are 24 hours following the onset of core damage and just the time frame after that initial 24 hours. The SECY identifies what should be the role of the containment, really, for the two time periods. That is that for the initial 24 hours, the containment should maintain its role as a reliable, leak-tight barrier. And then following those initial 24 hours, it should continue to provide a barrier against the uncontrolled release of fission products.

The SECY also identifies the acceptance criteria for the initial 24 hours. And that is the

containment maintains its role. So the containment maintains its role with a tight barrier by ensuring the containment stresses do not exceed ASME service level ceiling limits for metal containments or factor load category for concrete containments.

regulatory guide also provides acceptance criteria for the period following the initial 24 hours, as we will discuss in the coming slides.

CHAIR ABDEL-KHALIK: Now, the definition of failure in this particular bullet is that the containment is no longer a leak-type barrier.

MR. ROCHE-RIVERA: Yes.

CHAIR ABDEL-KHALIK: Is that definition consistent with ASME service level C, limits for metal containment, or the factored load category for containments as well? Is there a one-to-one correspondence between failure to be leak-tight in meeting these requirements or is that a conservative limit that assures that the containment will remain leak-tight?

MR. ROCHE-RIVERA: It is conservative, and it is expected that the leakage, if any, at this point will be extremely low. But yes, it is conservative.

MR. PIRES: But it is a good correlation. There is no containment test. Some of these limits

are yielding of the liner. At that stage, you are at the transition between leak-tight and not leak-tight. So it is a good limit. It is a good correlation.

MEMBER SHACK: Yes. I think it is a conservative one that you have got very low limits. But as they point out in the containment testing program, it's very difficult to get a good correlation.

You know, the only way you can really address the uncertainties is to take a slightly conservative approach. It becomes very difficult to actually have something that predicts the leakage through these structures as you really do begin to load up in any mechanistic way.

And so you address uncertainty in the way you frequently do in engineering problems, which is to take essentially a conservative limit.

MR. ROCHE-RIVERA: So in this relative position --

MEMBER POWERS: To be precise, Dr. Shack, it's a limit that you think is conservative.

MEMBER SHACK: The limit that you think is conservative.

MR. ROCHE-RIVERA: So with the key items addressed in these regulatory positions, also there

are some staff recommendations and comments from the public are the identification of the more likely severe accident challenges, which is a phrase that comes from the SECY paper and also the criteria for the evaluation related to the time frame of the initial 24 hours following the onset of core damage.

So the text in the reg guide for getting identification of the accident sequence is related to more likely severe accident challenges is that "The applicant provides the technical basis for the identification of the more likely severe accident challenges to be reviewed by the staff on a case-by-case basis. An example of an acceptable way to identify the more likely severe accident challenges is to consider the sequences or plant damage states, which when ordered by percent contribution represent 90 percent or more of the core damage frequency."

MEMBER POWERS: Have you done that for a plant?

MR. ROCHE-RIVERA: The criteria was based on previous experience. I mean --

MEMBER POWERS: It just seems to me that when I look at the contributors to a plant, I usually can get the first 73-75 percent, something like that. And then there are a bunch of things that are down in

the noise that make up the rest of them.

To get to 90 percent, really, it's not uncommon for me to really plunge down into the grass, as we call it, and whatnot. I mean, to get to 90 percent in some cases, I mean, I can find plants for you. It's all station blackout, and it really doesn't matter. But I could find cases for you where getting the 90 percent would really get you down into the grass.

Joe is smiling there. I think he knows this is -- he's seen this. I mean, sometimes in my summation, it's hard to get to 90 percent.

MR. DUBE: This is Don Dube in the Office of New Reactors.

Yes. This is the first time we attempted to put a number to what the Commission through the policy statement said, use the term "more likely." So the 90 percent, then, really wasn't picked out of the air.

We looked at two designs that are undergoing certification. One of them used 90 percent when they defined more likely and another one 95 percent. So we feel comfortable that 90 percent is a reasonable value.

Moreover, it's consistent with the

Commission's goal for new reactors of a conditional containment failure probability of ten percent or less if you look at the complement of that. So from those two perspectives, we feel it's a reasonable approach.

MR. ROCHE-RIVERA: So from the selected sequences, then we select the pressure and temperature for analysis in this regulatory position. And in the reg guide, we also make -- we highlight that for concrete containment specifically, it is generally acceptable to analyze the containment for the sequence or damage state with the highest pressure load and its coexisting temperature loading.

CHAIR ABDEL-KHALIK: What do you mean by "physically reasonable"?

MR. ROCHE-RIVERA: Meaning that from the severe accident sequence is selected. I mean, an applicant could choose to select the sequence with the highest pressure and then seek from the order of the sequences the highest temperature. And then we're making that comparison of the pressure and temperature. They have to evaluate if that condition is possible, if physically they can coexist together.

CHAIR ABDEL-KHALIK: So are you still sort of asking them to evaluate consistently a specific scenario, either one with the highest pressure or one

with the highest temperature, or are you asking them to evaluate sort of the hypothetical envelope of pressure-temperature envelope that covers all of these events that contribute to 90 percent of core damage frequency?

MR. PIRES: Essentially what we are asking is essentially that they choose the pressure, an enveloping pressure demand -- in most cases, that will be the controlling -- choose an enveloping pressure, pressure demand, and attend the temperature that is supposed to be that pressure that modified that sequence.

That will be for the most part the controlling event, particularly for the post-concrete containments or pretest. First year containment may be some other considerations, maybe 40 to take in the pressure temperatures that are chosen and are not incompatible physically.

MR. BAGCHI: May I interject? My name is Goutam Bagchi. I'm with the Office of New Reactors.

The structure and challenge for a containment design is really the pressure. It is always going to produce a limiting condition. And the associated temperature that goes with it is what physically exists hand in hand. But higher

temperature should be looked at only in case that some kind of constrained loading, like liner putting some exertion of pressure comes on.

Those pressures are really not structurally primary loads. They're secondary loads. And those kinds of pressures can be accommodated by liners bulging out inside and some of the other inelastic strains. So highest pressure is always going to govern the design load for the containment.

CHAIR ABDEL-KHALIK: My question really was just to add specificity to the term "select physically reasonable."

MR. BAGCHI: Well, where does it show up, "physically reasonable"?

MR. ROCHE-RIVERA: It is there in the presentation.

MR. ALI: This is Syed Ali. If I may add? I think what this statement does is kind of remove the conservatism. And somebody might assume taking the highest pressure, the highest temperature, which may not exist physically together.

So if that is the case, this guidance tells them not to do that, only if they are reasonably coexistent to consider. Otherwise, like Mr. Bagchi said, for containment design, it is reasonable to take

just the highest pressure and the coexisting temperature.

CHAIR ABDEL-KHALIK: Thank you.

MEMBER CORRADINI: So can I just ask a broader question just to go back? So not to go back in slides but your guidance number position 1 really was providing the analysts a way to define failure that didn't need leakage. It just was a free field analysis that set away from all penetrations and strange geometries. You shouldn't go above some strain limit. That was one.

Two was you are going to define failure as a pressure either due to hydrogen production and burning or some lower limit. And in this one, this in the first time you have actually gotten specific about how the load is to be calculated.

The other ones, every time we asked them, we said, "Well, there is another reg guide." So is there no reg guide that provides this before? Is this the first time the applicant is going to see a methodology to do some computation?

MR. ROCHE-RIVERA: Yes.

MEMBER CORRADINI: So I haven't read the reg guide. I have to admit this. So is there more specificity than this? Because now we go back to from

a calculational standpoint, are all gloves off, as inventive as they can be, to compute the pressure and temperature pairs for the reasonably likely sequences? Do you understand my question?

MR. ROCHE-RIVERA: The statements in the reg guide are actually very similar to what we have in this presentation.

MEMBER CORRADINI: So they can be realistic, conservative, or somewhere in between? And you would evaluate on a case-by-case basis?

MR. ROCHE-RIVERA: Yes.

MEMBER CORRADINI: Okay.

MR. BRAVERMAN: Excuse me. This is Joe Braverman from BNL. I just want to clarify something. The regulation position 1, it's a choice. You could do a nonlinear 3D finite element analysis or the simplified --

MEMBER CORRADINI: Yes. I'm sorry. I meant to say -- I just guessed that most people would go for simplified to begin with. So okay. Thank you.

MR. ROCHE-RIVERA: So for the period following the initial 24 hours after the onset of core damage, the criteria from the SECY paper is that the containment should continue to provide a barrier against the uncontrolled release of fission products.

The criteria presented in this regulatory guide 1.216 is as follows. The first two sub-bullets basically refer to the containment being a barrier as strong as for the initial 24 hours. And if this is not met, then the alternative is that the calculated release for the more likely severe accident challenges following the initial 24-hour period meets site-specific design criteria for fission product released from the containment in accordance with the requirements of 10 CFR 100.21 and 10 CFR 50.34.

And also if this is not met, then always the applicant has the option of submitting an alternative method. And then the staff will evaluate on a case-by-case basis.

The regulatory position also references regulatory position 1 in terms of the method of analysis to be performed and take some exceptions to it. And the information related to this regulatory position should be reported in chapter 19 of the FSAR.

MEMBER CORRADINI: And the three options besides the alternative method to be justified, the three options, it's not clear which is more limiting. I guess I just assumed the first one was most limiting, but I -- so are these progressively, shall I say, a bit more flexible?

MR. ROCHE-RIVERA: Yes.

MEMBER CORRADINI: Okay.

MR. ROCHE-RIVERA: Yes, they are.

On this slide, basically for your reference, we're just including a categorization of the public comments received. This categorization is consistent with the letter received from NEI. Again, it's just here for reference. This one provides our categorization, which is based on the regulatory positions.

One thing we could take from this slide is that it does mention RP 4, which is regulatory position 4. The draft guide used to have a regulatory position related to containment fragility. And it was taken out based on staff recommendations based on public comments.

We're going to discuss in the next slides these major revisions. So the major revisions include that the reg guide scope for new light water reactor designs. Also we clarified the regulatory purpose and its relationship to regulations. Apparently there was some confusion in the public in that regard.

Also, in terms of the severe accident performance goals, we concluded this criteria for the identification of the more likely severe accident

challenges and also included acceptance criteria from the period following the 24 hours after the onset of core damage.

And here, as I had mentioned earlier, we removed this regulatory position 4 from the draft guide, which was containment fragility on the pressure loads. And basically the logic behind it is that this item may require further development of technical bases and subsequent validation maybe in the report and also that this reg guide actually is really intended to focus on deterministic methods. And the subsequent research provides the technical basis for risk-informed performance-based regulatory guidelines.

With this, I conclude this presentation. I would be glad to take any additional questions.

MEMBER RAY: Well, your position 2 says, "dead load and pressure." I assume this reference to fragility, if it were somehow addressed, would take into account, say, an aftershock in a seismic setting.

MR. ROCHE-RIVERA: This one is basically focused on pressure, not really, internal pressure, internal pressure.

MEMBER RAY: Fine. It's not intended to do that or it wouldn't do that if it were satisfied.

What about the event is initiated by an

earthquake and then this is obviously sometime afterward? There's no dynamic loading considered here anywhere. What is the staff's thinking about that?

MR. PIRES: The pressurization will come after the aspect is already started.

MEMBER RAY: Yes, but I was thinking of the earthquake in Chile. You had aftershocks every few hours for days.

MR. PIRES: Yes, but what the aspect would do if it was a very severe earthquake would be that it would cause some initial damage to the containment and whether that initial damage -- it would be very unlikely that they will be simultaneous, the dynamic shock and the pressurization, but there could be an initial damage to the containment.

MEMBER RAY: Let me just assume that the --

MR. BAGCHI: May I interject one point? My name is Goutam Bagchi again.

