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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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TUESDAY, AUGUST 18, 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 Corradini, Chairman, presiding.

COMMITTEE MEMBERS:

MICHAEL CORRADINI, Chairman

RONALD G. BALLINGER, Member

DENNIS C. BLEY, Member

DANA A. POWERS, Member

JOY REMPE, Member

STEPHEN P. SCHULTZ, Member

GORDON R. SKILLMAN, Member

JOHN W. STETKAR, Member

DESIGNATED FEDERAL OFFICIAL:

MAITRI BANERJEE

NRC STAFF PRESENT:

GREG CRANSTON

JENNY GALLO

EVELYN GETTYS

JAMES GILMER

JEFFREY SCHMIDT

A G E N D A

P R O C E E D I N G S

8:30 a.m.

CHAIR CORRADINI: Okay. The meeting will come to order. This is a meeting of the Future Plant Design Subcommittee of the ACRS. My name is Mike Corradini. I'm the Chairman of this Subcommittee, or at least this Subcommittee meeting; one is never sure on a day to day basis.

ACRS Members in attendance are Dennis Bley, John Stetkar, Dana Powers, Dick Skillman, Steve Schultz, Joy Rempe, and Ron Ballinger. Ms. Maitri Banerjee is our 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 for the 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 three sections of the DSRS, 5.4, 5.4.7, and 15.9A. These involve reactor coolant system components, subsystem design, reactor residual heat

removal system, and thermal hydraulic stability, respectively.

The rules for participation in today's meeting were announced in the Federal Register on August 14, 2015, and the meeting was announced as an Open To Public meeting. No request for making a statement to the Subcommittee has been received from the public.

We have one bridgeline established. The bridge number and password were published in the agenda posted on the NRC Public Website. To minimize disturbance, 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 the designated times at the end of the meeting.

Dr. Rempe has a conflict of interest in the area of NuScale's Severe Accident Considerations because of her prior work that she completed for NuScale in this area, so she will recuse herself from discussions in this particular area.

I'll add one more extemporaneously, this is the first of a series of meetings we're going to have where Staff is going to identify, and we can also self-identify parts of the DSRS that have substantial

enough technical changes that we want to hear about them. There are a lot of changes that are, I'll use the word typographical, reorganization, but don't really involve technical substance, but I will leave it to the Staff to do a first cut as to what are the things we should look at, and then I look to the Members if there's other things that we want to look at. Also, remind everybody that we in discussing the mPower SMR have already started looking at the Chapter 7 Digital Instrumentation and Control System, so that's a separate activity that our colleague that Charlie is running, and we'll have separate meetings as that concludes.

I don't think there's anything else, so let me turn to Greg Cranston, the Project Manager. Where is Greg? I'm sorry, Greg. I keep on always looking there to introduce all the presenters and get us started.

MR. CRANSTON: Good morning. My name is Greg Cranston, and I'm the Senior Project

CHAIR CORRADINI: You've got to press the button. You're like I am, we have new policy. Press it to turn green. Thank you.

MR. CRANSTON: Sure enough. Good morning. My name is Greg Cranston. I'm the Senior Project Manager

for the NuScale project. As mentioned this morning here, we're to present some selected Design-Specific Review Standard sections from the NuScale project. With me is Jeff Schmidt, who will be talking about the reactor coolant system and decay heat removal, and Jim Gilmer, who will be talking about thermal hydraulic stability.

As mentioned, this is the first in a series of selected Design-Specific Review Standard sections. The draft, the SRS' have been developed based on NuScale design information available to the Staff at the time, and we will have an opportunity to provide minor changes and updates based on comments that are received.

The NuScale DSRS' are currently out for public comment, and comments are due at the end of this month.

CHAIR CORRADINI: When were they released to the public? I forgot now.

MEMBER STETKAR: If you're going to speak turn your microphone on so we can get you on the record.

MS. GALLO: June 30th.

MR. CRANSTON: So, we're here to provide the ACRS with the approach the Staff took in developing the draft DSRS', and what we want to cover is what has

changed from the Standard Review Plans that are in NUREG-0800 to the current draft Design-Specific Review Standards, and why the change was made. And those are the topics we'll cover.

The DSRS' were developed to provide plant-specific guidance to NuScale. When you look at the NUREG-0800, all the SRPs, we were able to use 134 Standard Review Plan sections as is for NuScale. Others were modified to varying extents, so we have currently 116 design-specific review standards specifically for NuScale.

And this interaction facilitated early engagement between the Staff and the Applicant to better understand the design, and also to help in preparation of the documents which were based on the design information that was available at the time.

Risk insights are not reflected in the DSRS. That's primarily because risk information is still coming in. For example, we just received from NuScale a Topical Report on Risk Significance Determination last month. And we will be getting more information that will be critical during our readiness reviews that are probably going to start around March. And subsequent to that risk information applicable to

DSRS, or the Standard Review sections will be provided to the reviewers prior to docketing the application.

The Staff created the DSRS for mPower to give you a little bit of background as to how we got to where we are back in 2012. In May of 2013 the mPower Draft was released for public comment. At that time, not only public comment was received in general on that document, but NuScale also provided specific comments on the mPower DSRSs that would be applicable only to NuScale to give us some insight as far as what might be different. So, we took all the comments on mPower that were applicable, plus the NuScale-specific ones, and those were used in the development of the NuScale DSRSs, so we're hoping that maybe we won't get as many comments on the mPower DSRS --- excuse me, on the NuScale DSRSs because of that. All the applicable comments on the mPower DSRS were resolved by the Staff, and as I said, incorporated into the NuScale DSRS.

As I mentioned earlier, the NuScale draft went out on June 30th, public comment period closes the end of this month, and we are tentatively scheduling the ACRS Future Reactor Subcommittee briefing on all the comments sometime in early November.

MEMBER SCHULTZ: Greg, if you could back up for a moment?

MR. CRANSTON: Yes.

MEMBER SCHULTZ: Could you give an appreciation for the amount of material in terms of public comments that were received that were --- on the mPower draft that were applicable to NuScale?

MR. CRANSTON: I don't have that number. I know there was about 2,000 comments received total for mPower.

MEMBER SCHULTZ: This helps. Thank you.

MR. CRANSTON: But I don't know specifically what the breakdown was between that.

MEMBER SCHULTZ: Okay.

MR. CRANSTON: The one thing I can add ---

MEMBER SCHULTZ: They've all been reviewed.

MR. CRANSTON: Yes.

MEMBER SCHULTZ: So, that's a healthy amount of comments that were ---

MR. CRANSTON: Yes.

MEMBER SCHULTZ: --- at least identified and evaluated.

MR. CRANSTON: Yes, and that includes both

editorial, as well as more typical comments.

MEMBER SCHULTZ: Okay.

MR. CRANSTON: In conjunction with the comparison, even though we have 116, as I mentioned, DSRSs, at least 80 percent of those have relatively minor changes, almost --- not much more than a name change.

CHAIR CORRADINI: You mean of 2,000.

MR. CRANSTON: No. Of the 116 DSRSs that were --- that had been previously looked at that were applicable to mPower, about 80 percent of those that are now NuScale DSRSs are really almost identical to mPower.

CHAIR CORRADINI: Just --- I don't like doing numbers, but on the other hand, just to get a handle on it. So, we're talking of the 116 that are ----- what you think are NuScale-specific.

MR. CRANSTON: Yes.

CHAIR CORRADINI: Okay.

MR. CRANSTON: That's correct.

CHAIR CORRADINI: So, something on the order of a couple of dozen are substantive enough that either we're going to discuss them or we might want to discuss them.

MR. CRANSTON: How many --- I guess the number ---

CHAIR CORRADINI: I took 20 percent of 116 and added some uncertainty factor.

MR. CRANSTON: Well, it's a little bit less than that because even though --- the 80 percent were essentially identical, and then there's varying degrees of changes in the remaining 20 percent. So, we tried to pick those that had substantial changes from the Standard Review Plans, and those that had also technical changes. In some cases, the significant difference was based on just a lot of rearranging. We tried to cull those out, if we could.

CHAIR CORRADINI: Okay.

MR. CRANSTON: The Staff did take the opportunity to develop DSRSs in some cases to provide clarification to facilitate the review later without any substantial technical revisions, which we supported.

MEMBER BLEY: Okay, just --- I think I heard this right, and I want to make sure. You didn't just suggest the ones that had substantial changes from mPower, but the ones that had substantial change from the standard.

MR. CRANSTON: Yes.

MEMBER BLEY: Okay. And that's important because we only looked at one of the mPower ---

MR. CRANSTON: Yes, we decided to go back to kind of like the original source as far as what is significantly changed.

MEMBER BLEY: Okay.

MR. CRANSTON: And mPower ---

MEMBER SKILLMAN: Greg, before you proceed.

MR. CRANSTON: Yes?

MEMBER SKILLMAN: Of the ones that, if you will, are different, can you identify any for NuScale that are both different from mPower, and that somehow crossed the general design criteria? In other words, they were really substantive; not only were they different from mPower, but they are different from the way we currently think about NSSS design?

MR. CRANSTON: Yes. Actually, one of the ones we're talking about today will fall into that category, but to give you kind of an example, when you look at their requirements for being able to shut the plant down using --- the way the general design criteria are written up, that you would have emergency

core cooling, which would be able to inject poison. And the ECCS system for NuScale is totally different, it's a natural circulation system. It does not have the capability to inject boron or any kind of poison, so there's other ways that NuScale is describing how they meet the general design criteria, or will be requesting an exemption, or whatever in conjunction with that. So that's an example where it's just completely different, and we're working right now to --- we're meeting with the Division Directors in DNRL to discuss the best way to handle some of these situations as far as what NuScale is requesting versus what we're comfortable with providing responses to.

MEMBER SKILLMAN: Would you be willing to propose an estimate of how many items like that there are?

MR. CRANSTON: Most of them relate to their CDCS system, their emergency core cooling system, and their natural circulation as far as containment heat transfer. For example, you know, they can't test per se post-accident containment heat transfer on a periodic basis because it's all natural circulation and basically water-to-water transfer that they really can't simulate, so there's those areas.

As far as a number, if I was going to equate the number to Design-Specific Review Standard, I'd say it's just a handful that are significantly different.

MEMBER SKILLMAN: Thank you.

MR. CRANSTON: Jeff, did you have any other thoughts? They're mostly in the reactor systems area.

MR. SCHMIDT: The only one I think I might add would be the Class 1E power.

MR. CRANSTON: Right. That's a good one, too, yes.

MR. SCHMIDT: Would be the one that I would add to that list, but ECCS, decay heat removal systems, they're all different. They're different from mPower, as well.

MR. CRANSTON: Yes, they don't have emergency diesel generators, nor do they want to have Class 1E AC or DC power.

MEMBER SKILLMAN: Because they're depending on the passivity of the designs.

MR. CRANSTON: Yes. They're basically saying that they don't need --- everything is failsafe, and once it goes to its failsafe modes it's all natural circulation, basically.

MEMBER SKILLMAN: And will we discuss these

in detail a bit later?

MR. SCHMIDT: For the decay heat removal system we will. We'll get into a little bit of the design, not too much.

MEMBER SKILLMAN: We won't talk about emergency power until we're talking Section 8?

MR. SCHMIDT: Correct.

MEMBER SKILLMAN: Fair enough. Okay, thank you.

MS. BANERJEE: Can I ask a question, please? This is Maitri Banerjee. Some policy issues that are holding up some of the sections may come back later to be substantial. Right? Like emergency planning, control room operation?

MR. CRANSTON: Yes, those are still being looked as far as what we're going to be comfortable with. Part of the reason that we're meeting with the Division Directors in DNRL is to discuss whether or not some of these issues are policy issues, or they can be handled through the exemption process, and control room staffing is one of them. So far we haven't identified specifically any policy issues but we're still in the review process for those to determine how we want to handle those positions that NuScale has next as far as

control room staffing, for example.

CHAIR CORRADINI: Make sure my green light is on. So, to put it a different way, you're still at the stage to decide what's policy, what's technical within the Staff.

MR. CRANSTON: Yes.

CHAIR CORRADINI: Okay. And the DS --- and depending upon that discussion, the DSRS sections will pop up in some sequence to us, if substantive.

MR. CRANSTON: Yes.

CHAIR CORRADINI: Okay. I'm trying to negotiate my way through this way, navigate my way through this whole process and I'm still a little bit muddled.

MR. CRANSTON: Okay. For example, currently you mentioned Class 1E power. The Design-Specific Review Standard now does not take a position that Class 1E power is not required. It's set up to do the review ---

CHAIR CORRADINI: As if it were there.

