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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

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FUTURE PLANT DESIGNS SUBCOMMITTEE

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WEDNESDAY

OCTOBER 7, 2015

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ROCKVILLE, MARYLAND

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The Subcommittee met at the Nuclear Regulatory Commission, Two White Flint North, Room T2B1, 11545 Rockville Pike, at 8:30 a.m., Michael L. Corradini, Chairman, presiding.

COMMITTEE MEMBERS:

MICHAEL L. CORRADINI, Subcommittee Chair

RONALD G. BALLINGER, Member

DENNIS C. BLEY, Member

CHARLES H. BROWN, JR. Member

DANA A. POWERS, Member

JOY L. REMPE, Member

STEPHEN P. SCHULTZ, Member

GORDON R. SKILLMAN, Member

JOHN W. STETKAR, Member

DESIGNATED FEDERAL OFFICIAL:

QUYNH NGUYEN

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

P R O C E E D I N G S

8:30 a.m.

CHAIRMAN CORRADINI: Okay, let's get started. The meeting will come to order now. This is a meeting of the Future Plant Design Subcommittee of the ACRS. My name is Mike Corradini. I am acting chairman of the Future Plant Design Subcommittee.

ACRS members in attendance today are Dick Skillman, Stephen Schultz, John Stetkar, Dennis Bley, Ron Ballinger, Charles Brown, and Joy Rempe, and potentially Harold Ray.

Mr. Quynh Nguyen is the Designated Federal Official for this meeting.

Today, we have members of the staff to brief the subcommittee on the staff's development of the NRC's design specific review standard or DSRS for NuScale small modular reactor. This document is being developed in anticipation of the NuScale design certification application for their integrated pressurized water reactor technology.

The discussion topics on today's agenda include DSRS Section 6.2.2 containment heat removal and 6.2.5 combustible gas in containment.

The rules for participation in today's meeting are announced in the Federal Register, dated

October 2, 2015. The meeting was announced as an open to the public meeting and no request to making a statement to the subcommittee has been received from the public.

We have one bridge line established. The bridge number and password were published in the agenda posted on the NRC's public website. To minimize disturbances, the public line will be kept in a listen-in only mode and the public will have an opportunity to make a statement or provide comments at a designated time towards the end of the meeting.

Dr. Rempe has an ongoing conflict of interest in the area of NuScale severe accident considerations because of prior work that she completed for NuScale in this area. And Dr. Rempe will recuse herself from discussions in this area.

I invite Greg Cranston of NRO's project manager to introduce our presenters. Where's Greg? Great. So Greg, the floor is yours.

MR. CRANSTON: Good morning. My name is Greg Cranston. I'm the senior project manager for the NuScale project. As mentioned, we're here to present two sections that relate to the containment.

I'll briefly cover some of the items leading up to this. We have received public comments and those have been sent to the technical branches on all sections and they are currently being processed and decisions are being made as to which ones are going to be incorporated. All that will be tracked on a comment matrix so that we'll have the status of each one. And we will be providing information as to whether the comment was incorporated or if we did not, what the basis was.

CHAIRMAN CORRADINI: Can I ask about that since I actually looked this time at the comments from the vendor, so they're fairly extensive. Are you going to have other people's comments integrated into those or a separate file so that we can unwrap if it's NuScale versus others? Because I'm not sure the volume of the others.

MR. CRANSTON: The volume of the others is --

CHAIRMAN CORRADINI: Not much.

MR. CRANSTON: A handful.

CHAIRMAN CORRADINI: Okay.

MR. CRANSTON: Literally.

CHAIRMAN CORRADINI: But you're not going to integrate them. You're going to separate them.

MR. CRANSTON: Well, we did. And the comment matrix at the end of the comment matrix that we developed, we added the NEI comments which were fairly general. They did not specifically comment on any DSRS sections. They did make a comment, for example, that they thought that some of the DSRSs could have remained Standard Review Plans, but they didn't specify which ones they thought fell into that category.

CHAIRMAN CORRADINI: Okay.

MR. CRANSTON: So they were very general and not section related at all. And there was about five of those out of the 600, roughly 680 comments.

There was about three or four general comments from the public, but they all related to comments about nuclear power in general and nothing specific.

CHAIRMAN CORRADINI: Oh, you had mentioned that before. I forget that. You're right. You had mentioned that.

MR. CRANSTON: So essentially all the comments are the NuScale comments.

CHAIRMAN CORRADINI: Okay. Thank you very much. Since there's like 350 pages. Okay.

MR. CRANSTON: Again, the purpose, we want to provide the subcommittee with the approach the staff took in developing the DSRS sections and what we want to cover is what change from the SRP to the DSRS, why the change was made, and then any questions based on the design information and then questions associated with the design information that we have available to date.

So with that, I'd like to turn the meeting over to the first presenter, Clint Ashley, who is going to cover the containment heat removal systems. And that will be followed by Anne-Marie and she'll be covering combustible gas control.

MR. ASHLEY: Thank you. Good morning. Clint Ashley. I've been with the Agency about seven years. Prior to that, 15 years in the nuclear industry. I've been a Navy nuclear officer and University of Michigan graduate.

I'm here to talk about the changes between SRP 6.2.2 and the DSRS 6.2.2 for the containment heat removal system. It's primarily driven by GDC 38 which is the containment heat removal systems. What we did is we added the general description of the NuScale design in the front matter of the DSRS. We also added general design criterion 5 because of the shared systems associated with the reactor pool which is an important part of the containment heat removal system. Essentially it forms the ultimate heat sink.

Most of the SRP 6.2.2 was crafted for active plants so there's mentions of net positive suction head review because of pumps. It talks about containment spray. It talks about other heat removal systems like the fan cooler systems. Those have all been eliminated from this DSRS because of the unique nature of the NuScale design being passive and not having these systems.

What is different is it's a submerged containment, partially submerged containment. So we did add some consideration for fouling concerns associated with a constantly wetted external steel medium.

CHAIRMAN CORRADINI: Can I ask about that? If this is the wrong time -- I have a question about that and the internal containment surface. So there's another -- it's 6.1.2. One, I get confused, the numbering. But there's something about surfaces, paints on containment. So is it -- what are you expecting to see from the design there that you're going to look at? The type of epoxy coating that would be on the steel surface or how it's treated?

MR. ASHLEY: Well, I think we didn't want to, what we know from NuScale is that they don't intend to have any coatings.

CHAIRMAN CORRADINI: So it will be just a stainless steel surface.

MR. ASHLEY: That's correct. But we're dealing with a PowerPoint design so we wanted to make sure that we keep the consideration in there for the reviewer to look at that just to make sure that there is a change in the design over time.

CHAIRMAN CORRADINI: And just to proceed with that, on the inside, is the coating -- well, to the extent that you know what the design is, is the expected coating on the inside of the containment similar to what I see in a current PWR?

MR. ASHLEY: There's no coating on the inside.

CHAIRMAN CORRADINI: So it's also stainless steel?

MR. ASHLEY: All stainless steel.

CHAIRMAN CORRADINI: Okay.

MEMBER REMPE: So since we're interrupting you, it will be a vacuum inside the containment, right?

MR. ASHLEY: That's correct.

MEMBER REMPE: Is there the potential for ice formation to occur?

MR. ASHLEY: For what?

MEMBER REMPE: Ice formation. I mean there's moisture in there, right? Originally.