If you're talking for seismic loads, that's quasi-static. Pressure load is more dynamic than that, but, leaving all of that aside, this really is targeted towards the internal pressure and internal events going on inside the containment after a severe accident.

Now, earthquake could presumably cause a severe accident. Could the aftershock effects be more limiting? They might throw in five seismic interactions. Load could impede the structural integrity of the wall. There are just too many complications to go into. This fragility is related to pressure integrity of the containment.

MR. BRAVERMAN: I would like to also add something. Of the three regulatory positions, source 1 looking at calculated ultimate pressure capacity of the containment, that was not intended to be placed in a load combination. It was just to determine the pressure capacity, like the accident that happened at TMI, to see how much margin we had.

The second regulatory position specifically addresses 10 CFR 50.44, hydrogen pressurization loading. And, as we discussed before, there is another reg guide, 1.7, where previously the determination was made that only dead load is needed along with the hydrogen pressurization load.

And in this third category, regulatory position 3, my thoughts on that is for the design of the containment, there are load combinations. You're correct that at seismic, they have dead, live, and local pressure, but this regulatory position 3 is not

a design load combination. It's specifically geared towards the SECY-93-087, which talks about the severe accidents, which I believe don't have to be added with other loadings.

VICE CHAIR ARMIJO: Once you get the internal pressure capacity through this process, what do you do with that information? What is an acceptance? What is the acceptance criteria or criterion?

MR. ROCHE-RIVERA: In terms of which regulatory --

MEMBER SHACK: Regulatory position 1.

MR. ROCHE-RIVERA: Yes.

MEMBER SHACK: There is no acceptance criteria.

VICE CHAIR ARMIJO: This is just for information.

MR. BRAVERMAN: Regulatory position 2. Well, the --

MR. ROCHE-RIVERA: Okay. Yes, as Dr. Shack mentioned, there is no pass or fail criteria for regulatory position 1. There is the value that is obtained from this evaluation presented in regulatory position 1. It is intended to represent the best estimate of the capacity of the containment. With

this best estimate of the capacity of the containment, we are able to assess the margin of the containment against the design-basis pressure.

And also in the context of this regulatory guide, we are able to assess the margin against the combustible gas control and the severe accident cases. So it is on the -- it is a valuable number to have.

VICE CHAIR ARMIJO: Well, I think so, but if someone is designing a new plant and he goes through the process and calculates what the capacity is for this containment, he doesn't have to meet -- does he have to meet some value, some minimum value, or does he have to redesign in case the capacity isn't great?

I guess I'm trying to find out, what do you do with this information: Either redesign or say the design is acceptable or what?

MR. BRAVERMAN: Of the regulatory positions, I wanted to clarify only position 1 deals with ultimate pressure capacity. Regulatory position 2 already has the kind of limits you're referring to. You have to meet ASME service level C.

VICE CHAIR ARMIJO: Yes. I understand those.

MR. BRAVERMAN: So 2 and 3 really don't

apply. I think you're focusing maybe on the regulatory position 1. And, as Robert was trying to imply, there is no absolute right or wrong answer. The staff would like to see that there is sufficient or substantial margin beyond the design basis loading. So there is no right or wrong answer. It's to show how much margin there is.

Now, the staff does know from past experience reviewing other applications what kind of factors above the design-basis are expected. I suppose if it's extremely low, then the staff could --

VICE CHAIR ARMIJO: Something is wrong with the design. You know, that's a --

MR. PIRES: It provides the reviewer essentially the full range of the pressure capacity of the containment from the design-basis to the combustible gases to the severe accident, very severe accident, per SECY-93-087. So the reviewer has that other information to help with the assessments.

MEMBER CORRADINI: Is there an expectation of where these all -- I mean, when we had the subcommittee meeting, I asked this. And I got the impression you guys had it in your mind but you felt it was too uncertain to put it down, which is if I were to think of a plot of leakage versus pressure,

where these various things lay out relative to the design pressure. If the design pressure is 30 psig, just to pick a number, something, how all of these things lay out in some progression --

MR. PIRES: We do have plots like that. We could actually show one, but the ultimate tends to be -- for instance, for reinforced concrete containments, it's about three and a half times the design pressure; pre-stressed concrete containment similarly. For steel containments, I don't recall the number, but these also -- there is a large margin --

MEMBER CORRADINI: So that calculation in regulatory position 1 bounds what you expect to be the other calculation, what you expect to be the other analyses from regulatory position 2 and 3 based on service load C?

MR. PIRES: It's the limit of that curve. If you plot the curve, you would find that there is the axis as the pressure. You would have the design pressure. And you are there for the combustible gas control limits; then if necessary for them to be invoked for the other severe accidents; then, finally, the ultimate pressure capacity.

And there would be a vertical axis with leakage rates, but there is much --

MEMBER CORRADINI: Of course, of course. But that --

MR. PIRES: Like a straight line on the log plot.

MR. BAGCHI: My name is Goutam Bagchi again.

A little bit of historic perspective might be helpful here. I am not trying to defend why regulatory position 1 does not provide an acceptance criterion. It must need this, that, and the other.

During TMI accident, it turned out that people wanted to know what the ultimate capacity is going to be so that public protection could be continued by relieving the containment of some of the excess pressure. So at what point could the containment valves be exercised?

That was the underlying thought behind it. That's why during the standard review plan 3.8 revision this provision of ultimate capacity went in. And we have never put down any particular set of numbers to that. It will be plant-specific, design-specific.

VICE CHAIR ARMIJO: Would this number be used in your severe accident management --

MR. BAGCHI: Potentially it could be.

VICE CHAIR ARMIJO: -- plans or something? You know, it may be a very useful number. I'm just trying to find out what use is there for it.

MR. BAGCHI: In my mind, historically that was the concept behind it.

VICE CHAIR ARMIJO: Okay. That's helpful. Thank you.

MEMBER SHACK: If there are no further questions, turn it back to you, Mr. Chairman.

CHAIR ABDEL-KHALIK: Thank you. We are way ahead of schedule. Fortunately, we have plenty to do. So thank you very much.

We will continue with item 3 on the agenda, and we are off the record.

(Whereupon, the foregoing matter went into closed session at 9:27 a.m. and went back on the record in open session as follows.)

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

(3:46 p.m.)

CHAIR ABDEL-KHALIK: We are back in session.

5) PROPOSED RULEMAKING ON DISTRIBUTION OF SOURCE MATERIALS TO EXEMPT PERSONS AND TO GENERAL LICENSEES AND REVISION OF GENERAL LICENSE AND EXEMPTIONS

CHAIR ABDEL-KHALIK: At this time we'll go to item number 5 on the agenda, which deals with a proposed rulemaking on distribution of source materials to exempt persons and to general licensees and revision of general license and exemptions.

Our colleague Dr. Ryan will lead us through this.

MEMBER RYAN: Thank you, Mr. Chairman.

5.1) REMARKS BY THE SUBCOMMITTEE CHAIRMAN

MEMBER RYAN: And today we have Andrew Carrera and Gary Comfort from the staff, who are going to lead us through this briefing. I might say at the outset that I think in reviewing the materials that developed from the first subcommittee meeting, it is likely we will have a second subcommittee meeting to further discuss some important details. We wanted to go ahead with today's full Committee briefing so you would have some understanding of where this rulemaking

activity is moving forward.

So, without further ado, Gary, I will start with you.

5.2) BRIEFING BY AND DISCUSSIONS WITH REPRESENTATIVES OF THE NRC STAFF

MR. COMFORT: Okay. Good afternoon, everybody. We appreciate your having us here today. My name, as stated before, is Gary Comfort. I'm a senior project manager in the Office of Federal and State Materials Environmental Management Programs, a mouthful by itself. And I'm in the Division of Intergovernmental Liaison and Rulemaking. We are known as DILAR.

We are here today to talk to you about our efforts on a proposed rulemaking on the distribution of source material, as stated, to exempt persons and to general licensees as well as that rulemaking has certain revisions to the general license for small quantities in 40.22 and certain exemptions.

Andrew Carrera is a project manager who is in our staff who is going to give the presentation.

MR. CARRERA: Thank you, Gary.

MR. CARRERA: Good afternoon, Mr. Chairman, ACRS members, and staff. Good afternoon, members of the public. My name is Andrew Carrera. As

Gary said, I work in the Office of Federal and State Material Environment Management Program.

I am here to brief you on our efforts to develop proposed rulemaking on distribution of source material to exempt persons and to general licensees as well as proposed revision to general license for small quantities of source material and some proposed changes to certain product exemptions in 10 CFR part 40.

Joining me is Mr. Gary Comfort. He will be here to help me answer your questions.

During this discussion, I will attempt to cover a number of topics. First, I will briefly discuss 10 CFR part 40 in general. I will follow this a with a brief discussion on the history of this particular rulemaking. And I will discuss why we believe the rulemaking is necessary by describing the problems we see in the current part 40 rule and how we propose to resolve those issues for the proposed rulemaking. Finally, I will introduce specific questions that we plan to solicit from the public.

First let's talk about 10 CFR part 40 and what it applies to. As this slide indicates, the purpose of part 40 is to establish regulations for the use and possession of source material and byproduct

material. This proposed rule, however, only deals with source material.

Source material is defined as uranium or thorium or ores containing greater than 05 percent by weight of uranium or thorium. Source material does not include anything that will be considered special nuclear material; in other words, enriched uranium.

Source material can be generated without a person realizing it because it comes under NRC's jurisdiction after the uranium or thorium is removed from its place in nature.

Next slide, please. NRC source material under part 40 in three primary fashions: under specific license, under general license, or through the issuance of exemption for products; listed a few examples of activities with products that would fall under each category.

This proposed rulemaking will primarily affect activities associated with exemptions and general license. Most materials and products that are provided in the exemption are determined to present an insignificant impact to public health and safety without further regulations. Normally they have no additional requirements for safe use to be used by the general public. And they are allowed to be disposed

of without restriction.

The NRC does not generally know who possessed radioactive material under the exemption and in the case of source material does not know how much material is distributed for possession and under an exemption.

MEMBER SHACK: Do you have a definition of when depleted uranium is depleted?

MR. COMFORT: There is no -- I mean, specific definition in the regulations as to where it is, no.

MEMBER RYAN: Bill, my experience is it's basically an operational definition to them. It's no longer viable to try and extract any more --

MEMBER POWERS: The trouble is that the tails vary according to the economic climate. And right now depleted is running .3 percent; whereas, it's naturally .7. You know what I mean? It's hardly at all.

MR. CARRERA: General License falls in a space between specific licensing and exemptions. Whereas, a specific license requires an application to the NRC to become a licensee, a general license is granted to any person who fills out an application to the NRC as long as they meet the underlying operating

condition.

Not all general licenses currently have reporting requirements. And so the NRC may not be directly aware of all persons who possess radioactive materials under a general license.

Slide number 7, please. One of the areas that the staff is proposing to revise in our rulemaking is the general license from small quantities of source material in section 40.22. Section 40.22 currently provides a general license for the use and transfer of not more than 15 pounds of source material at any one time and no more than 150 pounds total in any one calendar year for the operational purposes.

A person operating under this general license is exempt from requirements in parts 19, 20, and 21, which basically cover training and notification, health and safety, and reporting of defects and non-compliance.

This general license includes no reporting or registration requirements. And so the NRC has no easy way to identify persons operating under this general license.

CHAIR ABDEL-KHALIK: Where do these quantities come from?

MR. COMFORT: Basically, the history of it is back in 1960s, the general license that we're using was limited to three pounds. And it was primarily for the use of -- actually, I've got it specifically here, but it was for medical use by physicians and pharmacists is where it really was.