MR. CRANSTON: --- as if it were there, or if it's okay not to be there, how you would --- it's set up --- it's open minded I guess is what I'd say at this time, because we have not yet determined and agreed

that NuScale does not need any Class 1E power because we don't have sufficient design information at this point in time to do so.

Okay. At this time, I'd like to turn the meeting over to Jeff Schmidt who's going to talk about DSRS Section 5.4, Reactor Coolant System.

MEMBER BALLINGER: Excuse me. I have one more question. I had to grab this little thing and turn it on, so I was trying to be unobtrusive.

For the cases where there's an obvious difference that we need to look at that obvious, but who decides whether or not --- there may be a gray area that says this is --- we think this is not a substantive change, but maybe it could be. Who makes the decision on what comes before us?

CHAIR CORRADINI: They have a --- if I might help you. They have a --- I've read this enough times. There's a paragraph qualifier in here that says regardless of anything, you revert to essentially --- you've got to show essentially adequate protection. So, I would assume Staff is the ultimate arbiter.

MR. CRANSTON: Yes, and that's why we're also bouncing off the Division Directors as far as what

category they think it falls in, a policy issue, an exemption. Hopefully we don't get to rulemaking or anything like that. We haven't seen anything that significant as yet.

MEMBER SKILLMAN: Greg, I can't help but ask this question. When I think back years ago, I know one plant that is well known by many people was designed to not have emergency diesel generators. And the reason it didn't have emergency diesel generators is because it depended upon a very large hydro plant on site. And for those of you who don't know the story, it took 20 years to finally do a full load capacity test to demonstrate that the hydro plant would provide 4160 for ECCS, and that utility was finally forced in the emergency diesel generators.

I guess the point I make is that we've learned through trial and error in this business over 50, 60 years some things you just need to have. You need to have backup electrical power that's 100 percent dependable no matter what's going on. And we had that reinforced four years ago in Japan.

It seems that deliberations over whether a passive system may or may not need electrical power is almost a trap, and that the Agency should simply say

you know what, if you're going to have a core that has decay heat, you're going to have a decay heat removal system that's for certain able to remove that decay heat, and it will have emergency power no matter what, period. Why isn't the discussion that strong?

MR. CRANSTON: Well, we're currently still evaluating their position. They are submitting a topical report this month or next on what they're defining as highly reliable power. They've indicated they have the same separation and construction requirements as you would find for Class 1E power. They do have backup diesel generators that aren't classified as 1E, but they're also still in the process of putting forward their analysis as far as okay, if we lose all power, here's how the plant operates. There's nothing in their position currently, there's nothing the operators do or can do. It's --- the only thing they don't have, and this is one area that we're questioning them, is what kind of indication do you have to know that things are happening the way you want them to, even if you can't do anything right away? And that's why they're leaning more on this highly reliable power approach rather than Class 1E, so we have not accepted their Class 1E approach. We're still evaluating the

other aspects of the plant to look at how systems are classified, how they operate, how they function on loss of power. And that's why we did not change the DSRS for electrical power to acquiesce to no Class 1E power. So, it's still open. We haven't accepted their position.

MEMBER SKILLMAN: Okay.

MR. CRANSTON: But we're still listening to what they have to say.

MEMBER SKILLMAN: Thank you.

MR. CRANSTON: Anything else? Jeff.

MR. SCHMIDT: My name is Jeff Schmidt. I'm from the Reactor Systems Branch of NRO, and the first DSRS we're going to talk about is 5.4, which is the Reactor Coolant System Component and Subsystem Design.

This one didn't change substantially. Basically, 5.4 outlines a overview of how you review the subsections of 5.4, like 5.4.7, for example, the subsections of 5.4, so it's more like a project management document. It does assign areas of responsibility for the reviews of the various 5.4 subsections. For instance, like 5.4.7 is Reactor Systems Primary Review. It also sets up secondary reviewers, so it kind of lays out the areas of responsibility of the reviews of 5.4. There was no

change in the areas of responsibilities for 5.4. Could you back one slide?

And then the reasonable assurance finding is made under each of the various subsections of 5.4, not really in 5.4 itself. So, again, this really sets up who's responsible as the primary and secondary reviewers, but --- next slide, please. But it does go into what components and systems the primary and secondary reviewers are. So, there are a lot of text changes to 5.4.

So, there were major changes due to the NuScale design, major changes included eliminating all BWR material, eliminating RCP material. That's a fairly big section in 5.4, referencing the helical steam generators instead of the standard U-tube steam generators, and referencing the reactor vent valves, and reactor circulation valves.

CHAIR CORRADINI: Can I ask on that one, because as you said, 5.4 looked more like a roadmap that points you different places.

MR. SCHMIDT: Right.

CHAIR CORRADINI: So, in the pointing of the fourth on the reactor vent valves and reactor recirculation valves, are we going to come back to that

review later?

MR. SCHMIDT: Yes, that's a 6.3. That's on your schedule.

CHAIR CORRADINI: Okay.

MR. SCHMIDT: That's on September 9th.

CHAIR CORRADINI: Okay, fine.

MEMBER STETKAR: Jeff?

MR. SCHMIDT: Yes?

MEMBER STETKAR: I have a couple of questions.

CHAIR CORRADINI: Could you press your button, please.

MEMBER STETKAR: Thank you for reminding, sir. I was deficient in that, and I am appropriately chastised. Damn.

CHAIR CORRADINI: I've been waiting for that for four months.

MEMBER POWERS: It's just that we need to get you on the record.

MEMBER STETKAR: I --- seriously, how carefully did you guys look at the cross-references? Because since we mentioned reactor vent valves and recirculation valves, reactor safety valves, I didn't try to dog all of those references, but when I saw some

that seemed a bit odd, I thought about them. So, I was curious why I'm --- why you're referring to a review in Chapter 10 for reactor safety valves, materials of fabrication?

MR. SCHMIDT: That's part of 5.4 review. That's another subsection of the 5.4 review.

MEMBER STETKAR: Under a section that says reactor safety valves refers the reviewer to Chapter 10.

MR. SCHMIDT: Oh, instead of Chapter 5.

MEMBER STETKAR: Or something other. And I found a few other places that seemed a bit odd, so ---

MR. SCHMIDT: Said reactor safety valves and not like main steam safety valves?

MEMBER STETKAR: The title of the section is "Areas of Review, Item 6, Reactor Safety Valves." And the quote is, "The organization" --- I won't quote the whole thing. You get down to the bottom and it says, "While doing secondary review, assess the materials of fabrication for RCS pressure relief devices, reactor coolant depressurization systems under DSRS Section 10.3.6."

MR. SCHMIDT: Yes, that seems incorrect.

CHAIR CORRADINI: Which is secondary ---

MR. SCHMIDT: It should be under 5.

MEMBER STETKAR: Yes, it does. So, I was curious --- and I found several other references that seemed a bit odd. I didn't try to track all of them, so I'm curious how carefully in this god-awful roadmap you actually looked at the cross-references.

MR. SCHMIDT: You know, on this one we didn't look too closely because it was --- really we weren't trying to change the roadmap.

MEMBER STETKAR: Well, maybe the roadmap was wrong. Maybe it ought to be right now.

MR. SCHMIDT: Yes.

MEMBER STETKAR: Okay.

MR. SCHMIDT: Yes, that's a reference I don't understand.

MEMBER STETKAR: Now, another thing that I did notice, and this is more substantive. That's just editorial nitpicks and I was hoping somebody would pick that up.

When you refer to the once-through helical coil steam generators, Item 1 in the area of review, there are several citations to what a reviewer should look at in Chapter 15. It says the following, "Anticipated operational occurrences and postulated

accidents, decrease in feedwater temperature, increase in feedwater flow, increase in steam flow, inadvertent opening of a steam generator relief or safety valve, steam system piping failures inside and outside of containment PWR, feedwater system pipe break inside and outside containment PWR." It struck me that I didn't see steam generator tube rupture there, so I thought gee, I'll go look and see what section of Chapter 15 relates to steam generator tube rupture, and I found that it's 15.6.3, "Radiological Consequences of Steam Generator Tube Failure PWR." And in ADAMS accession number reference ML-15156B063 it is stated that that section shall be deleted for the review of NuScale. Why are you deleting the review of tube ruptures for NuScale?

MR. SCHMIDT: It wasn't out intention to delete them for ---

MEMBER STETKAR: Okay. Well ---

MR. SCHMIDT: Where does it say that, that we're deleting ---

MEMBER STETKAR: Okay. I'm looking at a document titled --- let me get up to the ---

CHAIR CORRADINI: I can't find it.

MEMBER STETKAR: Well, it was sent to us,

you know, so I take it --- NuScale Design-Specific Review Standard ESRS Scope and Safety Matrix.

MR. SCHMIDT: I'm not familiar with that document.

MEMBER STETKAR: And I wanted to read the ML number, because it's dated --- it's Revision 0, June 2015. And, again, for the record it's ML-15156B as in boy, 063. And this is, as I understand it, the master cross-reference that goes through all sections of the Standard Review Plan, and says is there a specific DSRS section.

MR. SCHMIDT: Right.

MEMBER STETKAR: Will the existing section of the Standard Review Plan be used, or is that issue not relevant? And I wanted to save this until we got to 5.4 because it's a specific example. And, in particular, when I come down to 15.6.3, it says it doesn't apply to NuScale. So, that is really curious.

MR. SCHMIDT: Yes, I can't see how that is.

MEMBER STETKAR: And that then leads me to be really curious about how carefully people thought about all of these sections and whether they apply to NuScale.

MEMBER POWERS: Again, that was --- it's

not because that --- there are a couple of treatments in the Standard Review Plan of steam generator tube ruptures, some of which have been replaced by later versions. 1.1.83, I think replaces 1.3, or something like that.

MEMBER SKILLMAN: That's true.

CHAIR CORRADINI: So, what you're saying is this could be deleting an archaic version?

MEMBER POWERS: It's archaic only in the sense that ---

CHAIR CORRADINI: It's been replaced.

MEMBER POWERS: Yes, modern reactors don't use it, but existing reactors are still subjected to it. And it may be no more than that.

MEMBER STETKAR: Well, where in the Standard Review Plan does the reviewer look at steam generator tube ruptures?

MEMBER POWERS: I would suspect it's 1.1.83, but for a modern reactor.

MEMBER STETKAR: 1.1.83 is a Reg Guide, it's not ---

MEMBER POWERS: I'm sorry.

CHAIR CORRADINI: It's not a Standard Review Plan section.

MEMBER POWERS: Yes. I ---

CHAIR CORRADINI: So, the Standard Review Plan would refer to a Reg Guide, but not Design-Specific Review Standard

MEMBER POWERS: Yes. I don't know that that's ---

CHAIR CORRADINI: We need to look into Chapter 15 or something.

MEMBER POWERS: I don't know that that's the case, but I'm wondering because there's been some evolution ---

MEMBER STETKAR: I mean, I looked under LOCAs, you know, I actually pulled out the DSRS for NuScale under LOCAs thinking well, maybe for some reason you folded it in there, but it isn't in there.

MR. SCHMIDT: No, there's ---

MEMBER STETKAR: And it wouldn't be.

MR. SCHMIDT: Right, yes.

MR. CRANSTON: There are several ---

MEMBER STETKAR: I was struggling.

MR. CRANSTON: I'm sorry. There are several Standard Review Plans which includes 15.6.3. There's 6.2, 6.3, 6 --- several others that have been converted and covered by 15.0.3. It's picked up that ---

MEMBER STETKAR: That may be. I didn't go look there.

CHAIR CORRADINI: So, can I take us back to a higher level since, of course, Mr. Stetkar is in the weeds, and I'm still trying to identify what color the weeds are, much less in them.

So, what he's saying, though, is correct, is that if you go to the public documents, this is the roadmap, and this should be the current roadmap as to how things are pointed.

MR. CRANSTON: Yes.

CHAIR CORRADINI: Okay.

MR. CRANSTON: And we'll verify that, but there's at least nine Standard Review Plan sections that deal with radiological consequences that are now covered --- these are in the 15.6X and 15.7X areas that are now covered by 15.0.3.

MEMBER STETKAR: Okay. I didn't go look there, so it may be there. Probably we don't have all of the DSRS sections available, so I ---

MR. SCHMIDT: But we're getting them.

MEMBER STETKAR: --- remotely get into Citrix, and ---

MR. SCHMIDT: And we'll certainly follow

through, too, on this ML that you mentioned and make sure that that's the case and get back to you.