MR. ASHLEY: Well, certainly when you have to evacuate the system because it's all assembled under -- in the reactor pool so that interior surfaces are wetted.

MEMBER REMPE: Right.

MR. ASHLEY: So they would have to draw down that water and then they would draw a vacuum.

MEMBER REMPE: Right.

MR. ASHLEY: I haven't thought about this concept of ice formation. I'm not sure. Maybe you could explain a little bit.

MEMBER REMPE: So I've been dealing with spent fuel storage casks and the fact that when they initially pull a vacuum in the drying process, they worry about ice formation and I just am wondering if that can occur in this situation. I've not tried to do the analysis and the temperatures and the pressures and the amount of vacuum, but that's an issue or something that they think about. And I just was wondering if you guys have thought about that when you were coming up with this standard and if it could have any adverse effects?

MR. ASHLEY: Not in the context of this DSRS. I don't know if there's another associated DSRS that looked at the containment evacuation system.

CHAIRMAN CORRADINI: Actually, I'm glad you brought that up. That was something that I did want to bring up. So where is DSRS that worries about the containment evacuation system? With all due respect, ice formation.

MEMBER STETKAR: Chapter 9, Section 9.3.6.

CHAIRMAN CORRADINI: I knew that if I brought that question I would get an answer.

MEMBER STETKAR: I have not reviewed that, but I happen to have --

MEMBER REMPE: So I shouldn't be asking this now. I should wait --

MEMBER STETKAR: Well, Section 9 tends to evaluate the systems, pumps and pipes and valves. It's an auxiliary system.

MEMBER REMPE: Okay.

MEMBER STETKAR: But not necessarily the thermal hydraulic function provided by that system. But that's the only place -- I was looking for it also. It was referred in a couple of other parts of

Chapter 6. And that's the only place that I could -- in the DSRS that I could find it, any mention of review of that particular system.

MR. ASHLEY: And if I'm not mistaken, that's a non-safety related system. It essentially establishes the --

MEMBER STETKAR: I think it has a safety related isolation valve or something like that.

MR. ASHLEY: As a safety function to isolate. Good question.

MEMBER REMPE: I guess I was wondering when I was reading this and again, I'm thinking about the systems and I'm relating things and what the effects would be.

CHAIRMAN CORRADINI: I mean if I pull the vacuum the pressure and temperature are going to go down, but I've got so much steel around that I can't imagine it's not going to hold up the temperature. It will be more of an isothermal process than an adiabatic process. So if it's an adiabatic process, temperature will go down. If it's an isothermal process, because of all the steel around, it's going to stay at the same temperature and you'll pull vacuum anyway. I don't think there's a problem, but --

MEMBER REMPE: I just am curious about

if it could get things --

MR. ASHLEY: It's a good question. We also touched on in the DSRS, we recognized that the containment heat removal system is dominated by this natural circulation process, so we added some language in the DSRS to guide the reviewer with respect to looking into that aspect of the thermal hydraulics associated with this natural circulation, looking at the test data, looking at the topic reports. We've also got regulatory tools available to us for inspection activities and audits. So those things will help inform this review on containment heat removal.

MEMBER SKILLMAN: Clint, let me ask this. What I've done is I've reviewed your mark up between the SRP and what you propose is the DSRS standard. To your point, it eliminated net positive suction head review in that same section. You have also eliminated this paragraph, the effect of accident-generated debris, including in the assessment for potential loss of long-term cooling capability resulting from loss of coolant accident generated in the late debris. That is in that section of what is supposed to be reviewed. It's the original item 8. It seems that even though this is a passive design, that the design specific review standard should recognize the potential for some form of debris.

MR. ASHLEY: I agree with you and in the DSRS, we do speak to in the DSRS acceptance criteria, we speak to it in item 5. We talk about the whole nature of long-term cooling with respect to the sump and the hydraulic performance following debris generation. We point to Reg. Guide 1.82, revision 4 which is the latest updated guidance which is supplemented for PWRs with the Nuclear Energy Institute guidance on the effect of problems with debris generation.

Now NuScale doesn't want -- there's no insulation on the reactor system, based on the fact that they're drawing a vacuum. That's their insulation, in effect. But I still think they have to evaluate it. We're not going to accept the fact that NuScale says we don't generate any debris. We're going to still look at that as part of this review standard for that potential to generate containment debris.

MEMBER SKILLMAN: So what I heard you say is even though we have eliminated that paragraph from the underlying SRP portion, we have included it later in the DSRS for this design.

MR. ASHLEY: I will take a look at that, so you're looking at Section 1, Roman numeral I?

MEMBER SKILLMAN: Yes.

MR. ASHLEY: Because it's in Roman II and III.

CHAIRMAN CORRADINI: It is. I actually -- I had a question about the fact that -- about what the sources of the debris were because you had it somewhere in there.

MR. ASHLEY: So it may have been an inadvertent deletion.

MEMBER SKILLMAN: I would suggest that that should remain. I'd like to ask one or two more questions.

MR. ASHLEY: Absolutely.

MEMBER SKILLMAN: In just a page or two later, the issue is the heat transfer. And I wanted to ask what requirement for uncertainty in this passive heat transfer fouling equation do you have? What uncertainty are you asking for? Or what margin on you are you requiring?

MR. ASHLEY: I'm not aware of a requirement when it comes to DSRS or SRP acceptance criteria, but certainly we'll use standard tools, industry accepted practice, but we don't speak to that particular aspect. That review will be done probably under the topical report that's submitted that uses the evaluation model. Takes into -- a part of Appendix K, the mass and energy and addresses all those thermal hydraulics associated with analysis.

MEMBER SKILLMAN: Thank you.

CHAIRMAN CORRADINI: Can I -- since we started on debris, so given the limited amount of knowledge you know about -- where would the debris come from in this? Because I agree you've got to worry about it, but I'm trying to figure out where would it be generated? From what would it generated?

MR. ASHLEY: I think when the reactor vent valve opens up, there's a lot of material up in that area on the top of the -- just seeing just general pictures, but it could be if there's cabling in containment.

CHAIRMAN CORRADINI: Okay. I was thinking electrical cabling is the only thing that came to my mind, but --

MR. ASHLEY: It's the first thing that comes to my mind. There could be coded components. I'm just not sure what the specifications are yet.

CHAIRMAN CORRADINI: It is -- I guess I'm -- I don't want to get a number, but if I were to make this analogous to AP1000, there was a number of we'll call it late debris that one had to worry about and it had to be no more than X to make sure we didn't have an issue relative to in their case their active pumping and then the recirculation back to the core.

In this case, you're waiting for a topic report from the vendor, from the applicant to do this sort of analysis?

MR. ASHLEY: Not with respect to latent debris.

CHAIRMAN CORRADINI: Or generated debris. I apologize, but generated debris from any sort of blow down.

MR. ASHLEY: I think that where I've seen that in most of the new reactor design certification applications, debris assessment, the GSI 191 type of review happens under the guise of a technical report, not a topical.

CHAIRMAN CORRADINI: Right.

MR. ASHLEY: So the technical report is typically incorporated by reference and then that would be reviewed as part of the DCD. It wouldn't get its own separate safety evaluation which a topical report does.

CHAIRMAN CORRADINI: Okay. All right.

Thank you.

MEMBER SKILLMAN: Clint, I would provide this observation and you probably have had the same experience I have had. In almost any water system, no matter what its temperature, you have the potential of getting biofouling, high temperature and low temperature.

MR. ASHLEY: Absolutely.