In 1961, when we basically revised part 40 in its entirety, they expanded that exemption to include other efforts, including commercial use, and raised the limits to 15 pounds. One of the big differences, though, that we have is that we have found that when they did that expansion of what they were looking at when they included commercial uses, that they didn't really do an evaluation of the potential impacts of it at that time or later.

MEMBER RYAN: Medical use for contrast in certain X-rays, Thorotrast. You might remember those patients. And there was a uranium analogue. So that was the origin of the --

VICE CHAIR ARMIJO: Just to make sure I understand, if you have 15 pounds of a material and it contains .05 percent uranium in it, you're at the limit?

MR. COMFORT: If you have --

VICE CHAIR ARMIJO: Is that correct?

MR. COMFORT: Well, if you have 15 pounds of uranium itself within the material, so if it's .05 --

VICE CHAIR ARMIJO: Okay. So you can have your --

MR. COMFORT: -- 30 tons basically.

VICE CHAIR ARMIJO: Okay. So the limit is on the uranium?

MR. COMFORT: It's on the uranium. Well, the definition is 15 pounds of source material. Now, source material is uranium and thorium or ores containing. So once it goes past that ore stage, then you're talking with some material containing the uranium and thorium, you can have up to the 15 pounds of the uranium and thorium itself.

VICE CHAIR ARMIJO: Okay. So that means --

MR. COMFORT: A lot of material.

VICE CHAIR ARMIJO: Could potentially be a lot of material.

MR. COMFORT: Well, volume-wise, yes.

VICE CHAIR ARMIJO: If you needed it --

MR. COMFORT: Right.

VICE CHAIR ARMIJO: -- in a more dilute form. Okay.

MR. CARRERA: Slide number 8, please. Exemptions for licensing are found in section 40.13 and are known as unimportant quantities. Persons receiving these products are exempt from requirements to obtain a license.

There are three major categories of exemptions in part 40, which are listed on a slide. This rulemaking, however, deals primarily with section 40.13(c).

Now I will briefly discuss the history of this rulemaking.

Slide number 10, please. In 1999, the staff proposed multiple activities associated with part 40 to the Commission as part of a SECY paper. One of the activities that the staff recommended was to develop a rulemaking plan for possible changes to the section 40.22 general license.

In 2000, the Commission agreed with the staff's recommendation and directed staff to move forward on developing the rulemaking plan. The staff submitted a rulemaking plan to the Commission in April of 2001.

In 2003, the Commission returned a staff requirement memorandum, SRM, on part 40 rulemaking plan, which directed staff not to make any changes to

section 40.13 or 40.22 at this time but to, instead, try to collect more data to support the rulemaking.

So from 2004 to 2006, the staff collected data about the general licensees by reviewing historical records and received data from the only known distributor of source material to general licensees.

In addition, the staff obtained the services of the Pacific Northwest Laboratory, or PNNL, to try to identify general licensees and how source material was used. PNNL --

MEMBER RYAN: Andrew, just one question, if I may, while you're at it on the inventory. If I understand the industry right, it has a decreasing collective amount that's under general license as time has gone on. Is that right?

MR. COMFORT: Well, I mean, we have never had a real good hold of how many people are actually possessing under general license, but the number of distributors that we know that send material --

MEMBER RYAN: "Look at our license" for sure.

MR. COMFORT: Yes, that are specifically licensed in the past. Back in 1986, we had done basically a request for information from those folks.

And we had identified, if I remember correctly, five distributors.

When we went to do the same thing in 2005 time period, we could only identify one left. Most of them, the other ones, we had seen decommission and shut down.

MEMBER RYAN: Do you know if that one is still in business?

MR. COMFORT: Yes, as far as we are aware, they are still in business.

MEMBER RYAN: But you are not positive?

MR. COMFORT: No. I'm pretty sure they are still.

MEMBER RYAN: Oh, okay. All right.

MR. COMFORT: Yes.

MEMBER RYAN: Thanks.

MR. CARRERA: PNNL's data indicated that the major use of source materials in the manufacture of thorium-coated lenses and proceeded to contact nine manufacturers to evaluate their practices.

PNNL provided a final report of the finding in 2007. At around the same time that PNNL was doing the evaluation, the staff also developed and submitted a SECY paper on tracking and providing enhanced controls for category 3 sources to the

Commission.

As part of the SECY paper, the staff recommended that the rulemaking envisioned in the 2001 rulemaking plan be restarted to address any potential concern that quantities of source material could be possessed under the section 40.22 general license. In their SRM, the Commission approved the staff's recommendation to restart the rulemaking. These efforts culminated in the staff's providing the proposed rule package that we are now discussing to the Commission in late December of 2009.

Slide number 12, please. Now that I have provided you with a basic understanding of what part 40 encompasses and a little bit of history behind this rulemaking, let's look at the concerns that the staff has with the current requirements in part 40 and how we propose to resolve them through the proposed rule.

The staff's general concerns with the current part 40 are listed on this slide. There are four of them. In the next few slides, I will discuss each of these issues and how this rulemaking will resolve each of the issues.

Let's look at our first issue: the current health and safety impacts in section 40.22 in greater details.

Slide number 15, please. The staff's first concern is that the current regulatory structure in part 40 may be inconsistent with the current radiation safety requirement in part 20. The regulations for source material in part 40 have not been significantly revised since 1961. Although the health and safety regulations in part 20 were significantly revised in 1990, the impacts of these revisions to part 40 were never fully evaluated.

And in the next two slides, I will discuss examples of how part 40 may not be consistent with the current health and safety requirements in part 20. First, I will discuss the PRM-40-27, which is a petition for rulemaking submitted by the State of Colorado and the agreement states in 1999. And then I'll discuss the 2007 PNNL dose assessment report.

In PRM-40-27, the Colorado Radiation Control Program identified a site where a general licensee had abandoned operations and leaving significant contamination. According to the petitioners, further investigation found the licensee ensured that its procurement did not exceed the 150-pound-per-year limit, as specified in 10 CFR 40.22(a), and had left the building with thorium contamination level calculated at 734 millirem per

year, which is well above both current release limits and occupational and public dose limits.

As a result of these findings, the petitioners requested in PRM-40-27 that section 40.22 be modified to remove the exemption in 10 CFR 40.22(b), which is to parts 19, 20, and 21, so that this and all other general licensees who use similar quantities of source material would have to meet the same health and safety requirements for specific licensees.

MEMBER RYAN: Andrew, I think this is the place where I would like to understand the details here. The 734 millirem is --

VICE CHAIR ARMIJO: Per year.

MEMBER RYAN: -- per year is a pretty precise number. You know, I really have -- and I learned by going through a lot of the background materials that these are based on stylized calculations. They're really not measurements.

MR. CARRERA: It was the code that we used.

MR. COMFORT: Correct. I mean, they had direct measurements for the 4.9 millirems per hour on the dumpster. But they basically stayed at Colorado, went out to the site where the material had come from

that set off the alarms at this dump, and basically they did do sampling of the building that was abandoned. They ran the numbers that they had through the D&D revision 1 code at the time. I'm not specific of what numbers they put in there and all that other stuff. That's why I expect they came out with a number to be so specific as they were using a code that gave them something like that.

They also did go through and found the actual licensee who had abandoned the site, they had actually moved operations. And,a gain, they did measurements there and did estimates that the workers were potentially receiving up to a rem. Again, they make it clear it's estimates. You know, we didn't look at the details of that calculation at that time.

VICE CHAIR ARMIJO: Well, is this licensee or whoever had this stuff taken to task? Was he fined? Was he put out of business? I mean --

MR. COMFORT: Well, that is the problem.

MEMBER SIEBER: Was he exempt from everything?

VICE CHAIR ARMIJO: Because he's exempt from all of these things, it just doesn't matter?

MR. COMFORT: Well, it was basically the State of Colorado went through and decided o their own

to go and make sure the site that they abandoned was cleaned up.

I didn't follow up on what they did with the licensee at the new site and the way that they tried to introduce any type of controls that should have been in place on that site.

VICE CHAIR ARMIJO: I guess I don't understand how these agreement states work. There's a regulatory limit and nobody's --

MR. COMFORT: Well, there is no regulatory limit. That's the problem, is because they're exempt from the part 20 limit. So there is no restriction on the exposures that they're providing, the same thing with there are no requirements because there the workers are getting above 100 millirem per year potentially that have training requirements.

VICE CHAIR ARMIJO: So the regulatory limit is for people who are not exempt --

MR. COMFORT: Correct.

VICE CHAIR ARMIJO: -- or for other --

MR. COMFORT: They are specifically, under 40.22 the general licensee is specifically, exempted from the requirements in part 20, which include decommissioning limits and exposure limits for health and safety.

MEMBER RYAN: I think that that is part of the -- we need to go into this in more depth, Sam, is that it's not clear to me that this is a real dose. This is a calculation.

MR. COMFORT: Right.

MEMBER RYAN: And I really don't understand how close that is. That could be 70 or that could be 1,000. I have no idea.

MEMBER SIEBER: The problem is, even in the statement there, 734 millirems a year is not a contamination level, so many microcuries or so many counts per so many square inches. And so you need to know, you know, is this guy laying on it all year or --

MEMBER RYAN: Yes. I mean, so if it is a highly stylized calculation and he's at 24/7/365, it doesn't mean anything.

MEMBER SIEBER: Right. No, it doesn't.

MEMBER RYAN: So we close up the room, and he is inhaling all of the radon. And there is no ventilation whatsoever.

MEMBER SIEBER: Maybe the guy is living in the dumpster. Maybe that would do it.

MEMBER RYAN: But so I think in going through this, like I said, some of the background

information, it's these bases as the reason for moving forward that I am really focused on challenging.

VICE CHAIR ARMIJO: So the petition had some documentation that justified the petition from the State of Colorado and they provided --

MR. COMFORT: They just provided the information on. Now, I mean, we are going to get into the PNNL report, where we did do some of our own calculations or we had our contractor do some calculations.

VICE CHAIR ARMIJO: Did you look over the State of Colorado submittal and say it made sense and it was done properly and you could revise --

MR. COMFORT: Since most of this is from thorium, you know, where there's a little bit higher external exposure limit, the sites that I have looked at with quantities of thorium have gotten some relatively high hourly dose limits that you can get from the contamination.

Where this is, no, we didn't look at it that detailed.

MEMBER RYAN: Let me pick on that. Looking at the contamination on the surface and getting a dose rate, say, here on this contaminated page is a whole lot difference than what the dose is

to each person in the room.

So the time, distance, and shielding of all of this needs to be accounted for carefully.

MEMBER SIEBER: Yes.

MEMBER RYAN: And the only way to do that that I know of is either fixed monitoring TLDs or some other dosimetry device in the area where people are generally occupied. God forbid let's pin one on the individuals and get a dose of that badge with that person around. So we don't have that data.

MR. COMFORT: Right.

MEMBER RYAN: So I am really nervous about interpreting/submitting the dose rates into a dose in the person. I think that is a risky thing to do.

Now, I will quickly add that I understand state regulation well. I mean, I was regulated under five licenses at once by state regulators. And I understand the mindset. And we're going to highball it so we know what the upper limit is and make sure they're protecting at this high upper limit level so we never make the mistake of having an exposure we don't like.

MR. COMFORT: Correct.

MEMBER RYAN: So I appreciate that, but I think we have got to recognize that in this case, the

basis for your moving forward is more of the kind of the regulatory mindset. Again, I offer that not criticizing it but just trying to recognize what it is, as opposed to saying realistic kinds of measurements of what actually a person is achieving.

MR. COMFORT: Yes.

MEMBER RYAN: Is that a fair summary?

MR. COMFORT: Well, I understand what you're saying.