MEMBER STETKAR: Okay, thanks. It may be in 15.0.3 because I'll admit, I didn't go there. I went --- I pulled up the LOCA section thinking maybe it was somehow, you know, included in there. It wasn't. I don't remember what section that was, but I didn't go look at 15.0.3, so it may be there.

MR. SCHMIDT: Can I ask a question?

MEMBER STETKAR: Yes.

MR. SCHMIDT: Was it in the original 5.4, was it cross-referenced correctly and we deleted it?

MEMBER STETKAR: I don't know.

MR. SCHMIDT: Okay.

MEMBER STETKAR: Lords know, I had enough of ---

MR. SCHMIDT: I can't remember if that was the case, or not.

MEMBER STETKAR: I had enough problems trying to follow all of the stuff that I had and didn't have.

MR. CRANSTON: We didn't delete it.

MR. SCHMIDT: Yes, that's why I'm wondering if it was just like a pre-existing condition.

MEMBER STETKAR: Well, the note in this table, though, that I'm looking at, at least somebody went to the trouble of at least copying and pasting, said "Delete SRP Section for NuScale Review (N/A)." So, it isn't some sort of generic --- or could be cut and paste.

MR. SCHMIDT: I'm not familiar with that.

MR. CRANSTON: Yes, there's over a dozen Standard Review Plan Chapter 15 sections that are not applicable to NuScale because they are covered in 15.0.3, which ---

MEMBER STETKAR: It is in .0.3 --- and it's clear that 15.0.3 is ---

MR. SCHMIDT: Yes.

MEMBER STETKAR: As I said, I didn't have that readily --- and I didn't even think of looking there, quite honestly, so it may be very well be covered in there, which I'd be happy with that. That's fine.

MEMBER SKILLMAN: Greg and Jeff, it appears you're down to your last slide, so I would like to ask a question or two before we transition to the next piece.

My first question is, as one reads through this guide, there's the identification of the primary

reviewer, and then the secondary reviewer. Is there a logic to how that review sequence is defined? I'll give you an example.

It's your once-through helical steam generators Item E, the text is, "The organization responsible for the review of transient and accident analysis for NuScale (primary reviewer), and the organization responsible for transient and accident analysis (secondary reviewer) assesses the steam generator response to various anticipated operational occurrences in postulated accidents," and so on.

And the next two paragraphs has that same --- similar arrangement, but the identification of the primary and the secondary seem to be vague. I don't understand what the logic is, and I would make that comment throughout the whole document. It is not crisp, at least as I read, that identification.

MR. SCHMIDT: Yes, we didn't --- you're really commenting on the SRP itself, I guess. We didn't change the --- you know, if there was an issue that wasn't horrible with the SRP, we didn't go back and try to change that because that's the document everybody's used to using at this time. So, that may be --- you may be correct, and that is not ---

MEMBER SKILLMAN: But this is legacy verbiage.

MR. SCHMIDT: Yes.

MEMBER SKILLMAN: Okay.

MR. SCHMIDT: Like I said in the presentation, the primary and secondary reviewer language and responsibilities didn't really change.

MEMBER SKILLMAN: Fair enough; next question. You provided in one areas of review, a bulleted list. And you've got a couple of examples that are kind of right here. Where is the identification of load-bearing internals? What's different about these compact PWRs is they're basically a telescope, and you've got a bottom and a middle, and a top, and each rests on a piece that is lower. And we learned through hard knocks in the big PWRS you better be mighty careful of how you design and arrange the loading on the internals. And in these plants we have no service life history. These are all very theoretical plants and I would assert we ought to be looking very carefully at loading of the internals.

So, my question is, where is that identified?

MR. SCHMIDT: I might have to call on Greg here to be some help here. I think it's in Chapter 3,

but I don't ---

MEMBER SKILLMAN: This is NSSS internals. This is areas of review, reactor coolant system component and subsystem design. These are components within that reactor vessel.

MR. SCHMIDT: Certainly, but there are other sections that look at, you know, like --- I know there's a fairly big issue with potential vibration issues of say the steam generators. There are groups, you know, looking at that. I don't know where the actual loading is reviewed. I don't know that off the top of my head.

MEMBER SKILLMAN: Then I would offer that as a comment. Okay? For inclusion in reactor coolant system components.

CHAIR CORRADINI: Just a point of information. We're looking at the roadmap, that sends the reviewer back to the Standard Plan.

MEMBER SKILLMAN: I don't see anything on internals, and that's the point I'm making.

CHAIR CORRADINI: Under 3.9.3?

MEMBER SKILLMAN: I don't see it in 5.4, which is ---

CHAIR CORRADINI: Well, no.

MEMBER SKILLMAN: --- reactor coolant system --- if it's over in 3.9 and covered, then steady as you go.

CHAIR CORRADINI: Okay.

MR. CRANSTON: Excuse me, 3.9.5 is reactor pressure vessel internals, but I don't know exactly how comprehensive it is as it relates to arrangement and loadings, and things like that, but it is talked about there. 3.9.6 talks about the functional design and qualification, but we'll look into it.

MR. SCHMIDT: Yes, I don't historically remember that being a 5.4 section off the top of my head.

MEMBER SKILLMAN: All right. Another comment if I could, please. At your number 5, chemical and volume control system, CVCS system, the sentence says, "The organization responsible for review of reactor thermal hydraulic systems in NuScale reviews the RTNSS function of CVCS under DSRS Section 9.3.4." My question is why is that review requirement so specific? That seems to be very, very narrowly worded. That was just a let's don't forget this, and let's add this in here?

MR. SCHMIDT: I believe so.

MEMBER SKILLMAN: All right. My final

comment in that same section, excuse me, in reactor safety valves, the same section that Chairman Stetkar pointed to, in G, "The organization responsible for review of component integrity issues related to reactor coolant pressure boundary, primary reviewer. The organization responsible for review of component integrity issues related to reactor vessel, secondary reviewer. And the organization responsible for review of chemical engineering issues, secondary reviewer, assesses RCS pressure relief device, reactor coolant depressurization system materials under SRP 523."

Within this reactor safety valve Section F and G, there appear to be almost contradictions between the DSRS section as the basis for review, and the SRP section as basis for review. So, earlier you were explaining where the SRP remains valid, the words are embedded in the DSRS. Where there's a difference, the difference is the DSRS wording. Is that what we're seeing here?

MR. SCHMIDT: I'm not sure I really followed what ---

MEMBER SKILLMAN: It seems that there is a variation in the text. Some cases you say you followed the DSRS guidance, others you're following the SRP

guidance.

MR. SCHMIDT: Well, it depends if the --- not all SRPs were replaced with DSRSs, so there's some ---

MEMBER SKILLMAN: But that's your 160 versus ---

MR. SCHMIDT: Right, right.

MEMBER SKILLMAN: --- 134.

MR. SCHMIDT: So, there's some mismatch potentially between if that was replaced with a SRP or a DSRS. So, they won't necessarily always be consistent with SRP and DSRS language.

MEMBER SKILLMAN: Fair enough. And you explained that first --- in your first comments.

MR. SCHMIDT: Okay.

MEMBER SKILLMAN: Thank you.

MR. SCHMIDT: Yes.

MS. BANERJEE: Can I ask a question, please? Did Staff, at the beginning, like a year or two ago there was an issue or a question from the Staff if the vessel riser inside the vessel is more appropriately defined as part of the vessel or piping as far as code requirements are concerned. Did Staff come to a conclusion?

MR. SCHMIDT: I'm not a code requirements guy, so I can't really answer that question. I would be out on a limb on that one.

CHAIR CORRADINI: You're talking the riser from the core up to the steam generators.

MS. BANERJEE: Yes, to the steam generators.

MR. SCHMIDT: Yes, I can't answer your question. I'm sorry.

CHAIR CORRADINI: Other questions for Jeff? Are you now taking the next section, too?

MR. SCHMIDT: Yes.

CHAIR CORRADINI: So, feel free.

MR. SCHMIDT: Okay, thank you. This is probably the more interesting section, for me, at least, Decay Heat Removal System.

So, the RHR SRP was rewritten to address the different design features and philosophies of the NuScale decay heat removal heat systems. And on the next slide, I will talk a little bit more about what the actual systems are. But the first slide here just talks about the changes relative to the SRP.

So, remove typical language from the PWR and BWR RHR System. So, there the major changes were

reviewing things like it's a low-temperature, low-pressure system, worried about RHR pumps because there are no pumps to worry about, MPHS to worry about for those pumps, heat exchanger, RHR heat exchanger, all that type of language was removed from the DSRS.

So, what we added was --- for the DHRS is the DHRS functions a lot like auxiliary feedwater, so we added 50.62 ATWS since auxiliary feedwater is called upon to potentially mitigate ATWS consequence, so that was added to the DSRS. And then also, the decay heat removal system is used to mitigate a station blackout, so we added 50.63 to note that it's used in station blackout mitigation.

MEMBER BLEY: When you say added, you mean you --- it's a pointer so that the reviewer realizes that this system has got to satisfy these requirements.

MR. SCHMIDT: It's actually added as part of the DSRS itself.

MEMBER BLEY: Okay. But, again, I'm not familiar with how the Staff does such a review, but the way I interpret what you're saying is you're making sure the Staff when it starts looking through the detailed design of NuScale ---

MR. SCHMIDT: Aware of this ---

MEMBER BLEY: That it's aware that this system has got to ---

MR. SCHMIDT: Perform this function. Yes, right. It needs to potentially mitigate ATWS, it potentially needs to mitigate station blackout.

MEMBER BLEY: Okay.

MR. SCHMIDT: We also added GDC 44 because this system instead of having an RHR heat exchanger and all the associated piping work to get to the ultimate heat sink, effectively dumps residual heat and sensible heat right to the ultimate heat sink, which is the reactor pool building. So, we added GDC 44 as an acceptance criteria.

And one of the reasons why we added 44 was really to get to 45 and 46, which is the inspection and functional testing of the decay heat removal system. So, to get to those we needed to add 44, so this is a, you know, inspection of a heat exchanger that's sitting in the reactor pool building. We wanted to be able to get to that inspection capability and functional testing requirements, so we added effectively those three GDCs.

MEMBER BLEY: When you say you add a GDC, the GDCs are part of the regulation.

MR. SCHMIDT: Right. We just added it to the DSRS.

MEMBER BLEY: Okay.

MR. SCHMIDT: Something to consider.

MEMBER BLEY: This is just a requirement in the DSRS, but maybe eventually it would become an actual GDC in the regulation?

MR. SCHMIDT: No, no, it's not to be a GDC. It's just pointing to existing GDCs.

MEMBER BLEY: Okay, okay. Just the reference to it is all you're doing.

MR. SCHMIDT: Yes.

MEMBER BLEY: Okay.

MR. SCHMIDT: Yes, we're not writing any GDCs.

MEMBER BLEY: Okay, that's what I thought. That's why I was a little confused.

CHAIR CORRADINI: I'd almost ask for a line diagram but I'd afraid to what it would look like. But let me get back --- so, you said you added Reference 244 to get you to 45 and 46.

MR. SCHMIDT: Right.

CHAIR CORRADINI: But practically speaking, which is the only way I --- so, when we were

visiting NuScale, the DHRS is a heat exchanger that's essentially hanging on the containment, so that means the only time they can look at it is when they disassemble for refueling and do an in-service inspection at that point. Have I got that approximately right?

MR. SCHMIDT: Yes.

CHAIR CORRADINI: So, somehow ---

MR. SCHMIDT: That's my understanding.

CHAIR CORRADINI: Okay, right. So, somehow the reviewer is going to have to be convinced that by the in-service inspection when they're going through refueling is going to satisfy the need to make sure things are all kosher relative to its functionality.

MR. SCHMIDT: Right.

CHAIR CORRADINI: I just want to make sure-

MEMBER STETKAR: But there are a lot of things in currently operating plants that you can't expect, other than refueling ---

CHAIR CORRADINI: No, no, I understand.

MEMBER STETKAR: So that's not ---

CHAIR CORRADINI: No, no. I didn't mean it that way. I just wanted to make sure I understood.

MR. SCHMIDT: Right. We just wanted to make

the reviewer aware that this is a system now that dumps directly to the ultimate heat sink, and that, you know, we're taking on that responsibility in this DSRS.

CHAIR CORRADINI: Whereas, there is no --- in prior times the terminox feedwater system would do it.

MR. SCHMIDT: Right, right.

CHAIR CORRADINI: Okay.

MR. SCHMIDT: It might be a different system, might be a different SRP section.

CHAIR CORRADINI: Okay.