MEMBER SKILLMAN: And I know from first-hand experience if you have a lot of water and you have even a trace of coliform, even a slight amount of oxygen will grow bugs. And it shows up as slime and some of it can be almost microporous, is light and fluffy that really has no tenacity. But I've also dealt with it when it turns out to be, in all candor, a scum that's probably a 32nd of an inch thick and it truly is a fouling surface and if it becomes heated and dried, it bakes on and if you have repeated cycles you can actually give up heat transfer capability.

MR. ASHLEY: Absolutely.

MEMBER SKILLMAN: That's what I'm thinking needs to be addressed here. Of course, the remedy is chemical cleaning and I'm not sure this design is capable of being chemically cleaned. I think this issue of fouling of bio-growth should be addressed head on.

MR. ASHLEY: I agree.

MEMBER SKILLMAN: Thank you.

MEMBER BROWN: Relative to the comment on the debris, I mean when I read Section 5, I saw the first part and I had the same comment he did about the debris generation being deleted from that. That was around page 30 or something like that. Page 30.

All right, we'll start again. It was page 30 where the debris generation discussion part was deleted. And then I went down and I found the acceptance criteria that you talked about in 6.2.2 item 5. But if you read item 5 it talks about debris generation relative to reactor recirculation valves, debris generation from that valve blockage, debris of long-term coolability of the core, in other words, stuff inside the reactor vessel, not necessarily the containment. And the reactor vent valves are the stuff that feed into the containment or that's my memory of what that --

CHAIRMAN CORRADINI: But what they were referring to, if I might break in, is the return valves so that you can actually create a natural circulation path.

MEMBER BROWN: That's for the ECCS or the core cooling or something like that. This is containment, and I'm just saying the acceptance criteria you talked about where it talks about debris refers to reactor recirculation valves or that part of the path.

MEMBER STETKAR: Those go from the containment back in to the reactor.

MEMBER BROWN: Reactor recirculation valves go through -- there's two types of -- if my memory is wrong, I'm remembering the diagram, there were reactor vent valves and there were reactor recirculation valves.

CHAIRMAN CORRADINI: RRV.

MEMBER BROWN: There's RVVs also.

CHAIRMAN CORRADINI: That's on top.

MEMBER BROWN: So the reactor vent valves come out and they go up into the containment.

CHAIRMAN CORRADINI: And the RRV go back from containment into the core.

MEMBER BROWN: That wasn't the way I remember the discussion.

MR. ASHLEY: This is correct.

CHAIRMAN CORRADINI: The other ones are RHR.

MR. ASHLEY: Think about the containment sump is actually collecting the condensate and the lower half of containment collects the condensate and that level comes up and that is the --- there's no other injection means to put the water back into the core so they open up --

MEMBER BROWN: I remember the recirc valves. I understand that. I guess I didn't connect it to the two different terminologies. I know if you have something going on in the reactor, it goes up and it recircs -- you're cooling the core so the containment -- there's nothing in it right now, theoretically. But I thought there was another relief valve set that blows off into the containment itself and that part -- I'm wrong. Is that correct? At least based on the present design.

MR. ASHLEY: That is correct.

CHAIRMAN CORRADINI: As I understand the current design, there's a pair of valves on top that essentially will, if you use my English, blow down purposely into containment and a set of valves which are the RVV and the set of valves, RRV, which once blow down and the water accumulatives will then by natural circulation flow back in to the downcomer and into the core.

MEMBER BROWN: You're saying the RVVs blow into the containment and then the valves, the lower one is just a valve with a stub on the end to let the stuff --

CHAIRMAN CORRADINI: So the concern is that you want to make sure that debris doesn't choke that off.

MEMBER BROWN: My brain is coming back into focus here from a picture. I don't have the picture in front of me. So okay, I got it. I still would agree with Dick that because you're going into the containment all kinds of crud is up there in the top, stuff could come loose. And therefore, the debris discussion seemed to me not -- didn't make a whole lot of sense to eliminate that earlier part and just have it pop up down in the acceptance criteria. Just an opinion.

MR. ASHLEY: It may have been just so there were a number of hands and there were a bunch of changes. So certainly acceptance criteria Roman numeral II, 10 CFR 50.46(b)(5), long term cooling. It's there. The DSRS acceptance criteria acknowledges the potential for debris generation and the effects that it could cause blockage of valves, blockage of the core. So I agree with the comment.

I think we can fold that back into Roman numeral I section.

MEMBER BROWN: I have one other comment when I started reading this, was that there were a whole lot of very design specific based on the -- what did you call it, the PowerPoint presentations? So there was a lot of very specific statements relative to what the PowerPoint presentations have given. I guess being a generalist, what I would have thought you would have had a general statement that said hey, if we forgot something, and I guess that was up around page 29.

MR. ASHLEY: I struggle with your page designation --

MEMBER BROWN: I'm going to tell you what section it is here in a second.

MR. ASHLEY: The DSRS is only 11 pages.

MEMBER BROWN: I've got to find where I marked it. No, no, I agree with that, this is part of the attachment they sent me. The whole darn attachment is all the sections and that's totally useless for you.

MR. ASHLEY: I apologize.

MEMBER BROWN: So within the areas of review, and it was on page -- where's the page numbers. There's no page number down there. It's not at the bottom of the page, there's nothing there.

MR. ASHLEY: It's on page --

MEMBER BROWN: 6.2.2-2 which is unnumbered on that page.

MR. ASHLEY: I think what could help is in Section 3 of the review procedures, it sort of speaks to some aspects of the design could be different than what we had envisioned. The set of information may not be all inclusive, and as a result, the staff -- it's incumbent upon the tech. reviewers and our design organizations to look at the application when it comes in and look for changes for what we understood. So it's sort of a motherhood and apple pie --

MEMBER BROWN: Where was that you said?

MR. ASHLEY: It's under 6.2.2.-7. It's under -- that's the page number of the DSRS. It's in Section 3 of the review procedures that are available to the staff.

It also touches on -- I wasn't present at the 6.3 meeting in September. But there was conversation about Appendix B. And we also touched on in all the DSRSs there was sort of boilerplate language put in that recognizes the Appendix B considerations for this type of a review.

MEMBER BROWN: Is that the part where you talk about this list of examples as not intended to be all inclusive, is that the paragraph you're talking about?

MR. ASHLEY: That's correct. I don't know if that --

MEMBER BROWN: It's Review Procedures Roman Numeral III(1).

MR. ASHLEY: That's correct.

MEMBER BROWN: Okay, all right. I didn't read that one that way, but that's -- I guess that would do the trick.

MEMBER SKILLMAN: Let me ask this. I'm on the mark up 6.2.2-8 at the added in 1 and 2. And this has to do with general design criteria 5 sharing of components.

MR. ASHLEY: Okay.

MEMBER SKILLMAN: And the wording is "G5 applies to this DSRS because the multiple reactors share systems, structures, and components important to safety. For example, the UHS which is shared by all reactor modules must have sufficient inventory and heat sink capacity capability to service the UHS and spent fuel cooling for all reactor modules during commonly effecting events." I understand what that set of thoughts means.

Here's my question. Five years from now, ten years from now, we have this plant. It's got 12 of these modules. There's a question about the integrity of the boundary that is holding all that water in place. For the plants that we've been dealing with up until today, we've got one sump for one reactor. We don't have one sump for 12 reactors.

Is there an idea of how you might respond to the critic or to perhaps me and my colleagues, here's why it's okay to have one common pool for 12 cores?