MEMBER RYAN: You see what I'm saying?

MR. COMFORT: Yes.

MEMBER RYAN: Okay. All right.

CHAIR ABDEL-KHALIK: I am just trying to understand the meaning of this number. When this building was vacated or when this estimate was made, how much source material was still left in the building?

MEMBER RYAN: I mean, it's basically -- my understanding because it's thorium operation, it was likely somebody like a lens manufacturer who basically a lot of them are putting the material in a -- you know, basically dispersing it in the air to coat lenses effectively. So there's a lot of ground contamination.

It's all in the soil or the surfaces that

are in the facility. If I'm reading the report from Colorado, it was all over the surfaces everywhere basically in a layer they threw out. They didn't do any type of housekeeping cleanup, you know, sweeping, that type of thing, as far as I could tell from what I have read on the report, you know, the information that was provided.

MEMBER RYAN: You know, I have done an awful lot of FUSRAP surveys in the eastern United States, 17 to be precise, anything from thorium to uranium and Mallinckrodt Chemical Works in St. Louis and all sorts of places.

I mean, we would go into facilities and "Oh, yeah. We'll move this cabinet" and find a small bitty U-308 and things like that. But we never measured airborne radioactivity because we had samples running all the time and our occupational analyses were pretty low. Yet, we would find materials like you're describing.

MR. COMFORT: Right.

MEMBER RYAN: So I'm trying to gibe up those experiences that are firsthand from the interpretation we have here. So, again, I'm sharing that, really, not to be critical of what you're offering but just to say I think we need to get to --

how do we get to the realism for these cases as we would if we were out doing a decommissioning project, for example?

MR. COMFORT: But the one big point you need to -- I mean, that needs to be made, it's persons operating under these general licenses basically may have absolutely no radiological background at all or health physics at all and stuff. So that's one of the reasons why --

MEMBER RYAN: Absolutely. Well, I appreciate that.

MR. COMFORT: -- looking at the, doing the more conservative look at what the potential is versus what may actually be happening in all cases. And in reality, I expect most of them are going to be well below these types of limits.

MR. CARRERA: Slide Number 17, please. PNNL dose assessment study designated as PNNL-16148 report. I mentioned earlier that the staff obtain the services of PNNL to try to identify general licensees and how source material was used.

As part of their report, PNNL developed scenarios for selected specific uses. Calculations were made with appropriate computer codes to standardize the data for a larger number of

radionuclides or variants of exposures. Radiation dose commitment from inhalation or ingestion were estimated using dose coefficients from the ICRP publications 68 and 72.

Taken from the report and summarized on this slide, the study reported that the committed effective dose to unprotected workers during routine use accidents and manufacturing of thin-film optical coatings could approach about 800 millirem for the case of a single worker processing up to 150 pounds per year of thorium with progeny via inhalation and ingestion pathways.

MEMBER RYAN: This assumes I'm guessing -- from what I have read, I think it is right -- no respiratory protection?

MR. COMFORT: Correct. Yes.

MEMBER RYAN: No contamination control and countermeasures in an operation that involves heat because these optical lens are coated on the thermal, high-temperature kinds of sputtering. So it's --

MR. COMFORT: They are usually electroplated.

MEMBER RYAN: Electroplated, yes. So there's lots of mechanical stuff in there. There's a holder of the lens. So, again, I challenge just from

my own experience that that stylized calculation doesn't recognize things like industrial hygiene requirements, even for a dust mask or other things. So I am struggling with --

MEMBER SIEBER: You can make up a scenario to get any number you want.

VICE CHAIR ARMIJO: Well, is it really electroplated or is it a vacuum deposition kind of process because thorium is not an easy thing to electroplate in its aqueous form? I have heard of lens coating and possibly people put them in a vacuum and they heat up the thorium source and it deposits uniformly in very thin films, very precise.

MR. COMFORT: Okay. Maybe that's --

VICE CHAIR ARMIJO: It's not electroplating --

MR. COMFORT: Maybe that's what I misunderstood on it when I was told before.

VICE CHAIR ARMIJO: So, you know, I don't know what of process PNNL --

MR. COMFORT: Hot cell and stuff also.

VICE CHAIR ARMIJO: Yes. And if they did it in a hot cell, that even provides some --

MR. COMFORT: Well, most of the -- I mean, the exposure coming from the hot cell scenario is

basically you do literally have somebody going in there and sweeping it all up to collect it and deposit it somewhere else. That's where your biggest dose is going to be coming from.

VICE CHAIR ARMIJO: Probably more like a big glove box, rather than a hot cell, because there's not that much reach.

MEMBER POWERS: Yes. It would be a glorified glove box.

VICE CHAIR ARMIJO: Yes, yes, yes.

MEMBER POWERS: You wouldn't use a hot cell.

VICE CHAIR ARMIJO: PNNL in order to do this --

MR. COMFORT: Plus, you'd have lots of hot cells to burn.

MEMBER POWERS: Can you imagine holding a lens with a manipulator?

VICE CHAIR ARMIJO: But PNNL apparently took some sort of this facility and modeled it and came up with these kinds of doses.

MR. COMFORT: Correct. And they also looked at another scenario trying to be even more -- I won't say bounding but other conditions, I mean, that we're aware of people could be using the material.

One of them is things like a glaze. You know, they'll use the powder in a glaze and all.

So we're trying to look at the guy doing that and licking his fingers and all that kind of thing, which, again, is allowable under this general license. So those are the kinds of conditions that we're trying to limit somewhat.

As a matter of fact, when we were doing this research, I got a call from an individual who had run out of his material for glazing and all and was looking for a new source. And it was actually interesting because when I talked to the distributor, they were like they won't touch that type of process anymore. They will not provide it to them because it is considered frivolous.

So even those types of scenarios are probably being somewhat limited because nobody can get the material anymore.

MEMBER SIEBER: Isn't that the case with a lot of these situations, the usage is declining?

MR. COMFORT: Certainly.

MEMBER SIEBER: By the time you get through publishing your rule, nobody would be in business?

MR. COMFORT: Nobody to use it.

MEMBER SIEBER: Okay.

MR. CARRERA: Slide Number 18, please. To resolve concerns with the current section 40.22 being not in alignment with health and safety standards, the staff is proposing to make significant revision to section 40.22.

First, based upon evaluations of the PNNL report and PRM-40-27 that we discussed earlier, the staff found that the biggest health impact from the processing of dispersible source material is primarily because of the ingestion and inhalation pathways. Although it is expected that most general licensees may implement procedures, such as hot cells, to maintain doses well below levels of concern. The staff believes that reducing the possession limit for source material would best ensure that the use of these materials will not generally exceed current public dose limits in part 20 and to account for the exemption to training requirements in part 19.

CHAIR ABDEL-KHALIK: Tell me about the possession limit per calendar year. Is that the amount that they can buy from these distributors per calendar year or the amount that they can --

MR. COMFORT: It is basically they can possess at one time on this case what we're proposing

to go to the 1.5 kilograms at one time. They take that material. They process it, ship it off to somebody else. And then they can receive more, up to a total of the 7 kilograms per year.

CHAIR ABDEL-KHALIK: So at any instant in time during the year, they can't have more than one and a half kilograms?

MR. COMFORT: Correct. It parallels what we currently have, which is the 15 pounds.

CHAIR ABDEL-KHALIK: Fifteen-pound? Okay.

MR. COMFORT: A hundred and fifty pounds.

MEMBER RYAN: And you are proposing the 150 limit goes away? They can do 3.3 pounds at a time up to the --

MR. COMFORT: To the 15 pounds.

MEMBER RYAN: To 15 pounds per year?

MR. COMFORT: Yes. That's for dispersible material. If they happen to possess it in solid forms, you know that they're using it for demonstration, whatever, the limit stays the same at the 15 pounds per year, 150 pounds. I mean all 15 pounds at one time, 150 pounds per year.

And, similarly, we are also specifically not changing the removal of uranium from drinking water, where they may be accumulating it on resins,

that, again, we're limiting that at the current limit at 15 pounds at one time, 150 pounds per year.

MEMBER RYAN: That could be 350 cubic foot liners of resin with lots and lots of uranium on it.

MR. COMFORT: Yes.

MEMBER SIEBER: That sort of confuses me a little bit, too. If you're processing, let's say you're running a water treatment plant and you've got demineralizers there and you're processing to remove uranium or thorium from the drinking water, which is to compile the drinking water standard, what do you do when you reach this limit, you know, the annual limit? Do you shut down your water treating plant or use a demineralizer or what do you do?

VICE CHAIR ARMIJO: Well, don't you regenerate the resins and flush them out and concentrate something in the --

MR. COMFORT: That is usually what they will do is they will regenerate the resins and then ship off the --

MEMBER SIEBER: So that is out of their license jurisdiction once they ship it away?

MR. COMFORT: Right.

MEMBER SIEBER: Hopefully they will.

MR. COMFORT: Yes.

MEMBER SIEBER: And who do they ship it to?

MR. COMFORT: I've heard a variety. I mean, under the current regulation, a lot of people it is my understanding are potentially just diluting their product and sending it down the POTW.

And it's not clear that the 40.22 regulations prohibit that. That is one of the things we will be talking about on it. Otherwise, you know --

MEMBER SIEBER: It ends up in a landfill.

VICE CHAIR ARMIJO: In a drain.

MR. COMFORT: Right.

MEMBER RAY: It goes right back into your water treatment plant or into the river or --

MEMBER SIEBER: Right. That's --

MEMBER RAY: It goes downstream basically for the next plant to pick up.

MR. COMFORT: Effectively.

CHAIR ABDEL-KHALIK: Is there a calculation that shows that if you comply with these one and a half-kilogram and seven-kilogram limits that you are automatically in alignment with current standards?

MR. COMFORT: Well, we're basing it on the

calculations that PNNL did that were effectively saying if you're taking a fifth of the material -- they were looking at the full limit at that point, you know, the 15 pounds at one time, 150 pounds per year. And so we're basically taking a factor of that came out to around the 700-millirem per year. We're dividing it down to something close to the 100-millirem.

Again, we felt, like Mike, that there are relatively conservative calculations. So we're trying to limit that down the --

MEMBER RYAN: And that is where I am struggling. I don't know how relatively conservative they are. They could be orders of magnitude off.

MEMBER SIEBER: Yes, either way.

MEMBER RYAN: I bet they're not off on the upper end.

CHAIR ABDEL-KHALIK: No.

MEMBER RYAN: I'll bet these are --

CHAIR ABDEL-KHALIK: On the conservative end, right.

MEMBER RYAN: Yes, right.

MR. CARRERA: As a result, the staff is proposing to reduce possession limit of source material to 3.3 pounds at any one time down from the

current 15 pounds and receive up to 15.4 pounds down from the current 150 pounds per calendar year.

However, if the source material is possessed in a solid, non-dispersible form or accumulated from the treatment of drinking water, the licensee could continue to possess up to a total of 15 pounds at one time and receive up to 150 pounds per year.

The staff believes that these uses have been sufficiently evaluated to reduce the likelihood that excessive doses would occur to workers or the public from these latter forms or uses. General licenses would continue to remain exempt from the requirements in parts 19, 20, and 21.

This may result in some general licensees requiring specific licenses. It is expected that the majority of larger users are likely distributors of exempt products which would, therefore, be required to obtain a specific license under the proposed new distributor requirements that I'll address shortly. They would be able to reduce possession limits to within the new limit.

The staff is also proposing to require the general licensee to minimize contamination during and at the end of their operation. When a section 40.22

general licensee ceases operations, if they identify that there is a potential for significant contamination, the general licensee would notify the NRC or the agreement state to determine what cleanup actions are necessary.