MEMBER BLEY: Now, this might be a good point to go back to Dick's earlier question about electric power. This is a case where you usually electric power to drive pumps to get water somewhere you want it. Kind of here, all the water is already where you want it, and if the valve is open. I mean, to me, that's the ---

MR. SCHMIDT: Right, the valves ---

MEMBER BLEY: --- glitch, the valves all have to operate properly if this is going to work.

MR. SCHMIDT: Valves open on a loss of power.

MR. CRANSTON: And they are redundant

parallel valves.

MEMBER STETKAR: Right. And you have to isolate the normal ---

(Simultaneous speech)

MR. SCHMIDT: --- steam and feed.

MEMBER STETKAR: Right.

MR. SCHMIDT: But those are all supposed to fail in the --- with the loss of power, go to their safe positions.

MS. BANERJEE: Can I ask another question, please?

CHAIR CORRADINI: Only one more.

MS. BANERJEE: Okay. Since my function is to make sure that I'm bringing to the Members all 100 percent or near to DSRS sections that has major changes, my question is for ATWS and SBO, there are Chapter 15s that address ATWS and address SBO, if I remember right, or somewhere there, maybe 8.4 is SBO?

MR. SCHMIDT: 15.8.

MS. BANERJEE: Pardon?

MR. SCHMIDT: 15.8 is ATWS.

MS. BANERJEE: Right.

MEMBER STETKAR: 8.4 is station blackout.

MS. BANERJEE: So, 8.4 is listed as coming

to ACRS Subcommittee, but I didn't see a corresponding Chapter 15 for ATWS.

MR. SCHMIDT: Okay.

MS. BANERJEE: And I'm wondering why ---

CHAIR CORRADINI: So, to follow-up, that means either how the reviewer is to look at it doesn't change even though we have a ---

MR. SCHMIDT: We have a different system but it probably looks the same in terms of review.

MS. BANERJEE: But from aux feedwater versus DHRS is so different.

MR. SCHMIDT: Well, it's functionally the same.

MEMBER BLEY: Chapter 15 proposes something happens and you have to functionally respond to it. It doesn't lay out requirements of what systems have to do what.

MS. BANERJEE: But you have to make sure that your assumptions for the systems functioning ---

CHAIR CORRADINI: You're whispering.

MS. BANERJEE: I'm sorry. I mean, the assumptions that the system going to be working is valid, you know, that kind of thing.

CHAIR CORRADINI: That's true.

MS. BANERJEE: You have to look at the system, too.

MR. GILMER: I would add that ---

CHAIR CORRADINI: Is your green light on, Jim?

MR. GILMER: I think it is.

CHAIR CORRADINI: Okay, just checking.

MR. GILMER: It looks like it is. I was going to add that we determined that the existing Standard Review Plan 15.8 could be used so there was no DSRS Section. That's probably why you're not getting a presentation on that one.

CHAIR CORRADINI: That's fine. Okay. But we're all learning, so that helps us clarify. Keep on going.

MR. SCHMIDT: Okay, next slide. Okay, decay heat removal system, as you're probably are aware since you were out there recently is a passive secondary side heat removal similar to the auxiliary feedwater function which we've talked about a little bit already. It's a safety-related, means to reach a safe shutdown condition when their normal shutdown heat removal systems are unavailable, so when you've lost your secondary side, this is the system you first go to.

This gets you to --- the difference here in the text is the first system gets you to the normal shutdown, I'm sorry, the safe shutdown condition. The second one, ECCS, gets you to the cold shutdown conditions if you don't have AC power to get to your normal systems to get to cold shutdown. So, ECCS, as you're probably aware, is also passive, but this is the primary side heat removal system similar to RHR, similar to the old RHR of PWR. And like I said, the safety-related means for cold shutdown conditions, so this gets you from the safe shutdown to cold shutdown conditions.

MEMBER STETKAR: Jeff, I was going to wait until the end, but it's probably better to ask now. As I read through this section, because this section applies specifically to decay heat removal. It kind of bounces back and forth between RHR and DHRS, but the bigger picture is, I don't know what the Staff's requirements are for this plant.

In particular, the review guidance cites GDC 5, and it says that, "An accident in one unit cannot impair the ability to --- well, an accident in one module and orderly shutdown and cool down of the remaining units." What's a stable state for this plant?

MR. SCHMIDT: A stable state for this plant?

MEMBER STETKAR: Yes.

MR. SCHMIDT: I would say Design-Specific Review Standard

MEMBER STETKAR: Can ---

MR. SCHMIDT: --- if you lost the secondary side.

MEMBER STETKAR: Yes.

MR. SCHMIDT: I would say it's on the decay heat removal system.

MEMBER STETKAR: Okay. You don't need to go to cold shutdown.

MR. SCHMIDT: Not --- no.

MEMBER STETKAR: Okay. I was hoping you'd say that.

MR. SCHMIDT: Well, great.

MEMBER STETKAR: Is the review guidance --- I couldn't find it, but maybe it's in there somewhere. Does the review in this section confirm that the reactor pool has adequate capacity to remove the heat from all 12 modules immediately after an event that causes loss of feedwater to all 12 units?

MR. SCHMIDT: That may be in a different

DSRS, but that's --- there is a pointer, I think, to that.

MEMBER STETKAR: I couldn't find it.

MR. SCHMIDT: There should be a pointer that talks about shared systems.

MEMBER STETKAR: Well, that's --- see, that's where I started to get confused. It points to GDC 5. It says, "The DHR system must conform to GDC 5 as it relates to understanding maximum pool temperature determination for multiple unit effects, multiple shutdowns, multiple shutdowns plus one loss of coolant accident." That seemed to tell me that it's part of this section.

MR. SCHMIDT: I think that's trying to say like the initial condition of the pool temperature.

MEMBER STETKAR: Okay, I didn't get that out of that. Section 9.2 does refer to Section 9.2.5 for review of the ultimate heat sink itself.

MR. SCHMIDT: Yes, I think that's where it is.

MEMBER STETKAR: Okay.

MR. SCHMIDT: But I'm not 100 percent sure.

MEMBER STETKAR: Well, where I'm heading is there's one section, that's in Section 1 and part of

Section 2 kind of talks about this multiple unit GDC 5-type issue. And then in Section 3 there's an Item 7. It says, "The reviewer determines that DHR has the heat removal capacity to bring the reactor to a stable condition in a reasonable period of time with assuming a single failure of an active component," yadda yadda yadda. "For the purpose of this review, the NRC considers 36 hours a reasonable time period."

MR. SCHMIDT: Right.

MEMBER STETKAR: Now, what's 36 hours?

MR. SCHMIDT: That is for the old RHR system, the 36 hours. This has --- this brings you to safe shutdown conditions and maintains it there for at least 72 hours.

MEMBER STETKAR: I'm --- you're starting to confuse me. So, what is a safe and stable condition if I lose all feedwater to the entire facility, all 12 modules? What do I consider a safe and stable condition of that facility?

MR. SCHMIDT: It would be similar to the AP1000 which ---

MEMBER STETKAR: No, no. I'm talking about now the NuScale facility. I don't ---

MR. SCHMIDT: I'm just saying it's similar

to, so it's in a safe shutdown condition. So, it's a temperature --- I don't know if I can throw out numbers, but it's a ---

MEMBER STETKAR: It's not cold shutdown.

MR. SCHMIDT: It's not cold shutdown.

MEMBER STETKAR: Okay. What then relevance does 36 hours have to that? It seems that I have to get to that condition like immediately. I can't wait 36 hours to get to a safe and stable condition after I lose all feedwater.

CHAIR CORRADINI: I interpret that to be more than, but it could be --- it could easily be less than. That's the way I interpreted that.

MEMBER STETKAR: I don't understand what 36 hours has --- is relevant to anything, unless, as Jack said, it's a holdover from the old interpretation that I need to achieve cold shutdown within 36 hours.

MR. SCHMIDT: Yes, I think that's ---

MEMBER STETKAR: Which we've addressed before and found that there isn't actually any regulatory requirement to do that.

MR. SCHMIDT: Right. I think that's what it is.

MEMBER STETKAR: And if it is, why is that

holdover still here?

MR. SCHMIDT: I think ---

MEMBER STETKAR: Because it is in the DSRS words.

MR. SCHMIDT: I think the time that that discussion was going on, this DSRS was being written, so I don't know if that had fully been resolved, getting the safe shutdown condition would ---

MEMBER STETKAR: See, this is kind of a fundamental --- now I'm not talking about nitty picky pointers or things. It's a fundamental, what is a stable safe shutdown condition for this facility ---

MR. SCHMIDT: Right.

MEMBER STETKAR: --- from the perspective of the NRC Staff?

MR. SCHMIDT: And I think ---

MEMBER BLEY: This document ought to reflect that. That's ---

MR. SCHMIDT: No, I agree. I don't disagree. It's just that that --- you've got to remember that these were written well before some this stuff have been fully vetted and decided.

MEMBER STETKAR: And sent out for public comments, though; one would think that people would

have looked at fundamental things before it went out for public comments. It should be really clear ---

MR. SCHMIDT: No, I agree.

MEMBER STETKAR: Because if I'm a reviewer, I now don't know whether I need to require these guys to get to cold shutdown in 36 hours or not.

MR. SCHMIDT: No, it's ---

MEMBER STETKAR: And if I do, I can't do it on ---

MR. SCHMIDT: You can't do it on the DHRS. You've got to use the ECCS system.

MEMBER STETKAR: I've got to do it on ECCS.

MR. SCHMIDT: Right.

MEMBER STETKAR: And that's a whole different way of thinking about that review.

MR. SCHMIDT: That's right. No, you're correct.

MEMBER STETKAR: So, I'd suggest you think about that ---

MR. SCHMIDT: Well, then we have to strike it, change it to safe shutdown.

MEMBER STETKAR: And define what safe shutdown is. I mean, you know, it doesn't necessarily have to be a temperature, but at least functionally what

it is.

MR. SCHMIDT: Right. Right.

MEMBER STETKAR: To recognize that safe shutdown can be achieved on DHRS with nothing else.

MR. SCHMIDT: Alone.

MEMBER STETKAR: Provided that it's --- you know, you don't boil off the reactor pool within 72 hours or whatever the nominal ---

MR. SCHMIDT: Right.

CHAIR CORRADINI: --- coping time is.

MR. SCHMIDT: Okay, agree.

MEMBER STETKAR: Okay, good. That helps me there. Still also, though, when you do that, check to make sure that the notion of capability of the reactor pool for a simultaneous event that affects --- I don't care whether it's loss of all non-essential AC power, or loss of ---

MR. SCHMIDT: Right.

MEMBER STETKAR: Something like --- that requires all 12 DHRS systems, 24 DHRS loops to be demanded that, indeed, you've got adequate capacity, you know, to maintain that heat removal for 72 hours, if that's the time.

CHAIR CORRADINI: But as a matter of

information, I thought we asked --- I mean, I know what you're saying relative to the review.

MEMBER STETKAR: Right.

CHAIR CORRADINI: But didn't you --- wasn't this asked of NuScale back in July, and they had ---

MEMBER STETKAR: But that's --- I don't want to do the review right now.

CHAIR CORRADINI: I understand.

MEMBER STETKAR: I want to make sure that when the Staff does the review they ask those questions and get the answers. Right? We may have information that supports the answer, but it's not formal, it's not --- the Staff hasn't asked it.

CHAIR CORRADINI: Got it.

MR. CRANSTON: I'd just point out, we have had presentations where NuScale has said they have done analysis, but we haven't ---

MEMBER STETKAR: But again, that's ---

MR. CRANSTON: But we have to confirm ---

MEMBER STETKAR: That's answering the question from the review. That's not developing the review standard, what the Staff ought to ask about.

MR. CRANSTON: Right.

MR. SCHMIDT: Okay, next slide. Decay heat removal for normal cool down and removed by the non-safety system. So, in this case we're talking about the feedwater and turbine bypass to reach safe shutdown conditions, and then the containment flooding and drain system.

The containment flooding and drain system is non-safety-related and used to reach cold shutdown if onsite or offsite AC power is available. So, these would be your normal means of reaching safe shutdown and cold shutdown assuming you have AC power.

Any other questions?

MEMBER STETKAR: Yes, but go on, Dick, because you're organized.

MEMBER SKILLMAN: This discussion reminds me of years ago when the general design criteria were published in 1969 or '70, that we actually negotiated until we got the Reg Guides to try to fit all the pieces together. Among the discussions we had back then were what are the code requirements for, particularly, not safety-related systems? So, what's the code requirement for CFDS?

MR. SCHMIDT: As far as when you're saying code, ASME Code requirements?