CHAIRMAN CORRADINI: Common pool, you mean the outside --

MEMBER SKILLMAN: Bingo. Because that is the common -- that is the ultimate heat sink for all 12. So we've got these 12 machines in this great big pool. Some are running, some are not. Some are being bolted on, bolted and put back together and there's this thread of loss of integrity of the common pool. What's the answer?

MR. ASHLEY: I don't know the answer.

MEMBER SKILLMAN: We need to have an answer to that question.

MR. ASHLEY: I agree. I think it's cross cutting. It's more than just -- it affects all the accident analysis. You've got this common reactor pool, but I think that's part of the struggle that the staff will have looking at the design associated with that pool and providing reasonable assurance that we made our safety functions.

CHAIRMAN CORRADINI: Let me ask this question differently. If I were the staff, I'd ask the applicant how shallow can the pool be and still get away with decay heat removal? Right now, if I understand how the cartoon is, we have our canonical cartoon up there. Everything except the top itty bitty amount is full of water, but my guess is there's sufficient margin that I could have a half a pool or maybe even a quarter of a pool and I still could remove decay heat. I'd be very curious if that analysis is done or ought to be done to see at what point do I start challenging the ability to remove decay heat.

MR. ASHLEY: Certainly it would be a technical specification requirement for level.

CHAIRMAN CORRADINI: Right, correct. But even if there was a technical specification requirement, I've got this -- I think where Dick is going with this is I've got this enormous swimming pool, so I have to start making make up. I've got watch it. I've got to make sure that it's going to take some time to make it up because this is -- this is not a football field, but let's say from the 50-yard line to the end zone amount of water. So it's one hell of a lot of water that you've got to --

MEMBER SKILLMAN: I think the riddle is this. The water level must be high enough that the most recently full-run core with full burden of decay heat can be cooled by the level of water that is over the containment because that's a natural heat removal process.

And so the funny thing is, you can have 12 reactors, 11 could have been shut down for 2 years, but if your last remaining reactor has just done 24 months, flat out, and 5 weight percent fuel, you've got a full decay heat burden on that one machine. And so the water level surrounding that one containment must be sufficient to ensure that you can transfer the decay heat generation rate at a rate that protects that core. Of course, it decreases quite quickly, but you have to have enough water over that one containment to protect that one core.

So even though one might say well, golly, there are 12 and it's really not that great of a problem, I think it turns out to be a problem that is focused on the most irradiated, hottest, most recently run core.

MEMBER BLEY: We probably ought not try to solve that one here. They're going to have to work on it. But it's worse than that.

MEMBER SKILLMAN: It is worse.

MEMBER BLEY: I don't know what the shortest time interval is between refuelings, but they can refuel one after another, so we can get a much higher heat load than that.

MEMBER SKILLMAN: What I was really going after is what do you do if you're on watch and you have the perception of a failed containment boundary? We had that happen at TMI 2. And we said what do we do? And you kind of are in this sudden moment recognizing there's not a whole lot we can do. I mean we can't get to it. It's under water. We don't know where the leak is. That needs to be thought through for -- if you will, the ultimate heat sink that 12 reactors that are cooled by a common pool. That shouldn't be a surprise question and that shouldn't be a surprise answer. That's all I'm saying.

MR. ASHLEY: I agree. As a matter of fact, I would envision all 12 modules being at full power and all that decay heat having to be satisfied by the pool.

MEMBER SKILLMAN: There's a minimum and a maximum.

MR. ASHLEY: Right.

MEMBER SKILLMAN: That's what I'm -- okay. MR. CRANSTON: Excuse me. NuScale has made presentations to us, again, this is the PowerPoint stage because we haven't actually seen calculations. And we will get into it eventually to do these calculations, that if the situation occurred where they have a loss of coolant accident on one unit and then shut down all the other units to be able to focus on that accident and they have no pool make up or anything, they just have to sit there and watch what happened, that based on the heat loads and the quantity of the water in the pool, that they could actually allow the pool to slowly evaporate. And by the time the pool water got down to a level where the heat transfer effect from that water was minuscule, that air cooling would be adequate. That's what they're claiming. Again, we're going to have verify that by analysis. But they have a slide that they've shown us and they've made that presentation.

So we know that they've considered that and we'll just have to wait for the submittal and do the actual analysis to confirm it.

MEMBER SKILLMAN: Very good. Appreciate it. What I'm saying is what happens if there's a leak?

MR. CRANSTON: Yes.

MEMBER SKILLMAN: That's a little different situation. Thank you.

MS. BANERJEE: This is Maitri Banerjee. May I ask a question?

CHAIRMAN CORRADINI: Get closer.

MS. BANERJEE: This is Maitri Banerjee. I'm wondering, each module has some sort of an enclosure, walls around it?

CHAIRMAN CORRADINI: No.

MS. BANERJEE: No?

CHAIRMAN CORRADINI: There's a bay. There's a bay that separates them, but the bay is open to the common swimming pool.

MR. CRANSTON: The walls are between the modules, but not -- it doesn't close off the --

MS. BANERJEE: But is that going to allow certain level of water in case a leak develops elsewhere?

MR. CRANSTON: No, it's all -- the pool that goes down the middle, the portion of the pool down the middle is open to all the modules at all times. It's only side walls. It's all common.

The only rear wall that's in there that would protect is between the spent fuel pool and the rest of the reactor building such that if the reactor building pool water evaporated because you couldn't make it up and all the heat was being ducted in there and evaporating it, that the spent fuel pool itself wouldn't drain down below the top of the spent fuel because there's a rear wall there and that pool that would be maintained separately while whatever was going on in the rest of the reactor building happened.

MS. BANERJEE: Thank you.

MR. ASHLEY: Next slide, please. We have roughly three public comments on DSRS 6.2.2. I view them as primarily editorial when I took a quick scan of them, fixed some edits, and in general, I would agree with those public comments.

CHAIRMAN CORRADINI: So I have some general questions, but I don't think -- I'm sure I think I know the answer, but just to be clear, so the containment evacuation and as John quite quickly pointed out is one of the aux. -- auxiliary system is covered in 9. But my understanding is it runs continually to hold the pressure to whatever the tech. spec level is which I think currently is like 1 psia or something like that.

MS. GRADY: 1.5.

CHAIRMAN CORRADINI: I'm sorry?

MS. GRADY: 1.5.

CHAIRMAN CORRADINI: 1.5. So it is continually sucking away with essentially inflow of air, correct? It's not in an inerted containment. I'm asking this -- so here's where I'm going with this. If you look at this and you close your eyes, this is like a super small Mark 1, right? So it's not really a PWR, right? It's a BWR with a wet well outside. It's a strange sort of thing. So I'm trying to understand energy flows and what I have to watch. So the first thing I'm pretty sure is it's not inerted. I'm pulling vacuum on it and I'm sucking in leakage and everything is being held in quasi steady state at about 1.5 psia. Do I have that right?

MR. ASHLEY: I agree in principle, but

I'm not so sure that there's going to be an extensive amount of leakage, end leakage.

CHAIRMAN CORRADINI: Okay, all right. But the system will turn on and off. But my assumption is on that system it has isolation. And I know I asked this before, but I didn't write down the answer. Are the isolation valves both in and outside containment or are they of the type of some plants where they're both outside containment, the pair of valves are outside?

MR. ASHLEY: I believe for NuScale design is they want to have the valves on the outside addition.