Currently because of the exemption to part 20, a general licensee may decide that they have no obligation to clean up their facility and, instead, abandon it in place, such as that identified in PRM-40-27.

So these two changes are expected to bring possession of source material in greater alignment with existing part 20 requirements.

Next slide, please. Next I'll talk to the issue regarding the lack of reporting requirements associated with section 40.22 general license.

MEMBER RAY: Has any of this been subject to public comment as yet?

MR. COMFORT: Not yet. I mean, we're waiting for final SRM to publish it, which should be forthcoming.

MR. CARRERA: Slide number 20, please. Currently there are no regulatory mechanisms for the NRC to ensure that products and source materials distributed for use are maintained within the

applicable constraints of the requirements. Therefore, the staff cannot fully evaluate the resultant risks to public health and safety.

This is inconsistent with how we handle part 30 byproduct material where we have requirements for distributors to be specifically licensed by the NRC.

MEMBER RYAN: But part 30 covers such a wide range of -- not covered here, correct?

MR. COMFORT: Correct.

MEMBER RYAN: So why should it be? Why should that analogy be comforting or not comforting?

MR. COMFORT: Well, primarily it's more of the identification of we've got licensees, we don't know who they are, don't we think we should know who they are.

MEMBER RYAN: I mean, I'm back to the risk space. I mean, part 30 and part 40 are completely different animals. What might be good for part 30 doesn't translate to the other one real easily I don't think.

MR. COMFORT: But, I mean, what I stated wasn't specific to part 30. It's we have a licensee. We probably ought to know who we are regulating and that we're within limits if there are limits

associated with it.

MEMBER RYAN: Okay.

MR. COMFORT: And that's really where that is coming from, is, you know, in addition, because we don't know what the potential impacts -- I mean, how do you go out and do studies if you don't know who you are supposed to be studying?

MEMBER RYAN: The analogy that Andrew mentioned was --

MR. COMFORT: That also comes out of historically part 30 and part 40 were kind of locked in step together for a long time. It's basically they did major revisions to part 30 that part 40 never did since it hasn't been revised since '61. We're trying to get it also more in alignment with --

VICE CHAIR ARMIJO: The general licensee, let's say this thorium-coated lens manufacturer. Who actually gives them the license? Is it the state that they're in or is it --

MR. COMFORT: Well, if it is in an NRC jurisdiction, I mean, NRC grants the general license. If it's a state, the state would be granting it under their authority.

VICE CHAIR ARMIJO: And you don't have records of who they are?

MR. COMFORT: No. It's just a general grant. If you have this material under this condition, you are granted the --

VICE CHAIR ARMIJO: I don't understand general licenses.

MR. COMFORT: Yes. That's the difficulty. General licenses are basically --

MEMBER RYAN: It is a piece of paper that says you can own small quantities of source material. That's it. And there's no restriction.

MEMBER BLEY: And "you" is not defined.

VICE CHAIR ARMIJO: Right. And who gives it to you?

MR. COMFORT: It is yours. You were granted.

MEMBER RYAN: Run it through the regulation.

MR. COMFORT: You don't have to apply for it or anything.

VICE CHAIR ARMIJO: It is your right by birth.

MEMBER BLEY: All right. So general license, it is not --

PARTICIPANT: Sam, it is not a license.

MEMBER POWERS: It is more like --

VICE CHAIR ARMIJO: Right.

MEMBER RYAN: It is a permission. In regulation, that is exactly what it is. It's a permission in regulation that needs no further explanation.

VICE CHAIR ARMIJO: Okay. Got it.

MEMBER RYAN: Just go over the limit.

VICE CHAIR ARMIJO: That's the problem I have.

MR. COMFORT: This general license is pretty unique in a lot of ways that it has all of these exemptions to the existing. It doesn't have any type of reporting requirements. A lot of our general licenses have reporting requirements.

In part 30, you have for sources -- there's a tracking system that you are required to apply to. Under 40.25, which is for concentrations of uranium, you have to basically tell us when you're moving it from place to place and that you have received it. So there are different types of general licenses that have other conditions that do allow us to know who they are, even though they're actually not applying for it.

MEMBER BLEY: The odd thing to me with what the use is, it's possible you could have this

stuff and not know there is a general license that applies to you.

MR. COMFORT: That's exactly the -- that's a good point. And we often get calls, you know, "Do I need a license or a general license?" from people who find out on the buy side. And you can imagine how many people who should be having them that probably don't under existing parts.

Now, I mean, we do have another action going on that we have been working on for the last decade, which is to basically look at should we even have jurisdiction over a lot of these activities for source material or that are under currently source material for uranium and thorium. And that is an ongoing action trying to determine if we should. And if we shouldn't, how do we change that jurisdiction because we acknowledge that is a big problem?

MEMBER BLEY: And penalties accrue to someone who doesn't know it's a general license?

MR. COMFORT: Can what?

MEMBER BLEY: Penalties are going to accrue to someone who doesn't know they're subject to a general license.

MR. COMFORT: I can't speak on enforcement on how that does, but generally when we found people,

you know, that have been remiss, we basically advised them that they need to do whatever the condition is of the license.

MEMBER POWERS: The rule generally is ignorance is no excuse. On the other hand, unless it is willful ignorance, there's --

VICE CHAIR ARMIJO: I am really confused. This is a license that has some --

MEMBER SIEBER: These are rules. It's not like a driver's license --

VICE CHAIR ARMIJO: -- obligations, I guess.

MEMBER SIEBER: -- to run a car. You get no piece of paper. And you don't know --

VICE CHAIR ARMIJO: Even though you don't ask for it? A general license has no obligations?

MEMBER POWERS: That is right.

MEMBER SIEBER: You don't have to apply. They don't know who you are.

MR. COMFORT: That is the specific general license. Many of the other ones do have requirements that you have to notify NRC that you possess the material or that you have transferred it to somebody else.

MEMBER SHACK: We are only talking about

this general license.

MR. COMFORT: This specific one does not. That's what we're trying to fix, that problem.

MEMBER SHACK: That's what you're trying to fix, that problem.

MR. COMFORT: Yes. And that's what we're talking about here.

MEMBER SHACK: As bad as you think, Sam.

MR. COMFORT: Yes.

VICE CHAIR ARMIJO: I am just trying to figure out is there a problem, you know.

MEMBER SIEBER: Your problem is you don't know it.

VICE CHAIR ARMIJO: Well, I am the licensee. And any one of us who chooses to go out and get some of this stuff from somebody, there's no prohibition.

MR. COMFORT: Unless it is an exempt product, but it --

MEMBER RYAN: If it's uranium, you are a general licensee, Sam.

VICE CHAIR ARMIJO: I am a mineral collector. I probably have more thorium --

(Laughter.)

MR. COMFORT: As unprocessed minerals, you

get an exemption under 40.13(b). So you're okay there.

MEMBER POWERS: Yes, but you can put it in a box for processing. I think we ought to put some --

VICE CHAIR ARMIJO: Okay. I am reading.

MEMBER RYAN: Let's go ahead.

MR. CARRERA: Slide number 21, please. To resolve the issue with lacking of complete and timely information on the types and quantities of source material distributed for use either under exemption or by general licensees, the staff is proposing two new specific licenses for the initial distribution of source material: one for the initial distributors of source material to exempt persons under the newly proposed section 40.52; and the second is for the initial distributors of source materials to general licensees in a newly proposed section 40.54.

Slide number 21 lists some of the major components associated with the proposed new specific license for the initial distribution of source material to exempt persons. One other key thing to note is that this type of license may only be issued by the NRC and not the agreement state.

The category of initial distributor could include manufacturers or importers of exempt products

containing source material. Both importers and persons located in agreement states would be exempt from requiring requirements in part 19 and 20, although it is expected that the agreement state who would ultimately be responsible for protecting public health and safety in the state would likely require such initial distributors to obtain specific licenses for possession and use from the agreement state.

It should be noted that these new requirements may force some person manufacturing exempt products under section 40.22 general license, such as thorium-coated lens manufacturers, to become specific licensees.

Next slide, please. Similarly, the initial distribution of source material to general licensees would also require a specific license, issued either by the NRC or by the agreement state. The general requirements associated with this proposed new distributor license are listed on slide number 22.

In addition, prior to or with the first shipment of source material to a general licensee, the distributor would be required to include information that notifies the recipient about the requirements of the general license and appropriate safety precautions for handling, use, storage, and disposal.

The NRC staff has concerns that some persons receiving source material may not even be aware that they are operating under a general license. So this would help alleviate those concerns.

And, as stated earlier, NRC is currently aware of only one initial distributor of source material. It is expected that these requirements will only have a small impact to any distributor since they would already be specifically licensed.

Slide number 23, please. Under the next issue, the staff determined that the original use of certain products possessed under the exemptions in 10 CFR 40.13(c) have changed over time. As a result, the staff is proposing to revise certain exemptions to address those changes.

Next slide. In 2001, the staff issued NUREG-1717, which is an evaluation of the exemption in parts 30 and 40. NUREG-1717 identifies certain products containing source material allowed under exemptions that are no longer being manufactured or used. As a result, the staff believes it is warranted to modify or delete those exemptions as appropriate.

In addition, the staff has identified confusions related to thorium-coated lenses because of the changes in manufacturing practices such that the

staff determined it was worthwhile to expand the exemption to more clearly account for such new practices.

Next slide, please. To be more specific, first, the staff is proposing to remove the exemption for uranium smoke detectors. The staff is unaware of any product that has ever been distributed under this exemption and believes there is no reason to continue to allow it.

Second, the staff would prohibit further distribution of glazed ceramic tableware. The staff is unaware of any products currently being newly distributed. Product already distributed would continue to be exempt.

Next, the staff would reduce the allowable concentration of source material in glassware from ten percent by weight to two percent by weight. These would include things such as glass figurines or other show pieces.

The staff is unaware of products currently being distributed above this new limit. And previously distributed product would continue to be exempt.

MEMBER SIEBER: The glazed ceramic tableware, that's like Fiestaware?

MR. COMFORT: That exemption was removed many years ago. I mean, the existing is still exempt, but we don't allow production of it anymore.

MEMBER SIEBER: Okay. Yes because we used to use it as a source check for our --

MR. COMFORT: Right.

MEMBER SIEBER: -- Geiger counters. It was pretty accurate.

(Laughter.)

MEMBER RYAN: The green-colored glass.

MR. COMFORT: That is what we're talking about in the glassware. Your green-colored glass lights up under the ultraviolet lights.

MEMBER RYAN: Probably decorative kind of stuff.

MR. COMFORT: Right.

MEMBER RYAN: It's like maybe not used for --

MR. COMFORT: We're reducing it from ten percent, which is allowed now, down to two percent basically because we've looked at the market and haven't really identified anything that's above it. So we don't think it will be a big impact while at the same time it will help restrict further doses or potential.

MEMBER RYAN: Right.

MR. CARRERA: And the biggest revision is proposed for the product exemption in section 40.13(c)(7). This exemption currently applies to thorium contained in lens up to 30 percent by weight.

Industry practices have changed from homogeneously incorporating the thorium into the lens to, instead, coating the lens with thorium. This has led to numerous question about the applicability of the current exemption to thorium-coated lenses. The staff --

MEMBER SIEBER: Does that coating come off?

MR. COMFORT: No. As far as we have been able to identify, I mean, it stays very firm there. I mean, you can't scrape it off easily or anything to that sort. You basically have to sandblast it.

VICE CHAIR ARMIJO: Are these lenses for like photographic --

MR. COMFORT: They cannot be optical pieces up against your eye. They can be like the end of a television camera lens. Usually they're going to be laser lenses, that kind of thing, that you're manipulating.

MEMBER RYAN: Generally, they are either

big, as I understand it, big lenses or a specialty use. And there's some optical aspect to it.