MEMBER SKILLMAN: Yes.

MR. SCHMIDT: I don't know the answer to that. I'm not an ASME Code guy.

MEMBER SKILLMAN: Kind of building on the discussion that we just had, the clarity of the expectation for the design is critical because it sets, among other things, who can supply and what kind of equipment is available. So, if you say well, CFDS is not safety-related but really is important, so therefore it's got to be ASME Section 3 Class 1 Seismic 1. All of a sudden 50.2V come into view and men and women who are doing this work understand exactly how to design and build this facility. But unless that clarity is set out right up front, this type of discussion will occur over, and over, and over again.

The real question is what is the expectation for the design? What's the design standard? How will the codes be applied to in this case systems that are not safety, but are really important to get to cold shutdown?

MR. SCHMIDT: Well, I mean, you can get to cold shutdown through the ECCS system, and that's their safety-related means of doing it, so I can't really speak to what code requirements are for this. Well, it's

their I guess preferred way of shutting down using the containment flooding system, but it isn't the only means. But I don't know how the codes are structured for ---

MEMBER SKILLMAN: What's I'm suggesting is establishing early on the ---

MR. SCHMIDT: I'm not even sure NuScale has even talked to us about where that fits in their scheme, you know.

MEMBER SKILLMAN: It needs to be discussed because I will tell you it's a mighty important feature of how the facility is built.

MR. SCHMIDT: Okay. Yes, I mean, NuScale doesn't necessarily share all of their information with us on these sections; even the containment flooding drain system was kind of a surprise or shock to us, so ---

CHAIR CORRADINI: But when we say this --- I mean, maybe I'm solving the problem instead of reviewing the problem. But the system is basically they're flooding up containment so they establish a heat transfer path to the pool.

MR. SCHMIDT: That's correct.

CHAIR CORRADINI: It's that simple.

MR. SCHMIDT: It's that simple, right.

CHAIR CORRADINI: Okay, so ---

MR. SCHMIDT: Right. Right.

CHAIR CORRADINI: I'm filling up the bathtub, then I open up the pieces and move them around like jigsaw. That, to me, is the harder thing is I have to move all these things through the pool.

MR. SCHMIDT: Right. But I think what I was trying to say is that I think it's somewhat of a unique and novel way of getting to cold shutdown. That's all.

CHAIR CORRADINI: Okay.

MS. BANERJEE: And they plan to do it on a regular basis?

MR. SCHMIDT: Yes.

MS. BANERJEE: How about thermal shock to the pressure vessel? It doesn't have any insulation.

MR. CRANSTON: They flood up every time before they move the module for refueling.

MS. BANERJEE: But then after some decay time ---

MEMBER STETKAR: That's --- we don't ---

CHAIR CORRADINI: We're not going to review it.

MEMBER STETKAR: We're not reviewing it

now.

CHAIR CORRADINI: Staff will figure that out.

MEMBER STETKAR: A couple more, Jeff, and I'll do this in a stream of consciousness because it's, as I wrote my notes down. In Section 8 under the technical rationale there's a sentence that says, "The NuScale design incorporates two 100 percent capacity trains of DHR per reactor allowing for suitable redundancy to assure that safety function can be accomplished with either onsite or offsite power available concurrent with a single failure." That sounds like a review conclusion rather than a technical rationale. You might want to ---

MR. SCHMIDT: Rephrase that?

MEMBER STETKAR: You might want to just delete it.

MR. SCHMIDT: Oh, delete it. Okay.

MEMBER STETKAR: The whole paragraph seemed to flow okay, except this sounded like ---

MR. SCHMIDT: The conclusion ---

MEMBER STETKAR: --- the conclusion rather than telling the reviewer that ---

MR. SCHMIDT: Okay.

MEMBER STETKAR: --- this is the way it worked. And that it not only worked that way, but it was okay.

CHAIR CORRADINI: Just as a side note, I was confused by the same thing. I go back to the original standard review plan and there are wording in the SRP that sounds awful ---

MEMBER STETKAR: This is different, though, because this is in the technical rationale for the reviewer versus the end part that says the acceptance criteria.

CHAIR CORRADINI: Okay, excuse me.

MEMBER STETKAR: This is in the technical basis for why the reviewer ought to look at certain things. And, again, that's in Item 8 under Section 2 Technical Rationale.

"The reviewer is asked to verify that to the extent practical, whatever that means, the NuScale DHR is design to an ultimate rupture strength at least equal to normal RCS operating pressure." That's certainly a different requirement than is imposed on any existing plant, residual heat removal system or anything else. Why? I mean, it says because you could have a steam generator tube rupture is why --- it says

why.

MR. SCHMIDT: Right.

MEMBER STETKAR: But we don't require existing plant main steam systems to be able to withstand reactor coolant system pressure, because you have a tube rupture. We have code safety valves, we have code relief valves to make sure that the piping doesn't break if it's pressurized above ---

MR. SCHMIDT: I don't believe there's any relief valves on this ---

MEMBER STETKAR: I don't know whether there are or not.

MR. SCHMIDT: --- removal system, so I think that was the justification, or not the justification, that's the wrong word, but the thought process behind.

MEMBER BLEY: Yes, I'm remembering, I think I'm remembering from our visit that they said this was all designed to handle that pressure.

MR. SCHMIDT: Yes, that's my understanding, too. And I think that's where our --- we got the wording idea from, was that this is a full pressure system.

MEMBER STETKAR: Good. Again, I'm thinking

about what the reviewer is asked to look at, and why the reviewer is asked to look at it. Is --- this says that the reviewer is asked to look at the DHR system. I didn't see any cases where the reviewer is asked to look at the main feedwater system downstream of the main feedwater isolation valves, and the main steam piping upstream of the main steam isolation valves to verify that it is also designed to handle reactor coolant system pressure, because it must be in these events.

MR. SCHMIDT: Right.

MEMBER STETKAR: This is simply pointed to the ---

MR. SCHMIDT: Functioning on ---

MEMBER STETKAR: --- DHRS ---

MR. SCHMIDT: DHRS system, right.

MEMBER STETKAR: So, this ---

MR. SCHMIDT: Anything involved in that loop or that path.

MEMBER STETKAR: No, but anything that is connected which is the main steam piping up to the MSIVs and the main feedwater piping downstream from the main feedwater isolation valves, if you're using the rationale that when this thing is all bottled up it can be at reactor coolant system operating system, then all

of that piping ---

MR. SCHMIDT: Right.

MEMBER STETKAR: --- that's called main steam and main feedwater had better be able to withstand that pressure.

MR. SCHMIDT: That's correct.

MEMBER STETKAR: And I don't see a pointer --- maybe it's implicit?

CHAIR CORRADINI: I was going to say ---

MEMBER STETKAR: But it's so explicit here and people get so tunnel-visioned into DHRS is everything that is downstream from those two little isolation valves.

MR. SCHMIDT: No, it's the whole system from steam generator to, like you said, the isolation valves, to the heat exchangers.

MEMBER BLEY: It seems we're kind of mixing a bit of what we know about the system with the requirements we're putting in place. That's kind of where you are.

MEMBER STETKAR: That's where I am.

MEMBER BLEY: Yes, and if we write it this way without having the requirements in place, what if they change something?

MR. SCHMIDT: Well, that's --- there's a caveat, I think, in all these DSRSs, if they change something, the DR --- you know, there's flexibility within the DSRS. I forgot how that's worded, but there is --- I mean, these are --- these were written at a snapshot in time, right, for how we thought the systems were going to operate. They can deviate ---

MEMBER BLEY: Let me turn around what I just said. If there are embedded assumptions on --- because of the snapshot in time, shouldn't they be included? At this point in time we see this all being able to handle system pressure, so that somebody five years from now after long delays and they get back to this or something, you know, doesn't forget where we were in that snapshot in time.

MEMBER STETKAR: And make sure that it's not --- people tend to get off --- my experience is the Staff tends to get awfully focused on individual piece parts of things. So, if you're going to say that based on our understanding of the design the reviewer should confirm that all elements of the piping systems connected to the reactor coolant system to support the decay heat removal function, which would be that the main feedwater piping because it's got to be isolated,

and the rest of the stub of the main steam piping need to withstand pressure. That might help.

MR. SCHMIDT: Okay.

MEMBER STETKAR: But if you focus it only on the DHRS loops, I guarantee you that people are just going to focus it on those.

MR. SCHMIDT: It wasn't meant to focus in on those.

MEMBER STETKAR: Okay.

MR. SCHMIDT: I see your point. It's a valid point.

MEMBER STETKAR: I'll --- let me just make a note here quickly. Okay. And the only other one that I had is in the last section, Section 4 in the evaluation findings, there's a long paragraph, I won't read it, that summarizes the normal shutdown procedure. That's different from what I understand their normal shutdown procedure to be.

MR. SCHMIDT: Yes, I think when that was written, I don't think we really knew ---

MEMBER STETKAR: Yes, okay.

MR. SCHMIDT: --- what their normal shutdown procedure was.

MEMBER STETKAR: And that'll give you

--- but since, you know, since this is something that the Staff is going to quote verbatim ---

MR. SCHMIDT: I think we'll get public comments on that.

MEMBER STETKAR: All right. Well, you just got one.

MR. SCHMIDT: Yes.

MEMBER STETKAR: That's all I had.

CHAIR CORRADINI: Okay. I guess I'd like to --- do you want to take a break?

MEMBER SKILLMAN: Let me ask one more. I'm on your Paragraph 23, 24, 25, 26. These are on your pages 547-18. You include this important paragraph section in Item 23, "The non-safety-related active systems are the first line of defense to reduce challenges to the passive systems in the event of transients or plant upsets. The extensive use of safety-related passive systems and the non-safety-related active system design philosophy presents a departure from previous licensing practices." Then you put in this paren, "(Note: In NuScale both active and passive methods are used for shutdown, and the active non-safety shutdown system is not safety grade and hence this section is applicable.)"

MR. SCHMIDT: So, we were trying to capture that the feedwater and turbine bypass, which is non-safety-related, is one of the means that they use to get to safe shutdown conditions. That was the whole purpose of that.

MEMBER SKILLMAN: Then in 24, "The reviewer verifies that interlocks are in place to prevent DHR from activating with low reactor building pool water level."

25: "The reviewer verifies provisions are to clean the heat exchanger fins which are in borated water."

My point is there are a couple of bullets here that actually sound like new design criteria, and they're intermixed in this document.

Then in 26 for review of a DC application, "The reviewer should follow the above procedures to verify that the design, including the requirements and restrictions," et cetera, "meet the acceptance criteria."

What procedures? I would just suggest that the wording is going to affect men and women that will be doing this design, and the clarity of the wording needs to allow the folks to do that. I would find this

very confusing if I were a designer at NuScale.

MR. SCHMIDT: So, what's the particular confusing ---

MEMBER SKILLMAN: Well, it is on your page 547-18, and it is the string from 23 to 26 that really kind of points to a procedure, when in reality I think what you've done is embedded a number of specific requirements for the NuScale design.

MR. SCHMIDT: Right.

MEMBER SKILLMAN: Perhaps these came from the review of the proposed DSRS against the SRP, but you've got kind of a mix and match of technical requirements here that I suggest are confusing. And you may want to take a look to insure ---

MR. SCHMIDT: We'll have to take a look at that.

MEMBER SKILLMAN: --- that they are not confusing to men and women who are doing the design.

MR. SCHMIDT: Okay. All right. Thank you very much.

MEMBER SKILLMAN: Thank you.

CHAIR CORRADINI: So, if we I might break in. So we need to do, Jim, before the break or after the break. I have a feeling you're going to take more

than a half an hour, so I propose --- you look like you're anxious to give us the dirty details of stability, so I propose that we take a break until 10:00. Okay? And then we'll bring Jim up to have some fun.

(Whereupon, the above-entitled matter went off the record at 9:47 a.m., and resumed at 10:00 a.m.)

CHAIR CORRADINI: Okay. Let's get back into session. Jim?

MR. GILMER: Okay. My topic is Thermal Hydraulic Stability, and I'll start out by saying this section was a particular challenge for two reasons. One, we had very little design information from NuScale to even determine if stability is an issue. And second, there's no existing SRP that covers a PWR that behaves like a boiler.

MEMBER STETKAR: Yes, the other thing, it's not a boiler.

MR. GILMER: Yes. But Staff had a long discussion and we felt that because of the central riser with potential boiling, it'll behave a lot like a BWR flow channel in some regards, so we felt that stability, NuScale should address.

CHAIR CORRADINI: This would be at least under accident conditions.