CHAIRMAN CORRADINI: Has happened in other systems.

MR. ASHLEY: Yes.

CHAIRMAN CORRADINI: Okay, so that's point one. What is the percentage coverage of what is not covered by water? Are we talking like five percent of the surface area? And the reason I'm asking that question is this is kind of like the inverted AP1000 with a very small containment where in AP1000 or 600 you guys got all energized over that all the heat was going out the top because that's where you're pulling the film down. And then you could have a potential of essentially stratification of any sort of stuff like combustibles and accumulation. But here, the hot point is above.

So my question is I assume the staff is going to look at how gases mix and the heat transfer as the hot point now sits at top. So that some of the functionality of those valves might be -- maybe -- I don't know would be, but may be have to be checked relative to temperature differences.

MR. ASHLEY: They'll have to be qualified for the postulated environment that they're going to see.

CHAIRMAN CORRADINI: Okay.

MR. ASHLEY: And I don't have a sense for the percentage of surface area.

CHAIRMAN CORRADINI: I was just guessing by looking at about five percent.

MR. ASHLEY: I would say much less, but --

CHAIRMAN CORRADINI: Okay, right. And then you had something -- since I think you're done, you had something in Section 4, the evaluation findings that said something like "the staff review indicates that the applicant filed in GC-40 by design of the containment heat removal system to permit appropriate periodic pressure and functional testing to ensure structural leak kind of integrity." So they're going to a typical containment leak rate test?

MR. ASHLEY: They are. Whether or not it's consistent -- there is some discussion that NuScale wants to take somewhat of a -- I don't know what the right word, departure --

MEMBER BROWN: Is that an exemption that you're talking about? If it's an exemption --

MR. ASHLEY: There's some discussion in the staff. That's currently a dialogue. There's a gap analysis report that is public that NuScale has proposed certain positions they want to take. Today we weren't in a position to speak to those gaps because that's still within the --

MEMBER BROWN: I've heard about that.

MR. CRANSTON: Additionally, NuScale is submitting a topic report on that subject where they will tell us exactly what they want us to take an exemption to. What they indicated was that they would come in and just do a type A test, the full containment pressure test at a reduced pressure.

They didn't want to pressurize that containment all the way up to 600 pounds or greater. They'd rather do something less.

CHAIRMAN CORRADINI: So they want to do a different sort of containment leak rate test?

MR. CRANSTON: Yes.

CHAIRMAN CORRADINI: Then that kind of gets to my question. I was trying to understand what was the testing the staff was implying with this requirement? So the answer is it's in the mix of being discussed?

MR. ASHLEY: Yes. But Appendix J type testing.

MEMBER BROWN: Have they given you any basis for not doing a full pressurized or is that just what they're thinking about? We had a discussion on this before I think. I thought I remembered this. We hadn't?

MR. CRANSTON: They are concerned as far as what they've indicated to us is that when you have a vessel like that and you pressurize it with air to that pressure and something blows, it's not a good thing, like a penetration or something. They'd rather do it at a reduced pressure even though it's qualified for well over that pressure. That was what they indicated to us, but again, we're waiting to see what they describe in that topical report and what they're proposing.

MS. GRADY: The current design pressure they're talking about in pre-application --

CHAIRMAN CORRADINI: Are you on? Is your little green light on?

MS. GRADY: Yes, it's green.

CHAIRMAN CORRADINI: Speak louder.

MS. GRADY: I will. The current design pressure that they're discussing with us in pre-application meetings is a thousand pounds.

CHAIRMAN CORRADINI: For the containment.

MS. GRADY: Yes. Hence, the issue of reduced pressure for Type A testing.

CHAIRMAN CORRADINI: Okay.

MS. GRADY: And that has changed. It started off a little bit lower, but it's up to a thousand. That's design.

CHAIRMAN CORRADINI: Okay, so my question is to TBD, to be determined?

MR. ASHLEY: That's correct. That's

correct.

MEMBER BLEY: I am just curious. Do you know what's driving it up?

MS. GRADY: They specified which accident could lead to that pressure, but I don't recall which one --

MEMBER BLEY: So maybe new calculations are somewhat higher pressures than they expected?

MS. GRADY: One of their calculations that we haven't seen, yes.

MR. ASHLEY: I think the real issue is it's just such a small containment.

CHAIRMAN CORRADINI: Well, the free volume, that's where I went back to my whole analogy. This is kind of like the second vessel.

MR. ASHLEY: And it's a vessel that gets unfastened every refueling outage and gets bolted back together.

MEMBER BLEY: Before you go on, I wanted to go back to Dick's first comment. There is quite a bit of discussion about debris and about fouling. Were you suggesting they really ought to have a separate section or at least raise the issue of biofouling and bio-debris or I would have thought that normally you think of that in this, but I'm not sure.

MEMBER SKILLMAN: No, I was not suggesting there should be a separate section. But I am suggesting there needs to be vigilance to that potential and it's not one that's obvious unless you run one of these machines.

I think when I mentioned the idea of coliform, probably some people in the room kind of recoiled to that. Well, the fact is you get your make up water probably from the city and that's not -- that water is not pure and it's not sanitary. It's good enough to drink, but if you're taking raw water from the city, you probably have a very small amount of coliform. And with a little bit of oxygen, if there's any carbonite material, it will grow.

MEMBER STETKAR: It's borated, deionized water in the pool. It's like a refueling storage tank.

MEMBER SKILLMAN: I have seen borated deionized water grow leafy great vegetables. All I'm saying is heads up. Here we are at the DSRS stage. Let's make sure that we really address that. That's all I'm saying.

MEMBER POWERS: Dick's point here which is very good, I have seen triply distilled water over -- distilled over permanganate in the first stage develop fungus in collection.

CHAIRMAN CORRADINI: Are you on?

MEMBER POWERS: I am. Would I be anything else but on point.

CHAIRMAN CORRADINI: You're so quiet.

MEMBER POWERS: Have you recently had an auditory check?

MEMBER SKILLMAN: The reason that I made the comment, Dennis --

MEMBER BLEY: No, I understand, but I was wondering if you were looking for a change in the DSRS. I understand we want to pay attention to it.

MEMBER SKILLMAN: Clint understood what I said. A piece had been eliminated --

MEMBER BROWN: Won't be the reviewer.

MEMBER SKILLMAN: Well, I mean he's writing the DSRS.

MR. ASHLEY: Let me speak to that. There's two aspects of fouling. One is macrofouling like GSI-191 and then there's fouling of surfaces which if you look at DSRS Section 3 under Roman numeral II which -- this is under the DSRS acceptance criteria, page 6.2.2-4, we speak to that issue about surface fouling.

MEMBER BLEY: Oh, you do?

MR. ASHLEY: Yes. And the reason I put that in there is because I did some reading, looked at some operating experience. I looked at spent fuel pools to see if there was a potential for biological fouling and there was some hits on that of concern. And so most of those spent fuel pools were not borated and not treated.

I found less of an impact for borated, deionized water in like a traditional spent fuel pool. So I expected there will be less of a concern, but it's something that we want the reviewer to look at require the applicant to provide information on.

MEMBER SKILLMAN: We have no experience with residual water from a vacuum flask and the containment is a vacuum flask. And as Dr. Rempe pointed out, all kinds of crazy things happen. You can get phase change. You can get sublimation. You can get ice. My view is you can grow critters and they can screw up your heat transfer surfaces. That's really all I'm trying to communicate.