MEMBER POWERS: They are just looking for the index of refraction on the material.

MR. COMFORT: That's where the thorium is. I think so.

MEMBER RYAN: Yes, and maybe

MR. CARRERA: The staff's evaluation of thorium-coated lenses found that significantly less thorium is applied in a lens coating than when incorporated homogeneously throughout the lens and, thus, resulting in an even lower potential dose. Therefore, the staff is proposing to expand the exemption to specifically apply to thorium-coated lenses.

The staff also has found that such coatings are also applied to mirrors and believes that it is appropriate to allow such use under the exemption. The staff learned that uranium may also sometimes be used as part of the coating. And so the staff proposes to expand the exemption to include uranium.

Finally, the staff found that the current practices generally maintain the concentration of source material on lenses to less than ten percent by

weight. And so the staff is proposing to reduce the concentration limit for lenses to this lower limit. Again, previously distributed products would remain exempt.

Slide number 26, please. Issue number 4, over time the staff has learned that there are few issues that aren't particularly clear in how they should be addressed in section 40.22.

Next slide, please. The item we've seen a lot of confusion with is the waste disposal requirement, if any, under section 40.22 general license. Because a general licensee is exempt from part 20, which contains NRC requirement for disposal of source material, many general licensees have concluded that they can dispose of their wastes or abandon them without further consideration. However, this leads to the recipient of such waste unknowingly being in possession of the source material such that they eventually could become required to obtain a specific license. This, of course, creates a problem.

In reality, when a general licensee is exempt from parts 19, 20, and 21, they are not exempt from the remaining requirement in part 40. For example, the transport provision in section 40.51 applies to all licensees and limits the transfer of

source material to someone who is authorized to receive it.

As a general licensee cannot know how much material a recipient has, they should not arbitrarily be disposing of its material as the recipient may exceed its general license condition and not be able to legally receive additional source material without obtaining additional specific license.

There are also a few other sections in part 40 that general licensees may not normally be aware of if they focus their attention on the text in section 40.22 alone. This is because section 40.22 does not currently alert them to other requirements in part 40 that may apply to them.

Slide number 28, please. To resolve the concerns in the area of source material waste disposal requirement, the staff proposes to implement new requirements for disposal to ensure that contamination and abandonment of source material become less of a concern. The staff is proposing revision in section 40.22 to clarify certain activities, including specific requirements that the general licensee may not abandon its source material and to properly dispose of it.

The staff is allowing a general license to

transfer up to .5 kilograms per year for permanent disposal in a solid, non-disposable form and would exempt the recipient from requiring a license.

Disposal of source material above this level would have to be consistent with the requirements for disposal in part 20.

VICE CHAIR ARMIJO: What kind of documentation is required in this disposal process? I've got .5 kilograms of stuff that I want to get rid of.

MR. COMFORT: Right.

VICE CHAIR ARMIJO: Who do I have to go to to get permission? And what kind of documentation and what kind of packaging and what kind of regulations do I have to comply with?

MR. COMFORT: Basically right now the way it is envisioned is it is just granted as a general provision that says that if you put it in a solid form and you send it to the landfill under .05 pounds, the landfill can receive it as an exempt material. And that's all you have to do.

VICE CHAIR ARMIJO: You don't have to inform them of anything?

MEMBER SIEBER: No.

MR. COMFORT: No.

MEMBER SIEBER: You just put it in your garbage.

MR. COMFORT: Right.

MEMBER RYAN: Here is the problem with that. And, again, I've been helping on the receiving end of these materials. I'll tell you how it works in a landfill. They all have Exploranium detectors, --

MR. COMFORT: Right.

MEMBER RYAN: -- all of them. If that thing goes off, they don't care what's in the truck. Out you go.

MR. COMFORT: Sure. And we do have a caveat.

MEMBER RYAN: They don't care what it is. They don't care if it's a diaper with some radiopharmaceuticals in it or source material or --

MR. COMFORT: Bananas, right.

MEMBER RYAN: -- anything else. They're going to reject the load.

MR. COMFORT: And basically we state that, in the statements of consideration at least, that there is no requirement for them to accept it and all.

MEMBER RYAN: But the reality is the practice is such that landfills almost everywhere that I know of, at least the ones in the big cities and so

forth, they reject anything that sets off the meter, period. They don't care what it is.

MEMBER BLEY: So you've got to go dump it somewhere.

MEMBER RYAN: That is somebody passing it in a dumpster at Dunkin Donuts or something. You know, I don't know. It doesn't recognize the reality of the circumstance that you're saying it's okay to throw away .5 kilograms per year for permanent disposal when a lot of places have methods in place to prevent it.

MR. COMFORT: Now, for example, though, I mean, I've got a local incinerator up here in Montgomery County that I've gone and visited. And they basically throw everything on a track that goes up. And when it sets off the alarm, they stop the system, see what it is.

And specific to your example of diapers or cat litter or things like that, if they see what it is, they'll let it go.

MEMBER RYAN: And the cat litter is radioactive because of the thorium?

MR. COMFORT: Right, yes.

VICE CHAIR ARMIJO: Is that because of the minerals that they dig up?

MEMBER RYAN: No. That would be a fairly uncommon one. I mean, most landfills and recycling centers, for example, just -- they just say get all the --

MR. COMFORT: With this small quantity, I mean, with thorium, you might set it off. With uranium, you probably are not going to.

MEMBER RYAN: That's right, yes.

MR. COMFORT: So we're trying to look at a variation on it and all. The key thing is what we're trying to look at is because we now there are things like educational institutions that may have like urinal acetate that they're holding under the general license right now. We have run into this situation before. What do we do with it?

You know, if I am going to have to send this as low-level waste somewhere, this small vial, it is going to cost me 10,000 bucks. I'm going to put it into a certain waste form package and all and stuff like that. So we're trying to --

MEMBER SIEBER: That dumpster in the park.

MEMBER RYAN: You end up with a lot of that. Well, never mind. We made the point. Go ahead. Sorry.

MR. CARRERA: As Gary just mentioned,

these requirements will allow small users, such as educational institutions, to safely and economically dispose of the source material.

The staff is also proposing to include direct citation in section 40.22 to other applicable sections in part 40 to make sure that general licensees are better aware of general regulations that have always been applicable to a general licensee under part 40.

MR. COMFORT: Basically provide them a roadmap to the rest of the regulations that apply to them.

MR. CARRERA: During the rulemaking, staff identified certain areas that we believe public insight will be very helpful in directing the future course of action in this rulemaking.

Slide number 30, please. As part of the Federal Register notice requesting comments on a proposed rule, the staff is soliciting comments on certain open issues. Many of these issues are listed on the slide.

Next slide, please. In conclusion, I would like to summarize a few points. First, the staff is aware that the proposed revision related to distributor requirements and reduction in possession

limits will require a number of persons currently operating under a general license to become specific licensees. The staff expects most of these persons impacted will be manufacturers and initial distributors of products to exempt persons.

A second but smaller categories expected to be persons impacted by the reduced possession limits. However, since we expect that most of the larger users are likely producers of exempt products, the group who cannot reduce their quantities below the reduced limits is expected to be small.

Because of the lack of available information, we hope to get a better indication of the impacts during the public comment period. The proposed rule changes are expected to increase health and safety for workers and the general public through the reduction of the limits allowed under section 40.22 general license and through providing clarification for the waste disposal and through the limiting contamination and through making general licensees more aware of other requirements that apply to them.

The new distribution licenses will allow NRC to better understand and react to the use of source material under exemption and general license

and to better refine our regulation to adapt to changing situations by both reducing our activities or expanding them as we better learn how source material has been used.

So overall because of a lack of available information, we look forward to hear and receive comments on the proposed rule from the industry as well as from the general public.

And, with that, I am open to any other questions.

MEMBER RYAN: Andrew, what is your public comment period schedule?

MR. COMFORT: When is it coming or how long is it?

MEMBER RYAN: Both.

MR. COMFORT: Well, right now we're at a point that we have gotten a draft SRM from the Commission. We're waiting for the final SRM later this week probably is what the --

MEMBER RYAN: And then you'll go out for public comment?

MR. COMFORT: Then we'll go out for public comment. Now --

MEMBER RYAN: Right. The --

MR. COMFORT: The public comment period

currently is 75 days. One of the potential directions from the Commission may be to expand that to 120 days that we're seeing.

MEMBER RYAN: Okay.

MR. COMFORT: The other big thing that we are planning to do on the public comment is we're going to be making a full-out effort to identify anybody that we can that is going to be impacted through this, you know, both from the records we already have, through trade journals and other sources of people that we know that know general licensees, et cetera.

And the Commission, one of the other directions that was actually currently in the SRM is that we're going to have to identify how we did do this public outreach because they are concerned that we get everybody who is going to be impacted and allow them to realize it and comment appropriately.

MEMBER RYAN: Is there any attempt or effort -- just a second, Jack. Is there any attempt or effort to gather real radiation exposure-type data, whether it is air sampling or badges or anything?

MR. COMFORT: At this point, no, there is not. The hope would be that if industry is concerned that we're doing something to that, they would provide

such data as part of their evidence as to why we shouldn't change those possession and all that stuff.

MEMBER RYAN: And they are part of the outreach that you are going to make in your -- general licensees, all the -- you're going to say, "And if you have specific data regarding, we would be happy to have it"?

MR. COMFORT: Right now the plan wasn't to do that, but that is something that we could certainly consider. I mean, the expectation is that they're going to provide comment that something is inappropriate or that --

MEMBER RYAN: I think it is helpful if you maybe request that that information were better informed because that could end up in you changing your mind about 3 and 15.

MR. COMFORT: Yes.

MEMBER RYAN: I think it behooves you to ask for it.

MR. COMFORT: There's a bunch of things that we're hoping because, again, we don't have the information because we don't know who they are. You know, are we making assessments incorrectly that the number of people who are going to be impacted are under the distribution, you know, become specific

licensees and all that stuff? You know, is that going to be a tremendous impact, things like that?

Things like importers right now who bring the material in is "Hey, I'm bringing in some frivolous stuff." They have to now pay for a big, expensive license. They may not want to do that. So you may see some concerns about that or there may be consolidation that you're going to have an initial distributor that distributes to a lot of people that formally did it independently.

MEMBER SIEBER: Or you could have a lot of contraband.

MR. COMFORT: That is true, too.

MEMBER RYAN: Is there a trade organization for this industry segment that you can work with?

MR. COMFORT: Well, portions of it, I mean, the ceramics industry, that kind of thing.

MEMBER RYAN: Are you going to seek their --

MR. COMFORT: Oh, certainly.

MEMBER RYAN: Okay. And, again, I think it's very important, if not the top item, to find out what really is the workplace exposure situation for these materials.

MEMBER SIEBER: That gets to my question. You have slides 16 and 17, which put out some pretty high numbers for what otherwise seem to be some mild situations. Are these specific examples driving the change in this rule or do you have more in-depth studies that are more realistic?

For example, I think 734 millirems for the general licensee that had the 4.9 mr dumpster is -- you know, that seems like a lot to me. So I am wondering if a few instances are driving the change in the rule or do you have a more comprehensive set of studies and data that are more realistic than the two that you have cited here.

MR. COMFORT: It is basically the studies that we have done that are presented there that are driving the drop in possession on it.

Now, the other changes, such as the distributor requirements, changes to specific exemptions and all, are independent to that?

MEMBER SIEBER: The slide 17 looks to me like it's linked to changing the quantities from 15 to 3.

MR. COMFORT: Right. That is exactly where the relation is coming from.

MEMBER SIEBER: That's in the lens

business.

MR. COMFORT: Right.