MR. GILMER: Yes, under accident conditions.

CHAIR CORRADINI: Okay, because under normal conditions they're still subcooled even at the top of the vessel.

MR. GILMER: Yes. And, actually, SRP 4.4 does have a section on stability for the core where they will have to address in the design cert. However, not the transient sense, which better fits in Chapter 15. So, we used as our starting point the existing 15.9 SRP which we fully expect NuScale will say on their design cert is not applicable since it's clearly for boiling water reactors; that we felt that it was a good starting point for this new design-specific review standard because a lot of the behavior is similar to a boiler, and potential solutions are similar, as well.

So, we started off by removing those references that were clearly BWR-specific, and added a couple of what we consider good references on natural circulation experiments. One particular IAEA paper was particularly relevant we added where the density wave oscillation was observed, so we considered that a

justification and good background for the reviewers. Next slide.

We didn't have our big picture, but if anybody --- I'm sure you're all familiar since you visited NuScale, that with the central riser, what we felt is that there is potential --- that's a potential source of instability as you get density wave propagating up the pipe, just due to the temperature difference. And NuScale agreed that there's potential for boiling in the riser.

We also were thinking of other potential modes of instability. One is control pattern-induced, control rod pattern-induced, so you may get some temperature differences that would be seen by the riser. We expect because of the thermal lag that that would not be a huge source of instability. The key one is the density wave of instability.

There are potential helical coil steam generator oscillations. We did actually --- the test being done --- they did actually see instability that turned out to be control valve oscillation-induced.

CHAIR CORRADINI: We're talking the third bullet?

MR. GILMER: Yes.

CHAIR CORRADINI: This was the experiments in Italy?

MR. GILMER: Yes.

CHAIR CORRADINI: Okay.

MR. GILMER: So you get, basically, a secondary side-induced oscillation.

CHAIR CORRADINI: What you mentioned and I don't have --- I can't find exactly where the words are, but you imply at the start off, and so now I'm trying to put myself in the mode of the Staff member that's got to look at this.

You kind of say there's three possibilities, core-wide, regional, and single-channel. But because this is an open core lattice, is there really any chance of that? In other words, you're identifying to the reviewer they ought to worry about this, but is that even possible in this design, because I've got an open core lattice. So, clearly, I could have core-wide oscillations, or in the rise --- what we call the chimney, the riser.

MR. GILMER: Right.

CHAIR CORRADINI: And, clearly, potentially, even though it's a small core, you can have regional. But I don't understand the single-channel

ones.

MR. GILMER: Well, as far as the core is concerned, I don't see that either ---

CHAIR CORRADINI: Okay.

MR. GILMER: --- local instability, but the steam generator, there's potential on the secondary side which would --- eventually turns back --- or feedback to the primary.

CHAIR CORRADINI: Oh, so that was the reason of putting that in, is to identify to the reviewer the secondary side? I lost track --- that I missed.

MR. GILMER: Well, that was the thinking, yes. Particularly during startup you could have thermal-induced secondary side heat transfer that would feedback to the ---

CHAIR CORRADINI: Okay, then I --- okay.

MEMBER BALLINGER: So, you're saying that if the feedwater control valve starts fluctuating, you get fluctuations on the secondary side's system, and the steam is being generated inside the tubes. Right?

MR. GILMER: Right.

MEMBER BALLINGER: And so that induces thermal fluctuations on the primary side, would then

feed back into the core?

MR. GILMER: Right.

MEMBER BALLINGER: Because of feedback, temperature feedback and those kinds of things?

MR. GILMER: Right.

MEMBER BALLINGER: Is that an instability, or is just a transient?

MR. GILMER: It's a transient, but it may result in instability. We have not analyzed it with TRACE or any other code yet.

CHAIR CORRADINI: But when Jim says --- I guess I'm --- this is kind of parsing it too fine. When you instability, I think of oscillation, whether your oscillation is undamped or just sits there and wiggles about and causes a problem, to me is of no consequence.

MR. GILMER: Right.

CHAIR CORRADINI: But your concern is some sort of oscillation, to make sure they consider it during potential operating modes.

MR. GILMER: Exactly.

CHAIR CORRADINI: Okay.

MEMBER REMPE: When I was looking at what was in the document ---

CHAIR CORRADINI: Joy.

MEMBER REMPE: I think it's on. It's on. Better, okay. Everybody okay? Okay, so in the DSRS when I was looking at what was required, I mean, it's pretty extensive about for the analysis tools, and justification for how often these instabilities will occur. And is there going to be validated data, even if you were to use TRACE for this particular reactor design? I mean, how will the reviewers or the applicant justify things with the new design this way, is what I was kind of struggling with.

MR. GILMER: Okay. Well, I'll answer that by saying we developed the DSRS before we got the June 2nd presentation from NuScale specific to instability. They are developing a new computer code just for this purpose.

MEMBER REMPE: And they're being able to get data for validation for that?

MR. GILMER: We have discussed with them adding some stability tests to the OSU series. We don't yet have ---

MR. SCHMIDT: We asked for validation.

MR. GILMER: We asked for validation, yes. I don't know if that's on their schedule yet.

MEMBER REMPE: Okay.

MR. GILMER: Staff will definitely be looking for that.

MEMBER STETKAR: Again, I think we have to be careful that the review standard should point the Staff at what the Staff should look at.

MEMBER REMPE: But when I was looking at this ---

MEMBER STETKAR: Not the tools that somebody ought to use to demonstrate that they can answer the question.

MEMBER REMPE: And I was looking at this, I'm wondering do we really even have that knowledge with the BWR stability?

MEMBER STETKAR: That's a different issue, though.

MEMBER REMPE: Yes.

MEMBER STETKAR: If it's something the Staff needs to look at ---

MR. GILMER: Yes.

MEMBER STETKAR: --- they'll have to point the Staff to look at it. Solving the problem, how the problem is solved is a different, you know ---

MEMBER REMPE: Yes, but to --- anyway, go ahead.

MR. GILMER: And NuScale has said they will submit a topical report on this --- the computer code they're developing, will probably contract at Jose March-Leuba.

MEMBER STETKAR: But that's one way of how it will be done, or might be done.

MR. GILMER: Right.

MEMBER STETKAR: Not what needs to be done, which is what the DSRS ought to point to. Right?

MR. GILMER: Exactly, yes. So, that June 2nd presentation is available in the SharePoint site if any of the Members are interested in getting into the details of that.

CHAIR CORRADINI: Again, since we're not trying to solve their problem, but since I looked at your references, my memory is that there's a --- I don't remember the name of the Boiling Water Reactor, this natural circulation boiling water reactor, is it Dodewaard?

MR. GILMER: Dodewaard, yes.

CHAIR CORRADINI: Did you reference that and I just missed it?

MR. GILMER: We did not.

CHAIR CORRADINI: Because of all the things

that kind of maybe possibly behaves like this might, is you get that flashing in the startup of Dodewaard as a natural circulation machine that probably is the closest to what you see here. And it would to me, again, not that we're trying to help them figure out how to answer your question, on the other hand, at least you want to couple it to the right physics. That strikes me as the closest physics that I'm aware of.

MR. GILMER: I would agree. We can certainly add that reference to be good background for reviewers who are not very familiar.

CHAIR CORRADINI: Yes. Okay.

MR. GILMER: So, take that --- we may get that comment also from the public. So, thank you.

Okay. I guess go to the next slide. Thanks. We were brainstorming on other potential instabilities, and mentioned xenon. I don't think that's going to be a significant issue for NuScale with the open channel core. The other one we talked somewhat about before, the primary loop coupling to the secondary side perturbations through the helical coil at the steam generator. And there may be other startup-induced transients.

You could also have like a loss of a string

of feedwater heaters, or loss of condenser vacuum-induced temperature differential.

CHAIR CORRADINI: Let me ask the question here since you brought it up in that regard. So, is startup procedures for the reactor, 15.9A ought to consider stability issues even in startup? Because it seems to me how this reactor starts up is more of a challenge.

MR. GILMER: Yes.

CHAIR CORRADINI: So, is this review section supposed to look at that, too, or is it somewhere else that's supposed to be looking at it?

MR. GILMER: Startup is addressed in 14.2, if I remember correctly.

MR. SCHMIDT: It also might be under 4.4.

MR. GILMER: There's some discussion in 4.4 also.

CHAIR CORRADINI: Okay. The only reason I'm bringing this up is, again, I go back to when we were doing ESBWR, Dodewaard was being used as the example. And there was a whole bunch of questions from one of our consultants, almost two hours of questions, about how I come up in power and flow, and I have to stay within a regime. In this case I don't think it's because of

an undamped instability, but essentially a chugging instability within the chimney region.

MR. GILMER: Right.

CHAIR CORRADINI: So, I would expect the same sort of problem, or at least considerations have to be made here.

MR. GILMER: I would agree with that.

CHAIR CORRADINI: Okay. That wouldn't be in this, it would be in another review section? That's a question.

MEMBER STETKAR: I just did a quick scan here. It does in this section mention startup in a couple of places.

MR. GILMER: Yes, it does mention startup but it's not the place where the Staff reviewer would normally find it.

MEMBER STETKAR: I couldn't quickly find a pointer that says the reviewer should look in other places.

MR. GILMER: That's a good point.

MEMBER STETKAR: I couldn't quickly find one. That doesn't mean it's not in here. I'm just doing quick word searches.

MR. GILMER: It's kind of hidden, so we

should more clearly ---

CHAIR CORRADINI: Part of it is my lack of experience on how you guys do reviews, but it strikes me that this is enough of a different beast that the startup of the machine has to be thought through carefully.

MR. GILMER: Right.

CHAIR CORRADINI: Okay.

MEMBER STETKAR: This section of the DSRS certainly in two or three places mentions the concern about startup. I just thought because it's mentioned in here and there wasn't a pointer elsewhere that it would be reviewed as part of this review.

MR. GILMER: We do in to some degree in 4.4 where you have the power flow operating map that'll have the startup region. In NuScale's case, their preferred approach is to operate with an exclusion region specified as their option, or solution option. So it'll certainly have to consider startup scenarios in developing that region.

I mentioned about the details in the June 2nd meeting we had with NuScale, if anybody is interested. It's on the SharePoint site.

Applicable GDCs are basically the same as

what's in the SRP 15.9. The key ones are the GDC 10 for the fuel SAFDLs. GDC 12 on the suppression of power oscillations; 13 was put in because one of the options is detect and suppress type of software/hardware solution. GDC 20 on protection system functions, and 29, protection against anticipated operational occurrences. We did not see any need for additional GDCs or acceptance criteria. I think the BWR SRP was relevant there.

Okay. Next slide. Two of those GDCs mentioned alternate means of controlling stability. Based on what we know currently with NuScale, they will have an automatic exclusion zone programmed into the core protection system, which will be their primary means. The backup will most likely be manual. The DSRS doesn't settle the question of whether that's sufficient. It gives the two options, the protect and suppress, and the second, the exclusion region.

CHAIR CORRADINI: Can you say that again? I didn't understand your point.

MR. GILMER: Well, another way of putting it is, Staff hasn't totally decided whether entirely manual is acceptable second means of resolving the instability.

CHAIR CORRADINI: First means is exclusionary.

MR. GILMER: Yes, which will be automatic. We'll probably look closely at the operating procedures, but that's way down the line in the design certification.

MEMBER STETKAR: Jim, I was going to wait until the next slide, but since we started talking about this, there are several places in the existing DSRS. The next slide you're going to get --- why don't you get to the next slide, then I'll ask the questions.

MR. GILMER: Okay.

MEMBER STETKAR: But I want to keep on this DSRS treatment of detect and suppress for a little bit.

MR. GILMER: Okay.

MEMBER STETKAR: But go to the next slide, I think.

MR. GILMER: Yes. As I mentioned, NuScale told us in the June 2nd presentation after we'd already written the DSRS that their preferred approach is exclusion region. The draft DSRS more focused on the detect and suppress, which is the way the BWR SRP was written.

MEMBER STETKAR: Now I'll ask the questions

that I had. There are several places, I counted at least three, in the DSRS that specifically say the technical specification should require that the primary licensing solution, in this case the detect and suppress automatic function, be restored in a relatively short period, no longer than 120 days. That sounds really, really specific to me. What's the basis for the 120 days?

MR. GILMER: I wondered that myself.

MEMBER STETKAR: Yes. Well, you must have the answer then.

MR. GILMER: I don't have the answer.

CHAIR CORRADINI: I don't think he does.