Joy really put her finger on something here. We can have some phenomenon that we have not seen before because this is technology that we have never experienced, at least on a large scale.

CHAIRMAN CORRADINI: The only thing though, I thought you were talking outside the pool and I was listening. But if I'm inside containment, then it's essentially reactor vessel water that leaked which means that if I had biofouling out there, I'll have biofouling inside the core, too, because it's the primary system water.

MEMBER SKILLMAN: You cook them. You cook them inside the core.

MR. ASHLEY: I will say this, there's quite high temperature in the containment, much higher than you would ordinarily associate with a large dry PWR. I don't want to get into proprietary information.

CHAIRMAN CORRADINI: We don't want to talk about that. But I know when we took the tour, they did tell us some temperatures and they were higher than you would first suspect.

MR. ASHLEY: Absolutely.

MEMBER BLEY: That kind of makes it

better and better for growing stuff, I would say, unless you get really high up to pushing boiling here.

MR. ASHLEY: But I think those considerations will have to be looked at.

MEMBER BLEY: Okay.

MR. ASHLEY: That concludes my discussion on 6.2.2.

MS. GRADY: I'm Anne-Marie Grady. I've been with the Agency since 2004. I'm in the Containment Systems Branch and also the PRA and Severe Accident Branch. And I'm here to talk to you today about the DSRS for combustible gas control.

First of all, there were no changes to the applicable GDCs. GDC 5 was already in 6.2.5 in the SRP.

There were very few changes in the acceptance criteria. There were major changes due to NuScale's design specifics and the major changes include we eliminated any reference to BWRs. We eliminated references to active containment atmospheric mixing systems because they're proposing to provide none of those.

We've added the general description of the NuScale design right up front in the DSRS. And we've made the focus more on severe accidents in accordance with 10 CFR 50.44.

And by that last bullet, I really mean in the SRP for 6.2.5, yet one of the acceptance criteria had to do with taking account of all of the materials in containment that could be corroded by, let's say, containment spray and putting inventories into the FSAR, that sort of thing. That was always meant to be as the hydrogen contribution in the design basis accident.

Ten CFR 50.544 is now almost exclusively focused on severe accidents. It was found way back by 2003 and certainly earlier than that that design basis accidents would not risk significance to severe accident events. So one paragraph was taken out that focused on the corrosion and the effects of the containment spray.

CHAIRMAN CORRADINI: So I have a question. I don't know how to ask this. I should have done some calculations to check it, but because this is such a small containment, and it's not inerted, is radial decomposition I build up gases if I had a release of primary system water into that, and I had radial decomposition, is it such a small volume that I actually would worry about a buildup of hydrogen and oxygen outside as well as inside? Do you know what I'm asking?

MS. GRADY: No.

CHAIRMAN CORRADINI: It's such a small containment. The inventories to worry about any sort of combustible gas ought to be of no problem because there's no oxygen or very little. But are there other ways to get to a problem? I'm just -- I haven't thought of any, but I'm trying to think out of the box because it's such a small volume.

MR. WAGAGE: This is Hanry Wagage from the staff. Actually, we ran into a similar problem to make sure --

CHAIRMAN CORRADINI: You ran it? Hanry say it slower.

MR. WAGAGE: Yes. We ran into a similar issue with ESBWR passive containment cooling system. Because of that we have been raising this issue every meeting and it's come up, and NuScale has gone on record that --

CHAIRMAN CORRADINI: Okay, but so you talked about an issue. Can you explain the issue you're worried about? Because I'm not sure I understand even what I brought up. It's so different. So what's your issue?

MR. WAGAGE: Okay. What I thought, you are raising the issue with generation of radiolytic gases in LOCA. And because there's things that condense and the radiolytic gases, hydrogen, oxygen, keeps accumulating in the containment and whether it would come to a detonatable level. That's what that developers worry about.

CHAIRMAN CORRADINI: You said it much better than I. Okay, but the reason I'm asking the question is because the free volume is so small and also I'm not sure about the mixing. I don't think there's an issue, but I would accumulate it up at the top because top now is hot instead of cold. So I don't think I'm going to cause some sort of stratification issue. But I just want to make sure staff is thinking about this relative because it's such a small volume and it's not inerted. So I sense the answer is you guys are at least thinking about it?

MR. WAGAGE: Yes, you are thinking about that we raised the issue to NuScale.

MS. GRADY: We certainly are thinking

about it, but the scenario you discussed, Dr. Corradini, is a design basis accident and 10 CFR 50.44 requires that the circ. water reaction, 100 percent of that, hydrogen regenerated from that be sent into the containment and be analyzed for potential combustion and potential detonation. So it doesn't have to be a deterministic accident to look at. You have to have to postulate an amount of hydrogen in containment and then analyze whether or not that could lead to detonation.

CHAIRMAN CORRADINI: But in their case because they started only at 1.5 or whatever it is. It's not of oxygen.

MS. GRADY: That is what NuScale says, therefore, it's a non-issue.

CHAIRMAN CORRADINI: Okay.

MS. GRADY: Is what they said.

CHAIRMAN CORRADINI: But I'm thinking differently. I'm thinking -- okay, fine. That was an artificial calculation that I'm not worried about. But on the other hand if I leak into containment I have -- and I have slow build up, that would concern me. I forgot we actually brought this over to ESBWR, but that was where I was coming from.

MEMBER REMPE: Again, if one thinks about the spent fuel casks and the drying process and they were worried about absorption of water on to surfaces during that drying and backfill process, is there -- again, and ice formation or whatever, you might get a false reading from the censors. During operation can you have some -- I mean they talk about residual moisture in the casks all the time. And can you give that, could you have some sort of radiolysis occurring? Are those kind of things going to be considered as you go through and evaluate the design?

MS. GRADY: Certainly.

MEMBER REMPE: So I mean not really an accident, just changes in the composition of the gas or the vacuum. Changes in the vacuum time, those kind of things?

MS. GRADY: Do you mean as part of the evacuation system design?

MEMBER REMPE: Well, you might decide -- again, it might show that there's a vacuum and there's no moisture in there and then with time, after you think you've got a vacuum could things change because of water desorption and because of the conditions changing, radiolysis occurring and things like that.

I'm not familiar enough with the design, but do they declare a vacuum, shut it off, and they move on and they don't monitor throughout the time it's in the pool?

CHAIRMAN CORRADINI: My impression is it's an active system that they have to continually watch.

MEMBER REMPE: They continuously monitor. So you would see that hydrogen, if it started to form or you would see a change in the vacuum that it had decreased.

MEMBER BROWN: But the vacuum system I thought acted such that it's always drawing --

MEMBER REMPE: It's always drawing.

MEMBER BROWN: Always drawing a vacuum.

MEMBER REMPE: Okay.

MEMBER BROWN: Based on the last comments.

CHAIRMAN CORRADINI: It's essentially a very -- a much more subatmospheric containment than we're used to.

MEMBER REMPE: Yes.

CHAIRMAN CORRADINI: It's like sirions stairways, but small containments.

MR. CRANSTON: And NuScale has indicated the higher tech. spec limit as far as vacuum, such that that was the initial condition.

MEMBER REMPE: And where would the hydrogen monitoring be done at? It is as you pull whatever comes off of the vacuum or is it something like containment with a monitor --

MEMBER STETKAR: The vacuum system is isolated when you have an accident so you can't monitor hydrogen out in the vacuum system.