MEMBER SIEBER: But that is just one example of where source material --

MR. COMFORT: Well, there is a wide variety of activities that are undergoing. I mean, many of them truthfully are operating or have the material in forms that you are not going to see a significant impact. And, yet, they're still going to be impacted by the reduction potentially.

There is a wide variety of scenarios that result in potential for higher doses. Whether you are using respiratory protection or other means to provide protection that could be reducing it, there is no requirement to do that. And so we're basically using what can you do versus always what is done.

MEMBER SIEBER: These two examples are the primary motivation for this. I think that the numbers that you present are very high compared to my vision of what the situation really is because I've been to the Fiestaware place. And it's not the world's cleanest place. I wouldn't want to eat my lunch there.

MR. COMFORT: Oh, yes, yes.

MEMBER RYAN: The other big segment is Vaseline glass, that green clear glass that also

fluoresces, and that was at one time a fairly robust industry. Go on eBay. You'll find all sorts of them at very high prices.

MEMBER SIEBER: Strangely enough, the 734 millirem per year compares pretty closely to the new estimate of medical.

MEMBER RYAN: That's back on 620, including medical, now. So that's, you know --

MEMBER CORRADINI: It's about the same.

MEMBER RYAN: About the same. So I think, I mean, the message I am getting from all of the members here is that we would really like to see some justification that that number for the doses and, in turn, the reduction in limits is justified by real information.

I just think a stylized calculation certainly doesn't satisfy me as a health physicist that it's absolutely acceptable as a method for determining the national program without any data.

And, again, in no way am I criticizing the folks that wrote it. I understand how they did it and what they did and don't, you know -- I mean, I understand what they calculated. And I know that that is no tie of that to reality.

MEMBER SHACK: But if they go out for

public comment and nobody complains --

MEMBER RYAN: Well, then that's not so much, but --

VICE CHAIR ARMIJO: You know, I don't see a health and safety issue. I'm still trying to see.

MEMBER RYAN: Well --

VICE CHAIR ARMIJO: Is there really a health and safety issue? It just seems like it's kind of an arbitrary decision to cut back on how much is being distributed and put in more documentation requirements, more stuff on a --

MEMBER RYAN: Well --

VICE CHAIR ARMIJO: -- minuscule little industry.

MEMBER SIEBER: Part 20 restricts potentially pregnant women to 500 millirems a year. And if these numbers are correct, then there is an issue.

VICE CHAIR ARMIJO: If those numbers are correct, but they sound like they haven't had much of a --

MEMBER SIEBER: That's what we're saying. Tell us if those are good numbers, instead of some stylized, pumped-up case.

MEMBER RYAN: That is one root issue here

is that the dose numbers that are the basis for this change need to be justified. That is one point.

MEMBER SIEBER: The dose numbers, as I understand it, are controlling the quantities --

MEMBER RYAN: That's right.

MEMBER SIEBER: -- that are in the rule. You may end up with a rule but different quantities --

MEMBER RYAN: Yes. That's okay.

MEMBER SIEBER: -- when you refine this calculation.

MEMBER RYAN: You've got a rule now with different quantities. If that number is, say, 10, instead of 768, it's a whole different world. If it's 30, well, 30 and 10, not so far apart. If it gets up to 150-200, then maybe it's not 3 pounds but 7 pounds. There's got to be some tie of the amount that's going to be less than --

MEMBER SHACK: You know, if you look at -- you know, they would have to go through a whole range of scenarios. How could this stuff get out and be used?

MEMBER RYAN: Bill, I would be happy with one measurement. How do you know that is bounding? I mean, you know, we have no clue. We're in the fog right now.

MEMBER SIEBER: We will do a risk study.

MEMBER RYAN: Mr. Chairman, I think that closes the presentation, yes?

MR. COMFORT: Yes.

MEMBER RYAN: Okay.

CHAIR ABDEL-KHALIK: Are there any other questions for the presenters?

MEMBER SIEBER: No.

CHAIR ABDEL-KHALIK: None? Okay.

MEMBER RYAN: I think the path forward, if I may, just to --

CHAIR ABDEL-KHALIK: Yes, sir?

MEMBER RYAN: -- get concurrence before we leave this, is that -- first of all, let me thank Gary and Andrew for coming back again and giving the full Committee this briefing. Again, you did a really good job and a very thorough job of explaining your path forward and what you have prepared and what your next steps are.

Given that public comment is going to be solicited very soon, my recommendation is that we have a subcommittee meeting to get the follow-up from the staff on what they learned through the public comment process and then revisit our concern to see if it has been addressed or it can be addressed with what they

gather and then come back to the full Committee after we have worked it out in a follow-up subcommittee meeting. Does that --

CHAIR ABDEL-KHALIK: Sounds reasonable.

MEMBER SIEBER: Without a letter?

MEMBER RYAN: Without a letter today because I think that they have got a path forward. The public comment period is eminent. So let's let that happen and work with the staff when we come back. I think having the full Committee understand the range of the discussion was very helpful today.

MR. COMFORT: Good. Thank you very much.

MR. CARRERA: Would it make you happy if Gary goes out to one of these facilities for one and wear the --

(Laughter.)

PARTICIPANT: Volunteer Sam.

MEMBER RYAN: The emphasis of our concern for real data and real drive in this. So we will ask you to take that to your public comment process.

CHAIR ABDEL-KHALIK: Thank you. We are off the record. Thanks very much.

(Whereupon, the foregoing open session was recessed at 4:56 p.m., to be reconvened on Thursday, June 10, 2010, at 8:30 a.m.)

U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

RG 1.216 on Containment Structural Integrity Evaluation for Internal Pressure Loadings Above Design-Basis Pressure (For New Reactors)

Prepared by: Robert Roche and Jose Pires, NRC/RES/DE/SGSEB
Joseph Braverman and Richard Morante, BNL

ACRS Briefing
June 9, 2010
Rockville, MD

U.S.NRC
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Outline:

- Background
- Objective
- Description

Background:

- This RG is intended to ensure appropriate and consistent implementation of regulatory criteria related to structural integrity of the containment for beyond design-basis pressure loadings.
  - The RG will provide detailed and up-to-date guidance on deterministic methods to evaluate containment structural integrity under pressure loads above design-basis pressures for new light water reactors design.
- Motivation:
  - Complement and consolidate guidance pertaining to containment structural integrity evaluation for internal pressure loadings above design-basis pressure (i.e. RG 1.136, 1.57, 1.7 and 1.206)
  - Issues identified during licensing reviews

Background (Cont.):

- Example of issues identified during licensing reviews:
  - Use of internal pressure loading for the combustible gas generation inside containment equal to 45 psig, without consideration of pressures generated by a 100% fuel cladding-water reaction.
  - Questions regarding what severe accidents and acceptable structural integrity criteria should be considered for an analysis that addresses NRC's deterministic containment performance goals in SECY-90-16, SECY-93-087, and corresponding SRMs.

Background (Cont.):

Timeline:

- Dec 2008 – Issued for public comments
- Feb 2009 – Received public comments
- DG revision with staff working group and BNL
- Oct 2009 – Category 2 public meeting
- June 2010 – Interoffice concurrence
- May/June 2010 – ACRS briefing
- July 2010 –RG publication

Objective:

- To provide guidance on methods acceptable to the NRC staff for:
  - predicting the internal pressure capacity for containment structures above the design-basis accident pressure
    - 10 CFR 50, Appendix A, GDC 50
  - demonstrating containment structural integrity related to combustible gas control
    - 10 CFR 52.47(a)(12), 52.79(a)(8), 50.44(c)5
  - demonstrating containment structural integrity for an analysis that addresses Commission's performance goals for the prevention and mitigation of severe accidents.
    - 10 CFR 52.47(a)(23), 52.79(a)(38).

Regulatory Position 1: Prediction of Containment Internal Pressure Capacity above Design-Basis Pressure

- 10 CFR 50, GDC 50:“Containment design basis. containment heat removal system shall be designed so that the containment structure and its internal compartments can accommodate, without exceeding the design leakage rate and with sufficient margin, the calculated pressure and temperature conditions resulting from any loss-of-coolant accident…”
- **Purpose:** to provide an acceptable method for predicting the internal pressure capacity for containment structures above the internal pressure for the design-basis LOCA.
  - Internal pressure capacity at which the structural integrity is retained and a failure leading to a significant release of fission products does not occur.

Regulatory Position 1: (Cont.)

- **Related SRP sections**
  - 3.8.1 and 3.8.2, SRP Acceptance Criteria 4.K and 4.D, respectively.
- **Items Addressed:**
  - Staff expectations regarding the use of a nonlinear finite element analysis to evaluate the containment response
  - Staff expectations regarding the use of a "Simplified Method"
    - Strain limits specified for the evaluation
    - Concrete failure modes near discontinuities

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Regulatory Position 1: (Cont.)

- Staff expectations regarding the use of a “Simplified Method” (Cont.)
  - The positions are consistent with criteria in SRP sections 3.8.1 and 3.8.2 with addition and clarification such as:
    - new position regarding verification of concrete shear and axial compression failures.
    - limits for the free-field hoop strain in the prestressing tendons apply to the total strain which is the strain from initial prestressing plus the strain from pressurization.
    - Defines global free field hoop strains limits for prestressed concrete containments
  - Information to be submitted in the FSAR and in which sections of the FSAR (i.e. Section 3.8).

Regulatory Position 2: Combustible Gas Control Inside Containment

- 52.47(a)(12) and 52.79(a)(8) for DC and COL applications respectively, require an analysis and description of the equipment and systems for combustible gas control as required by 10 CFR 50.44
- 50.44(c)(5)
  - "Structural analysis. An applicant must perform an analysis that demonstrates containment structural integrity… The analysis must address an accident that releases hydrogen generated from 100 percent fuel clad-coolant reaction accompanied by hydrogen burning…"
- **Purpose:** to provide an acceptable method to evaluate containment structural integrity to pressure loadings associated with hydrogen generation due to the reaction between fuel cladding and the water coolant.

Regulatory Position 2: (Cont.)

- This RG complements the guidance in RP 5 in RG 1.7
- In agreement with RP 5 in RG 1.7 it provides acceptance criteria to meet requirement in 10 CFR 50.44(c)(5).
  - Service Level C and Factored Load Category requirements of the ASME Code for steel and concrete containments respectively.
  - Load combination consisting of dead load and the higher of the following:
    - Pressure arising from fuel cladding-water reaction, hydrogen burning, and post accident inerting (if applicable), or
    - 45 psig.
- Additionally, it references the finite element model described in RP 1 of this RG, with some limitations, as an acceptable method to evaluate the containment structural integrity.
- Information to be submitted in the FSAR should be reported in section 3.8.

Regulatory Position 3: Commission's Severe Accident Performance Goal

- 52.47(a)(23) and 52.79(a)(38) for DC and COL applications respectively, require a description and analysis of design features for the prevention and mitigation of severe accidents.
- Section C.I.19.8 of RG 1.206 provides the following guidance:
  - "The applicant should provide a description and analysis of the design features to prevent and mitigate severe accidents, in accordance with the requirements in 10 CFR 52.47(23) or 10 CFR 52.79(a)(38), for a DC or a COL application, respectively. This review should specifically address the issues identified in SECY-90-016 and SECY-93-087, which the Commission approved in related SRMs dated June 26, 1990, and July 21, 1993, respectively, for prevention (…) and mitigation (…)."

Regulatory Position 3: Commission's Severe Accident Performance Goal (cont.)