MEMBER STETKAR: If there's no answer, why is it written into a DSRS so that I, as a reviewer, as long as they say it's 120 days, I'm good with that, because I'm told it's okay.

MR. GILMER: Well, I'll admit that was a carryover from the SRP.

MEMBER STETKAR: I think you ought to really rethink that because ---

MR. GILMER: It definitely will be, because I think one of the last slides I say we expect --- actually, we'll wind up revising the focus of the

DSRS more for the exclusion region approach.

MEMBER STETKAR: Well, but even if the exclusion region --- is there some automatic function that keeps you away from that boundary? And if that automatic function can be taken out of service according to tech specs, what's the time window for that?

MR. GILMER: Yes, 120 days ---

MEMBER STETKAR: And it's going to be 100 --- I'll guarantee you it's going to be 120 days because people will say oh, well, that's kind of like the detect and suppress. And I'm saying that that ought not to be wired into the review standard.

MR. GILMER: Yes, the tech spec should be more consistent with the core protection calculator---

MEMBER STETKAR: It should be a performance-based based on the Applicant justifying what the appropriate time is.

MR. GILMER: Yes. Okay, that comment is noted.

MEMBER STETKAR: Okay.

MR. GILMER: Good suggestion.

MEMBER STETKAR: And related comment is

regarding --- you mentioned manual operator actions, whether it's primary or backup to whatever automatic notion you have. Backup options in effect for short periods may rely on administrative controls and manual operator actions only if operator actions required to prevent SAFDL, and I always forget what that acronym is, exceedances can be accomplished within the two minutes allowed for operator action in the demonstration calculations. What's the basis for the two minutes for this plant?

MR. GILMER: I don't know where that is either.

MEMBER STETKAR: Okay. Other action says manual operator actions are acceptable only if there's a small probability of an instability that would challenge, can be shown within reasonable operator action plans. I don't know what a small probability or a reasonable operator action time is either. What's a small probability?

MR. GILMER: Well, that definitely --- the DSRS doesn't specify it.

MEMBER STETKAR: Okay. Well, if I'm a reviewer, how do I know it's small enough?

MR. GILMER: Well, that's probably going to

be a judgment call on the Staff's part.

MEMBER STETKAR: I think you ought to rethink those things. We've learned that a lot of this nebulous reasonable, sort of really good, highly likely or if I find DSRS acceptance criteria to meet GDC 29, the DNS system must be designed to insure an extremely high probability of accomplishing its functions. What's an extremely high probability, 99 percent, .999999 success?

MR. GILMER: Yes, that's a good point.

MEMBER STETKAR: Just it's time in 2015 --- my point is, it's time in 2015 if we're writing guidance to remove all of these nebulous things, or if we want to keep it flexible for a reviewer to make judgment, give the reviewer some guidance in judgment. Because your high probability might be much different than my high probability, and if all I have to do is say I think it's a high enough probability, and that's good enough, that doesn't cut it any more.

MR. GILMER: Okay. We'll take that as a public ---

MEMBER STETKAR: So, take --- think --- and the reason I bring it up here is that there may be several other sections of the DSRS that are subject

to this.

MR. GILMER: Definitely we'll take that as a public comment.

MEMBER STETKAR: And kind of a general item that if you're relying on these notions of small probabilities, highly likely, extremely high probability, extremely low probability, those types of notions, give your reviewers some help on this, and do it consistently so that in one section versus another section they have some basic notions of what that concept means.

MEMBER BLEY: And that, you know, that might be numbers, it might be a better description of what we're trying to avoid with those kind of concepts, that makes it a little more concrete what they're looking for.

The other side of this isn't just the poor reviewer, the first time through. It's later, people start making changes and eroding these things, and if we don't know what they mean, we don't know how far we get from eroding them to the point they didn't mean much to start with.

MR. GILMER: Yes, and the designer also needs to ---

MEMBER STETKAR: Right. And although I use numbers, and it's kind of the theatrics of my comments, I tend to not endorse putting specific numbers in review guidance. I think that the onus should be on the Applicant to demonstrate that whatever function they're proposing can provide assurance that the plant will be operated safely, and that we have adequate assurance of protecting the public. How one develops that adequate assurance, whether it's a combination of quantitative analyses or qualitative judgment based on submitted material is part of the review process. You know, wiring specific numbers, like 120 days, or two minutes into review guidance, or extremely reliable is 99.9 percent reliability, or extremely low probability of failure is 10 to the minus 5th, doesn't solve that problem. It, in fact, is a crutch, so beware of that. I wasn't trying to advocate the notion that specific values should be wired into the guidance.

MR. GILMER: As a reviewer, we would want to see the actual --- the transient response time and the PRA ---

MEMBER STETKAR: Right, some type of evaluation, whatever time or whatever reliability they're proposing is adequate.

MR. GILMER: Yes, it may involve human factors, as well, how quickly the operators can recognize ---

MEMBER STETKAR: Sure, sure. So, there's two issues. Try to --- you know, if numbers are in here, if they're not well justified, pull them out. In other areas where no --- where there are only these vague references to terms like small probability, reasonable times, extremely high probability, try to give the reviewers and the Applicant better guidance in terms of what's the expectation when you use those terms. And do it consistently across the whole review. This just happens to be the first section that, you know, we've seen so that, you know, a reviewer of Chapter 8 isn't using a different notion of highly reliable, non-safety-related, emergency --- can't use the term emergency, alternate AC power supplies versus highly reliable operator performance in regard to manually initiating a reactor trip.

MR. GILMER: Yes. One final point. Yes?

MEMBER SCHULTZ: John has said the terminology appropriately in the discussion, so if you go back to the transcript both in terms of the review guidance, as well as the design approach it's

justification, it's sensitivity evaluations, it's an uncertainty analysis. Those types of things must be done by the designer, and also by the reviewer. So, you don't get into the quantification there or the specifics about how that's done, but developing general terminology that shows what needs to be done by the designer and then also part of the review process is important.

MR. GILMER: I was going to make one last point that operating BWRs most have detect and suppress, they also have exclusion region in their plant computer. And then they still have operator backup as a last resort. It's kind of left undecided in the DSRS whether NuScale would really need all three. It sounds like they prefer not to go with a hardware detect and suppress. I don't know how the Members feel ---

MEMBER STETKAR: We're not doing the review right now.

MR. GILMER: Yes. And Staff doesn't have enough details yet. It probably will be found acceptable, but too soon to tell. Any other questions or comments? Okay, thank you. I think Greg has some closing comments.

MR. CRANSTON: Mainly, on the last slide, it does show a lot of bullets, but really what it boils down to is this is what you're looking for as far as the type of --- which sections we're bringing to you for your consideration. And that, obviously, we've been getting feedback during this presentation as far as what your expectations are, and is there anything else that you'd want to provide as far as making sure that for the next session we're bringing the right stuff? I'm going to go back and look at what we proposed as far as DSRS sections for the next presentation, and make sure that it seems to fit the guidelines that I picked up based on the interactions that we've had today. But if there's anything else that you would like to add as far as what you'd like to see, please let me know. That basically sums up what my closing remarks are.

CHAIR CORRADINI: Okay. So, I think you just volunteered for something that I was going --- no, it's not going to keep on ringing. Normally, it rings at least three times before it stops. But what I was going to get at is that I think we want to take some public comments, whether they be on the phone or in the room, but at least let's ask if the Committee Members have any other further questions of any of the Staff.

And then I wanted to ask about your last comment about planning out the next subsequent --- what's next in terms of topical areas.

MR. CRANSTON: Yes, we have provided what our recommendations are, but we're going to go back and revisit, if necessary, based on any feedback that we've gotten today.

CHAIR CORRADINI: Okay. So, why don't we do this. Any other Members have questions for Jim, Jeff, or Greg at this point?

MEMBER BLEY: You're going to go around the table afterwards?

CHAIR CORRADINI: I'm going to go around the table at the very end. But that's after I get some public comments, and after we talk about schedule in terms of other topical areas. Then we can go around. Okay?

MEMBER REMPE: I had a question about this June 2nd presentation. I'm not sure, maybe it's my not following the details, but I'm not sure I can get to that SharePoint site, so could we request a copy of it?

MS. BANERJEE: Yes, I noted that.

MEMBER REMPE: Okay, good.

MS. BANERJEE: If I don't have it --- yes,

I noted that. If I don't have a copy, then I will ask the Staff for the June 2nd presentation.

MEMBER REMPE: Thank you.

CHAIR CORRADINI: Other Members? Okay, so why don't I ask --- I'm sorry, Evelyn. Did you have a question?

MS. GETTYS: I just asked ---

CHAIR CORRADINI: Evelyn, go to the mic, speak in the mic. Please identify yourself.

MS. GETTYS: Evelyn Gettys. I just ask if there is an ML --- if you have the ML number?

MR. GILMER: Okay, we can provide it.

CHAIR CORRADINI: Okay. So, Staff will get it from Jim. Okay. Other questions by the Members?

All right. So, while I ask Maitri to get the outside line opened up to see if there are comments by the members of the public ---

MR. BROWN: There is no one on the bridge.

CHAIR CORRADINI: No one is on the bridge?

MR. BROWN: No.

CHAIR CORRADINI: Is that the voice of God?

MR. BROWN: Yes.

CHAIR CORRADINI: What's a cubit?

MR. BROWN: Don't start.

CHAIR CORRADINI: Okay. All right, good. That's a new feature of our room, so that's good. All right, so nobody's on line. So, let me turn to the schedule, because everybody ---

MR. BROWN: Are you going to ask from the room?

CHAIR CORRADINI: I'm sorry?

UNIDENTIFIED: I thought I --- it doesn't look like anybody's in the room; some members of the Staff that are busily taking notes.

CHAIR CORRADINI: All right. So, we had somebody that we thought was going to make comments. That's the reason we wanted to make sure we give someone the opportunity. So, not other comments.

Can you go back to the schedule because we were given a paper copy this morning, and I wanted the Members to look at this so that we understand what the plan is. So, my first question about the plan is, is 6.3 that substantive that we need four hours on 9/9, or is it just that that's all you'll have ready on 9/9?

MS. GALLO: The latter.

CHAIR CORRADINI: The latter. Okay, so if that's the case, then I think we want to properly plan what time window is appropriate for that, so we --- the

Committee has other pressing obligations, that we could effectively use some of that morning since we're going to be here with start of a Full Committee on the second-half of that day. So, that's the 9th of September.

And then on the 24th of September we have 3.8.2, which if I remember correctly is the containment?

MS. GALLO: Yes.

CHAIR CORRADINI: Right? And what is 11.1? I'll look it up in case you don't ---

MS. BANERJEE: It's radiation protection, 11.1.

CHAIR CORRADINI: 11.1, yes.

MS. BANERJEE: Rad protection.

MEMBER STETKAR: Eleven is radiation protection.

CHAIR CORRADINI: So, Dr. Powers will be around, Dr. Powers, that Subcommittee week?

MEMBER POWERS: On September the 24th?

CHAIR CORRADINI: Yes, sir.

MEMBER POWERS: What's in it for me?

MEMBER STETKAR: Glory. The opportunity to max out your 130 days before the end of the fiscal year.

MEMBER POWERS: I've been alerted that I'm in jeopardy there.

CHAIR CORRADINI: But all teasing aside, will you be in town for that?

MEMBER POWERS: It is my intention to be here with rings on my fingers and bells on my toes.

CHAIR CORRADINI: Okay, good. All right. Then, also, we're going to go through Section 8, which is electric power.

MEMBER POWERS: You mean to tell me that I am to play second fiddle on the source term?

CHAIR CORRADINI: I don't know what you mean.

MEMBER STETKAR: You're the first fiddle. You're playing first chair. You're Section 11.

MEMBER POWERS: Section 11 when I was being drafted was not a good thing, by the way.

MEMBER STETKAR: That's why I mentioned it precisely in ---

CHAIR CORRADINI: So, I guess what I wanted to --- so it's, again, a matter of timing. We've got essentially a half-day, and I'm just looking at how things look. Is that too much in the half-day?

MS. GALLO: So, the thought was that, so

you've got big chunks, too, like electrical spec day, as well, I believe.

CHAIR CORRADINI: Right.

MS. GALLO: So ---

CHAIR CORRADINI: Half of the half.

MS. GALLO: Right. So, we have a day reserved in November, I think it's the 4th or the 2nd of November where anything that we didn't get to cover, any issues we have to resolve with you like some of the things that came up today, we'll take care of them. And, also, if we don't have enough time on that particular date for that session, it'll carry over to the 4th. So, that was kind of the thinking.