CHAIRMAN CORRADINI: When you declare upon containment isolation, that's what I was asking earlier. That has to isolate.

MEMBER STETKAR: The vacuum is there as an insulator for normal operation. There's nothing about maintaining vacuum after an accident.

MEMBER REMPE: Say that again. It's not?

MEMBER STETKAR: The vacuum is there as a thermos bottle during normal operation to prevent heat transfer outside into the pool. They don't care about maintaining vacuum after an accident. So they isolate the vacuum lines. So you can't monitor hydrogen in the vacuum lines. It's got to be monitored in the --

MEMBER REMPE: Where in the containment is it monitored?

MEMBER STETKAR: I don't know. I would hope near the top.

MR. CRANSTON: Discussions are still going on with NuScale regarding what type of gases they're going to monitor during plant operation.

MEMBER SKILLMAN: I would like to ask this question if I could, please. I had the experience at a number of plants where the emergency diesel generators failed to start. They were cranked by compressed air and when the solenoid valves were commanded open to start the emergency diesel generators, the very slight moisture in the receiving tanks, the compressed air tanks, taking on its light and heat and vaporization, put an ice puck about as big as the end of your little finger in the solenoid, throttled to solenoid to where the air start motors had insufficient volume at pressure to crank the engine. I saw that happen in a number of places where I was doing consulting. So just hold that thought.

The issue is gas changing pressure into a different volume and the consequence of slight amount of moisture creating dysfunction. Is there an intermediate state in this containment with its vacuum system where there can be that same type of phenomenon where we're either trying to go from a high vacuum to no vacuum or from one pressure state to another to where we actually get moisture causing a freezing problem or a blockage problem?

MR. ASHLEY: I think if you look at the containment temperatures from normal operations, I don't think you'll -- I'll turn myself on.

CHAIRMAN CORRADINI: It's mostly important because all of our transcripts are picked up orally. We don't want to get them misconstrued.

MR. ASHLEY: I think the containment for normal operations, the containment is quite elevated in temperature. So I'm not so sure that there would be a freezing problem based on water leaking in, whether it be from the reactor pool or whether it be from the reactor itself, vessel having some inventory contribution into the containment.

MEMBER SKILLMAN: No, I would expect that containment to be fairly high in humidity with a fairly high water concentration, moisture concentration.

MR. ASHLEY: I'm not sure I share that observation.

MEMBER SKILLMAN: Then that might be a reason why there is no concern for moisture coming out of solution or moisture becoming an ice puck. We're dealing with a fairly large volume, even though like Dr. Corradini says it's a very small containment with a very low pressure. There still is moisture content and there's going to be a transport of material as you're either drawing a vacuum or letting the vacuum decrease to atmospheric pressure. Is there an in-between state there that needs to be examined? That's really the question I'm asking.

MR. ASHLEY: I think it's a good question. I'm not so sure that it's incumbent upon 6.2.2, a containment heat removal system to look at that. But I think you're looking at more of that normal ops. And I agree with your observation about taking compressed gas that has a high moisture content. When you expand that gas, you're going to have that cooling effect.

MEMBER SKILLMAN: I was really kind of pointing my question to Anne-Marie because she's talking about gas in this containment and I think the real thrust of that section is the radiolytic decomposition and how to handle the hydrogen that in that same environment you may have a high amount of moisture and under the right conditions that moisture could become a real problem.

MS. GRADY: Where do you see it becoming a problem?

MEMBER SKILLMAN: When its temperature and pressure potentially threaten the function of your -- whatever you might use to recombine the hydrogen and oxygen or whatever you might use to handle the hydrogen and the oxygen.

MS. GRADY: Okay. Currently, NuScale is not proposing to put anything in the containment to recombine the hydrogen, not igniters, not PARs, and not even hydrogen or oxygen monitors.

So at the moment that isn't under discussion. That has -- that's part of their position in the gap analysis.

MEMBER STETKAR: Anne-Marie, did you say -- I'm having trouble hearing you. Did you say they're not planning to install hydrogen monitors in the containment?

MS. GRADY: They are planning not to,

yes. That's what they propose. It's not necessary. In the gap analysis is what they're saying.

MEMBER STETKAR: Their assertion is there will be no oxygen, so therefore they don't care how much hydrogen.

MS. GRADY: Exactly, exactly.

MEMBER STETKAR: Okay.

MR. CRANSTON: We have not accepted that position by the way.

CHAIRMAN CORRADINI: We sensed that. I making notes and I wrote that down. Still under discussion.

MEMBER BALLINGER: Do we know what the dose rate --

MS. GRADY: Could I get back to Dr. Skillman? We would certainly consider your comment when we get into discussions about what they will be providing in the containment, but at the moment, it's not under discussion because it's not part of their design.

MEMBER SKILLMAN: Anne-Marie, thank you. I'm just kind of sitting here in my good old you don't know what you don't know state of mind. And you're on watch and you have this wallop, sounds like a concussion and you realize you just had a hydrogen detonation and you say to yourself, where did it come from? Well, actually, I had some moisture and guess what? I had disassociation and I had stoic and metric hydrogen and oxygen. How did that happen? Well, I just forgot to think about it. So I'm saying maybe we better think that through very thoroughly.

MS. GRADY: Yes.

MEMBER SKILLMAN: Thank you.

MEMBER BALLINGER: Do we know what the dose, gamma and neutron dose is at the interface between the containment and -- my guess is that the neutron dose is low by comparison. But the gamma dose might not be so low.

MS. GRADY: I don't know.

MEMBER BALLINGER: Because that's where radiolysis would occur.

MS. GRADY: Okay.

MEMBER BALLINGER: Okay? If you -- ten to the seventh rads, at the interface, you can get gamma radiolysis. You don't have to worry about neutron radiolysis. And then you've got a free system where any hydrogen or oxygen is just going to find its own place like above the top of the pool level. It may just be a no never mind, and the dose rate is ten to the third or something like that in which case there's no issue. But if it's 10 to the sixth or 10 to the seventh, you've got 12 of these units operating.

CHAIRMAN CORRADINI: Well, staff is -- I heard from Hanry that staff is watching.

MEMBER BALLINGER: Aye, aye.

CHAIRMAN CORRADINI: So we're watching staff.

MS. GRADY: I don't have any more comments. Do you have questions?

And we received no public comments on this section.

CHAIRMAN CORRADINI: Other questions from the committee?

Joy, questions?

MEMBER REMPE: No questions.

CHAIRMAN CORRADINI: Going once, going twice. I've run out of questions. I appreciate it.

Okay, before we end this, let me ask if there's people in the audience here from the public that want to make to make a comment. Anybody here in the audience? Okay.

Anybody on the phone line, please at least acknowledge your presence by grunting or saying hello.

MR. LEWIS: My name is Marvin Lewis. I was in no way trying to hide the fact that I was here. I have also left a message on the contact's phone as far as I know, although I don't even remember the name of the contact.

CHAIRMAN CORRADINI: So you have a comment, Marvin?

MR. LEWIS: Yes, yes, I do. And I do appreciate the fact that you have asked more than one time. I really needed that.

My comment is a very simple one. You know, people have had problems with hydrogen before and one of those people was a technician by the name Hartman, H-A-R-T-M-A-N, back in 1979 at Three Mile Island. Namely, he was bubbling hydrogen through a measuring tank that was looking at the leakage rate. He was taking data from a tank in order to get a leakage rate. And at the same time there was hydrogen bubbling through in which controlled corrosion.