- **Purpose:** to provide an acceptable method for an analysis that specifically addresses the performance goals identified in SECY-90-016 and SECY-93-087 and related SRMs for containment structures in nuclear power plants under severe accident conditions.
- SRM (July 21, 1993) to SECY-93-087 states:
  - "The containment should maintain its role as a reliable, leak-tight barrier (for example, by ensuring that containment stresses do not exceed ASME Service Level C limits for metal containments, or Factored Load Category for concrete containments) for approximately 24 hours following the onset of core damage under the more likely severe accident challenges and, following this period, the containment should continue to provide a barrier against the uncontrolled release of fission products."

Regulatory Position 3: Commission's Severe Accident Performance Goal (cont.)

- Key items:
  - Identification of more likely severe accident challenges
  - Criteria for structural integrity evaluation of the containment for the period after the initial 24 hours following the onset of core damage as it relates to the ability of the containment to continue to provide a barrier against the uncontrolled release of fission products.

More Likely Severe Accident Challenges

- Selection of accident sequences for consideration:
  - "The applicant provides the technical basis for the identification of the more likely severe accident challenges to be reviewed by the staff on a case-by-case basis. An example of an acceptable way to identify the more likely severe accident challenges is, to consider the sequences or plant damage states, which, when ordered by % contribution, represent 90% or more of the core damage frequency."
- Pressure-temperature demands
  - Select physically reasonable enveloping pressure-temperature demands from the identified sequences.
    - These demands define the deterministic loads for the structural analysis.
    - For concrete, it is generally acceptable to analyze the containment for the sequence or damage state with the highest pressure load and its co-existing temperature loading

Period Following Initial 24 hours after the Onset of Core Damage:

- "…the containment should continue to provide a barrier against the uncontrolled release of fission products."
- Acceptable ways for meeting the performance goal:
  - The maximum pressure/temperature demands following the initial 24-hour period is enveloped by the maximum pressure/temperature demands during the initial 24-hour period; or
  - The containment response under the maximum pressure/temperature following the initial 24-hour period meets applicable Level C or Factored Load acceptance criteria (as in the case of the first 24 hour period); or
  - The calculated release for the more likely severe accident challenges, following the initial 24 hour period, meets site-specific design criteria for fission product released from the containment, in accordance with the requirements of 10 CFR 100.21 and 10 CFR 50.34; or
  - Another alternative method if adequate justification is provided.
- For the evaluations to be conducted for the two time periods under consideration, the RG recommends using a finite element model such as that described in Regulatory Position 1.
- Information to be submitted in the FSAR should be reported in Section 19.

Public Comments

- Public comment period: December 9, 2008 to February 9, 2009.
  - 38 comments received by February 9, 2009.
- Comments by category as per NEI submittal:

Purpose	6
Applicability	11
Methodology	3
Acceptable Analysis Codes	2
Definitions	1
Limitations	10
Criteria	5

Public Comments (Cont.):

- Comments by Regulatory Position:

RP 1	4
RP 2	1
RP 3	7
RP 4	12
RP 1 and RP 3	2
RP 1 and RP 4	2
RP 3 and RP 4	1
Other	9

- Staff formed a working group for the resolution of the public comments that resulted in major revisions to the DG.

Public Comments (Cont.):

Major revisions include:

- The RG scope is for new light water reactor designs
- Clarification of the RG purpose and relation to existing requirements and guidance documents.
- Severe accident performance goals (SECY 93-087/SRM)
  - Approach to identify the more likely severe accident challenges.
  - Additional criteria for the period following the initial 24 hours after the onset of core damage.

Public Comments (Cont.):

Major revisions include:

- Removal of Regulatory Position (RP) 4, "Containment Fragility under Pressure Loads"
  - Item may require further development of technical bases and subsequent publication in a NUREG report or a standard.
  - This RG should focus on deterministic methods until subsequent research provides the technical bases for risk-informed performance-based regulatory guidelines.

Proposed Rulemaking on Distribution of Source Material to Exempt Persons and to General Licensees and Revision of General License and Exemptions

Andrew Carrera, Health Physicist
Rulemaking Branch A
Division of Intergovernmental Liaison and Rulemaking
FSME

June 9, 2010

U.S.NRC
United States Nuclear Regulatory Commission
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Topics

- Background on Part 40 and current general license and exemption conditions
- History of rulemaking.
- Part 40 current issues and proposed resolution through rulemaking
- Requesting public input

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Background on current Part 40 general license and exemptions conditions

What does 10 CFR Part 40 cover?

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40.1 Purpose

Establish procedures and criteria for the issuance of licenses to receive title to, receive, possess, use, transfer, or deliver source material and byproduct materials, as defined in this part, and establish and provide for the terms and conditions upon which the Commission will issue such licenses.

What is Source Material?

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Source Material is defined as:

(1) Uranium or thorium, or any combination thereof, in any physical or chemical form, or

(2) Ores which contain by weight one-twentieth of one percent (0.05%) or more of: (i) uranium, (ii) thorium or (iii) any combination thereof.

Source material does not include special nuclear material.

* *Uranium and thorium are found naturally throughout the environment*

Regulation of Source Material

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- Specific License
  - Yellow cake processors
  - Uranium conversion facilities
  - Mineral extractors
  - Uranium Mills (byproduct material)

- General License
  - Thorium-coated lens manufacturers
  - Water treatment facilities

- Exemption
  - Thorium lantern mantles
  - Thorium welding rods
  - Depleted Uranium Counterweights

"Small quantities" general license

- Section 40.22 provides a general license for "small quantities of source material"
  - Less than 15 pounds at any one time
  - Less than 150 pounds per calendar year

- Exempts licensee from Parts 19, 20, and 21
  - Exemption does not apply to Part 40 specific licensees

Exemptions

- Section 40.13(a) exempts source material in concentrations less than 0.05 percent by weight
- Section 40.13(b) exempts “unprocessed” source material
- Section 40.13(c) provides exemptions for use of certain products

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History of section 40.22 rulemaking

What is the history of the rulemaking?

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1999	Staff proposed multiple activities associated with Part 40 to the Commission in SECY-99-259
2000	Commission directed staff to move forward with developing rulemaking plan
2001	SECY-01-0072, “Draft Rulemaking Plan: Distribution of Source Material to Exempt Persons and to General Licensees and Revision of 10 CFR 40.22 General License”

What is the history of the rulemaking? (cont)

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2003	SRM to SECY-01-0072
2004 - 2006	Data Collection
2006	SECY-06-0094, "Tracking or Providing Enhanced Controls for Category 3 Sources"/ SRM to SECY-06-0094
2007	PNNL-16148, Rev. 1, "Dose Assessments for Current and Projected Uses of Source Material under U.S. NRC General License and Exemption Criteria"

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What are the issues with the current Part 40 and how do we resolve them through the proposed rulemaking?

Current identified issues with 10 CFR Part 40

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1. Health and safety impacts in § 40.22 are not in alignment with current standards.

2. Lacking complete and timely information regarding distribution of source materials.

3. Changes in how some products are used under exemption.

4. Lacking clarity in certain requirements in § 40.22.

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1) Health and safety impacts in § 40.22 are not in alignment with current standards

Health and safety requirements in § 40.22 are not in alignment with current standards

- Issues:
  - Part 40 not significantly revised since 1961.
  - PRM 40-27.
  - PNNL-16148, Rev.1 “Dose Assessment for Current and Projected Uses of Source Material Under a U.S NRC General License and Exemption Criteria”

Health and safety requirements in § 40.22 are not in alignment with current standards

PRM-40-27

- In January, 1999, Colorado Radiation Control Program was notified of activated radiation alarm at a landfill by dumpster used by a source material general licensee.
- 4.9 mR/hr (1.3 uCi/kg-hr) was measured on the exterior of the dumpster and initiated an investigation.
- General licensee vacated building with contamination level of 734 mrem/year (regulatory limit is 25 mrem/year).

Health and safety requirements in § 40.22 are not in alignment with current standards

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Radiation Dose Assessment for Routine Use, Accidents, and Manufacturing Involving Thorium + Progeny Thin-Film Optical Coatings. (PNNL-16148, Rev. 1)

Scenario	Annual Scenario Dose (mrem)		
	Ingestion	Inhalation	Effective*
Routine Use (TV Camera Operator)			4.0 E-3
Accidents	8.2 E-4	6.4 E-2	6.5 E-2
Manufacturing	206	562	768

* Contribution from external dose considered negligible (except in routine use scenario where external dose predominates)

Health and safety requirements in § 40.22 are not in alignment with current standards

Resolution:

- Would make changes in possession limits.
  - Only in natural isotopic concentration or as depleted uranium.
  - Limited to 1.5 kg (3.3 lb) at once or 7 kg (15.4 lb) per calendar year if processed or in dispersible form.
  - No effective change in possession limit for non-dispersible materials or when removing uranium from drinking water.
- Would require contamination to be addressed when activities completed.

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2) Lacking complete and timely information regarding distribution of source materials

Lacking complete and timely information regarding distribution of source materials

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Issue:

- No method to allow understanding of amounts of source material distributed to exempt persons and general licensees.

- Difficulties in identifying general licensees.

Lacking complete and timely information regarding distribution of source materials

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Resolution:

- New specific licenses for initial distribution of source material to exempt persons (§ 40.52) .
  - ➢ Would require specific license by NRC only.
  - ➢ Certain health and safety requirements would not apply to persons in Agreement States (AS) or importers.
  - ➢ Would require annual reporting of product types, quantities of products, and source material content of products.
  - ➢ May result in certain general licensees manufacturing exempt products to become specific licensees

Lacking complete and timely information regarding distribution of source materials

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Resolution:

- New specific licenses for initial distribution of source material to general licensees (§ 40.54)
  - ➢ Would require specific license for distribution (issued by either NRC or an AS)
  - ➢ Would require labeling and quality control
  - ➢ Would require recipients to be notified of § 40.22 (or equivalent AS) requirements and appropriate safety precautions for handling, use, storage, and disposal
  - ➢ Would require annual reporting to NRC or AS where source material is distributed including to whom and how much to allow identification of general licensees

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3) Changes in how some products are used under exemption

Changes in how some products are used under exemption

Issue:

- Changes in industry practices
  - Exempt products no longer being manufactured (i.e. uranium smoke detectors and glazed ceramic tablewares)
  - Reduced the concentration of source material used in the manufacturing practice (i.e. glasswares)
  - More prevalent use of thorium coated lenses

Changes in how some products are used under exemption

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Resolution:

- Revision of certain exemptions.
  - ➢ Would remove exemption for uranium smoke detectors [§ 40.13(d)].
  - ➢ Would allow no new distributions of glazed ceramic tableware [§ 40.13(c)(2)(i)].
  - ➢ Would reduce allowable concentration of source material in glassware [§ 40.13(c)(2)(iii)].
  - ➢ Would expand exemption for thorium lenses [§ 40.13(c)(7)] to include coatings, but reduce allowable concentrations.

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4) Lacking clarity in certain requirements in § 40.22

Lacking clarity in certain requirements in § 40.22

Issue:

- Waste disposal requirements
- Lack of direct citations to other applicable sections in Part 40

Lacking clarity in certain requirements in § 40.22

Resolution:

- Would clarify disposal and transfer requirements.
  - May not abandon.
  - May dispose of up to 0.5 kg per year for permanent disposal.
  - Disposal of other material must be consistent with § 20.2001.
- Direct citations to other applicable sections of Part 40 for general licensees.

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Specific Questions to the Public

Questions to solicit public input

- Use of concentration limit for coatings
- Use of activity limits in possession limits in § 40.22
- Should surveys be required when § 40.22 licensees cease activities?
- Should § 40.22 be expanded to cover 11e.(2) byproduct material from mills?
- Should provisions be added to include source material and special nuclear material in items in the sealed source and device registry?
- Should § 40.25 and § 40.34 be revised to make them more useful?

Conclusion

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- New specific licensees
- Providing additional health and safety
- Minimizing impacts

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Questions?