And sure enough, he got leakage rates when he turned the hydrogen off. That was quite significant. When he turned the hydrogen on, it looked like there was no leakage, of course, because it expanded the volume of water by bubbling hydrogen through it.

And so he asked his supervisors, what is he supposed to do? And his supervisor said leave the hydrogen bubbling through. Okay. Direct orders. Of course, he did it and he brought it up in sworn testimony after a certain thing happened at Three Mile Island 2.

And I'm just wondering if you're getting yourself into the same situation, namely, there is hydrogen often at places you'd never suspect, and not necessarily hydrogen generated by radiolysis. And I'm just wondering if there's a tank in that system that allows hydrogen to be bubbled through the coolant to control corrosion and can that hydrogen be bubbled through to hide the fact of a leakage and we're going to have the same situation here as we had at Three Mile Island 2 three months after the fuel was loaded in the middle of the night because somebody was able to get a judge to write an emergency order to load fuel.

That's my feeling on this subject. I

hope you will check into the Hartman testimony at Three Mile Island and thank you for listening.

CHAIRMAN CORRADINI: Okay, thank you very much, Marvin. We've got your comments on the record.

MR. LEWIS: I appreciate that.

CHAIRMAN CORRADINI: Is there anyone else on line, on the line? Okay. Hearing nobody else, could you close the outside line?

All right, so let me first remind everybody where we are. So this is the last -- is save for Chapter 7 which we are going to discuss in November. The date has escaped me now, November 19th. I think that's correct. Save for that, we have no formal plans to look at other DSRS sections, right? I'm looking at Greg, too, he's watching me.

We are going to have a subcommittee meeting on how staff is going to resolve the comments, the public comments from the DSRS and that's scheduled for the day before on the 18th. But it's not my plan to look at any other DSRS section. So that's one thing for the subcommittee to consider.

The second thing is at least at this point in my mind, we have a lot of little things that we've communicated to the staff that nothing rises to a level where I think there is a significant issue. But I'm going to write this up in some fashion for the subcommittee and the full committee to look at.

With that as an intro, let me go around and see if any members of the subcommittee want to say anything else?

Dick?

MEMBER SKILLMAN: I do. Thank you, Mike. I think the idea of 12 reactors sharing a common ultimate heat sink when that heat sink is bounded by a man-made boundary, specifically the poured concrete and whatever liner might be on that concrete, is an issue that deserves special attention. Thank you.

CHAIRMAN CORRADINI: Dana?

MEMBER POWERS: No.

CHAIRMAN CORRADINI: Steve.

MEMBER SCHULTZ: No comment.

CHAIRMAN CORRADINI: John?

MEMBER STETKAR: No, nothing, nothing.

CHAIRMAN CORRADINI: Dennis.

MEMBER STETKAR: No comments.

CHAIRMAN CORRADINI: Charlie?

MEMBER BROWN: Only one request. Since we have the Chapter 7 still to go, I presently have a copy that I got some months ago of the proposed Chapter 7 for NuScale and I have asked to make sure -- it's my understanding that there have been some changes to it. So if someone could get with Christina Antonescu and just make sure that I've got the latest version and that the committee has the latest version if they so desire to look at Chapter 7.

The other relevant piece of information for that review is the mPower Chapter 7, whatever the recent -- I think there's now an approved version of that out somewhere that's been -- got the Betty Crocker Good Housekeeping Seal of Approval or something and I would like, Christina, to make sure I have the most recent version of that because if it largely mirrors that without any changes in the areas where I am primarily -- where I get jacked up --

CHAIRMAN CORRADINI: Charlie has major ownership, so --

MEMBER BROWN: I just want to be able to a do a comparison because I know what theoretically they put in mPower. I'm going to check it against my comments before just to make sure they did it again and then see if this is the same. It makes it relatively easy. If it's not, then it makes it more difficult, that's all. I'll take that action, too.

CHAIRMAN CORRADINI: I was going to say, what we have, what you've given us is the July dated Chapter 7. So if there's any newer --

MEMBER STETKAR: My file date is July.

CHAIRMAN CORRADINI: That's what I've got also.

MEMBER BROWN: But I think it's an earlier -- I don't remember. I'll have to go back. I didn't open my file to look at it.

MEMBER STETKAR: It's Rev. 0 dated June 2015 are the files that at least I have.

MEMBER BROWN: That's the file date. Is there a date on the cover?

MEMBER STETKAR: Rev. 0 dated June 2015 and the footer is on the file pages.

MEMBER BROWN: So again, the mPower thing is important to get that one also because that's my reference point. Thank you.

CHAIRMAN CORRADINI: Joy?

MEMBER REMPE: No comments.

CHAIRMAN CORRADINI: All right,

MEMBER BROWN: The earlier the better. I'm finished.

CHAIRMAN CORRADINI: Okay. You're sure? Okay. So I don't have any other further comments. I think we kind of know where we're going. So we have a plan to see each other for a half day on the 18th to hear about how you're disposing of public comments and on the 19th about Chapter 7 and that would essentially be what we plan to discuss.

If the committee feels there's other things we need to discuss in terms of DSRS, you've got to let me know so I can communicate with Greg because we have two half days planned and nothing else planned on the DSRS. Okay? All right, with that, we're done, adjourned.

(Whereupon, the above-entitled matter went off the record at 9:44 a.m.)

ACRS Presentation on the NuScale Design Specific Review Standard (DSRS) Sections 6.2.2 and 6.2.5

Gregory Cranston,
Sr. Project Manager
Office of New Reactors
7 October 2015

NuScale DSRS Briefings to the ACRS Subcommittee on Future Reactors

- Public comments received and sent to technical branches
- DSRS comment incorporation and updating in progress
- Some DSRS sections may revert back to SRP sections

NuScale DSRS Briefings to the ACRS Subcommittee on Future Reactors

- Purpose: provide ACRS with approach staff took developing selected DSRS sections
- During the course of these presentations staff will cover:
  - What changed SRP to draft DSRS
  - Why change made (new system, elimination of system, significant design difference, etc.)
  - Questions based on the design information available to date

NuScale DSRS 6.2.2

Containment Heat Removal Systems

by

Clint Ashley

7 October 2015

DSRS 6.2.2 - CHRS

- Changes between SRP 6.2.2 and DSRS 6.2.2 due to NuScale design:
  - Added general description of NuScale design
  - Added GDC 5: Shared Systems (e.g., reactor pool)
  - Eliminated net positive suction head review
  - Eliminated containment spray review
  - Eliminated fan cooler review
  - Added fouling consideration for submerged containment

DSRS 6.2.2 CHRS Public Comments

- Three public comments
  - Editorial in nature
    (e.g., rewording to be consistent with NuScale design)
  - Preliminary review:
    Staff agrees with proposed changes

NuScale DSRS 6.2.5

Combustible Gas Control System

by

Anne-Marie Grady

7 October 2015

DSRS 6.2.5 CGCS

U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

- No change in applicable GDCs
- Few changes in acceptance criteria
- Major changes due to NuScale design specifics
- Major changes include:
  - Eliminated BWR material
  - Eliminated references to active containment atmospheric mixing systems
  - Added general description of NuScale design
  - Focus more on Severe Accidents in accordance with 10 CFR 50.44 (C)

DSRS 6.2.5 CGCS Public Comments

- public comments
  - None

Closing Remarks
ACRS SC Meeting

Comments or Questions?