CHAIR CORRADINI: Okay. And then --- so, let me just say it back to you. So, your point is, it's most important to deal with 3.8.2, which is containment, and 11.1, which is source term. And if parts of electrical power don't get finished on the 24th, that would essentially revert to a day in November.

MS. GALLO: That's correct.

CHAIR CORRADINI: Okay. All right. And then, finally, all things related to containment relative --- I should say accident analysis, Chapter

6, containment analysis, accident analysis will be a full day on the 6th of October.

MS. GALLO: That's correct.

CHAIR CORRADINI: Did that get moved from the 7th? I thought it was supposed to be on the 7th.

MS. GETTYS: This is Evelyn. It was moved. It was originally the 7th, but it had to be moved to the 6th.

CHAIR CORRADINI: Okay. I don't want to go into a P&P discussion, but oops, because I had other plans on the 6th, so we'll discuss that separately. All right?

MS. GALLO: Well, let us know because I need to ---

CHAIR CORRADINI: Okay. We can go offline on that.

And the final point I guess I wanted to ask to the Members is, this is what Staff thinks we ought to look at in difference to what, if we're going to get a complete listing of the CD of all the DSRS, if the Members feel there are other sections that they want to look at further, we've reserved a whole day in November.

MEMBER STETKAR: What about --- I mean, the

thing I brought up this morning, this 15 --- you said that a bunch of stuff in Chapter 15 has been rolled up into 15.0.3. I don't see that here.

MS. GALLO: They're not DSRSs, they're SRPs.

CHAIR CORRADINI: They're what?

MEMBER STETKAR: No, no, no, I'm sorry, 15.6.3 and the SRP in my cross-reference says that doesn't exist for NuScale, but there's a new section 15.0.3 ---

MS. GALLO: Right.

MEMBER STETKAR: --- that is specific for NuScale.

MS. GALLO: That's correct.

MEMBER STETKAR: Which seems to roll up, as I heard earlier, several sections from Chapter 15. That's what we heard this morning.

MS. GALLO: That's correct.

MR. CRANSTON: Yes, that's correct. We can provide a complete list of all ---

CHAIR CORRADINI: We have the master list which you gave us. And, John, of course ---

MS. GALLO: So I wrote the safety matrix that went out as part of the FRN, and when it says not

applicable to NuScale, it's because it was covered somewhere else. So, in this case Greg is right, it was covered in 15.0.3.

CHAIR CORRADINI: But the question that John is asking is when are we going to see 15.0.3, if it's brand new for NuScale?

MEMBER BLEY: Or why wouldn't we want to?

MEMBER STETKAR: Or why wouldn't we want to see it?

MR. CRANSTON: I'll go look at it and see what ---

CHAIR CORRADINI: Okay.

MR. CRANSTON: --- what's going on with it.

MEMBER STETKAR: It says 15.0.3 developed new DSRS sections, which to me says it's somehow new for NuScale.

CHAIR CORRADINI: As it does for 15.1.1 through 15.1.4 Design-Specific Review Standard

MEMBER STETKAR: Right.

CHAIR CORRADINI: --- and 15.1.5, and 15.1.6.

MEMBER STETKAR: Other than the ones that it says don't apply for NuScale, which we said --- we're told have been rolled into other places.

CHAIR CORRADINI: So, I guess, I want to do this for the Subcommittee so we're all on the same page, which is we're back together the day of the start of the Full Committee meeting on the 9th for one section, because that's the only thing Staff will have ready. So, we want to get an appropriate block of time, three and a half hours seems a bit too long for that.

Then we're together on the 24th which is Subcommittee week for a number of sections, and if we have any spillover of electrical power, that'll spillover into November. And the meeting which I thought was on the 7th of October is only Section 6 pieces, and if there's spillover there, that also will spillover to November. And that leaves only, essentially, a meeting in November as yet unspecified in case we want to add things, or in case we run out of time. Is that the current plan?

MS. GALLO: Yes.

CHAIR CORRADINI: Okay. So, I guess I'd like to make sure the Members understand that, and then get any reaction. Dennis?

MEMBER BLEY: Well, I'll offer one reaction now, because we had that little discussion earlier about the accident analysis, and that it's all in the

SRP. And, I guess, I've got to do a little reading to decide, but I think maybe a little discussion about why nothing new needed to be developed for that is something I'm wondering about. Don't consider this a request for that right now, but between now and then, I have to think about it some more.

CHAIR CORRADINI: Okay. So, just to give the action items to the --- let me write down these action items. This is just informal action items to my colleagues, which is one, make sure that you realize the plan going forward. There will be a full day as yet unscheduled in terms of specifics for November, but the two meetings in September, and the meeting in October, we have what Staff thinks are the things we ought to look at because they're substantive. If we have ideas that there are other things we think are substantive, we've got time in November for it. And we're going to get the complete CD with all the DSRS this week. Okay?

MEMBER STETKAR: How big is Section 6.3, pages? I mean, we don't have these, so ---

CHAIR CORRADINI: What is 6.3?

MEMBER STETKAR: Emergency core cooling system.

MR. SCHMIDT: It's probably I would say

roughly the same size as 5.4.7, so probably 20 some---

MEMBER STETKAR: Twenty some odd pages, okay.

MR. SCHMIDT: Yes, something like that. I would assume it's going to take about the same time, maybe a little less than 5.4.7, if I had to guess.

MS. BANERJEE: It's not an all day?

MR. SCHMIDT: No, it's probably two hours worth.

CHAIR CORRADINI: And that's what we're doing only on the first of September.

MS. GALLO: Yes, we have scheduling conflicts with folks on the other ---

MEMBER STETKAR: Chapter 15 people available on the 9th?

MS. GALLO: I can find out.

MR. GILMER: That would be me.

MS. GALLO: Oh, that's you?

MEMBER STETKAR: It would at least be good to get an overview of the philosophy of Chapter 15.

CHAIR CORRADINI: Are you Chapter 15 people?

MR. SCHMIDT: I am Chapter 15 people.

CHAIR CORRADINI: So, what's your ninth

look like?

MR. SCHMIDT: What does my night look like?

CHAIR CORRADINI: 9th.

MR. SCHMIDT: Oh, 9th. I was going to say dark.

CHAIR CORRADINI: How do you know?

MR. SCHMIDT: I'm hoping. I don't really know off the top of my head.

CHAIR CORRADINI: Okay. But I think if we have some open time on the 9th of September and we can take some of the new sections of Chapter 15, that would be good.

MS. GALLO: And I don't want to put you on the spot, but you're 6.3 that day, too.

MR. SCHMIDT: Yes, that's the problem, and I'm going out --- the real problem is I'm going to be out a fair amount of time between now and then.

CHAIR CORRADINI: Okay. Well, I leave you guys to think about it only because if you want us to look over the new sections to make sure something is not missing, the only other thing that I guess the November meeting would be appropriate for me to do is forget about all these numbers, which I get lost on. There are certain things after you're learning about

the design, we're learning about the design, we want to make sure a concept is covered. You may want to on the 11th be ready to explain in more of a back and forth session where is that covered so that we can look at it. And that kind of goes back to when I was asking about stability in startup. I didn't think it was here, John thought it was here. Right?

MS. GETTYS: Mike, this is Evelyn Gettys. I just wanted to point out that the Full Committee meeting on this is on November the 5th.

CHAIR CORRADINI: Really?

MS. GETTYS: Yes.

CHAIR CORRADINI: Why?

MEMBER STETKAR: Well, but we can change that.

CHAIR CORRADINI: Yes, we have the ability to change that.

MS. GALLO: Were you going to give us a list of those things for us to provide to the ---

CHAIR CORRADINI: After this, after we conclude, yes.

MS. GALLO: Okay.

CHAIR CORRADINI: That would be the plan. Okay? Any other --- let me go around the table for the

Subcommittee. I'll start with Joy. Any other parting shots?

MEMBER REMPE: No parting shots, but thanks for your presentations.

CHAIR CORRADINI: Ron?

MEMBER BALLINGER: Same.

MEMBER BLEY: Yes, we spent a lot of time this morning on all the pointers and connections and things like that. I'd rather we not, but I really wish you guys would take that on hard. That's really got to get cleaned up or this thing will be very difficult for people. I'd rather have us focus on like we did the second half of the day.

CHAIR CORRADINI: John?

MEMBER STETKAR: Nothing more, thank you.

CHAIR CORRADINI: Number one Chair?

MEMBER POWERS: No.

CHAIR CORRADINI: Dr. Powers?

MEMBER POWERS: None.

MEMBER SKILLMAN: I do have two comments. I think we communicated this several times this morning but somewhat veiled, and that is a request to make sure that the DSRSs focus on the functional performance requirements, not on what we expect the designer or the

Licensee to implement. What is the requirement that the reviewers are supposed to review?

The second thing is getting rid of these legacy requirements, 36 hours, 72 hours, numbers that have come over from a historical past that in all candor may not be --- might not be appropriate for this design.

So, those are the two comments, and I say that recognizing that there are two tiers of customers, one tier customer is the reviewers, the NRC Staff reviewers that need to review the design. But keep in mind there's a second customer, and that is once the Staff goes out and does the review, there's probably a young man or young woman in the NSSS shop trying to implement what the Staff reviewers are seeking. And the greater specificity for the functional performance requirement, in my view, gives a better outcome for nuclear safety. Thank you.

CHAIR CORRADINI: Steve?

MEMBER SCHULTZ: I appreciate the presentation this morning. My only comment would be for us to work on what we are going to do with the extra two hours in the first week of September, first our week of September. And perhaps an overview presentation that looks forward at what we're going to be seeing in

October --- September, October, and November.

CHAIR CORRADINI: Like a roadmap.

MEMBER SCHULTZ: Yes, something like that. But I'm not sure the roadmap that was described this morning would be what we would want to get into in detail, but rather some presentation and discussion of where we're going with this would be helpful.

CHAIR CORRADINI: John?

MEMBER STETKAR: We have some other things administratively that the Committee needs to attend to, and we don't need to fill an entire three and a half hour block on the 9th of September, but we need to know very soon whether we will fill the three and a half hour block. Let me just put it that way.

CHAIR CORRADINI: Okay. Thanks all the Members. What I --- I wrote down a bunch of notes to myself, and I wanted to identify a few of them that I thought go beyond typos, and master table updates, and pointers, et cetera.

The one thing was that John brought up, and I think a number of the Members agreed that cold shutdown is not the safe stable shut --- safe stable condition state, but it's not clear in the DSRS what is the safe stable condition state for the NuScale

design, and that's got to be defined pretty specifically. So, to me, that's a technical one that I leave to the Staff. All right. These don't rise up to anything that worries me as much as clarification so the reviewers really know what's going on.

The second one Jim brought up in back and forth with us where --- that the T-H stability was a ----- I'll use the word "transplant," a BWR transplant in, so some things fit, some things don't fit. You're expecting to get something back from the Applicant relative to what fits and doesn't fit, but I do think, in particular in my mind, startup not just normal operation and accident conditions is probably where stability issues are going to have to be considered. So, to me, that's technically important to consider.

And I think the third one, they kind of go together. John brought up a number of things where there are qualitative statements without helpful guidance to the reviewer, or numerical values without justification or maybe just holdover numerical values from past designs. I think those have got to be cleaned up, or else that's going to cause the reviewers a good bit of confusion going forward. And that which is just going to be production between the Applicant and the

Staff trying to get clear what really is appropriate for this design. So, those are the three things that I identified that I think kind of come out of the three we've seen, but they might have a possibility of being in other places in the DSRS.

So, that's all I've got. Any parting comments by anyone? Otherwise, I'll thank the Staff. We're starting up on a whole new endeavor, so we will essentially get ourselves organized for the next time in the first week of September. Okay?

All right, thank you very much. Meeting adjourned.

(Whereupon, the above-entitled matter went off the record at 10:52 a.m.)

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Protecting People and the Environment

ACRS Presentation on the NuScale Design Specific Review Standard (DSRS Sections 5.4; 5.4.7; and 15.9A)

Gregory Cranston,
Sr. Project Manager
Office of New Reactors
August 18, 2015

NuScale DSRS Briefings to the ACRS Subcommittee on Future Reactors

- First in series of meetings scheduled on selected draft DSRS sections
- Sections selected based on comparison of differences with corresponding SRP section
- Draft DSRS developed based on NuScale design information available to the staff at the time
- Opportunity for updates during comment incorporation

NuScale DSRS Briefings to the ACRS Subcommittee on Future Reactors

- Purpose: provide ACRS with approach staff took developing draft 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

Background

- Reasons for developing DSRS:
  - Provide DSRS guidance for staff review of NuScale DCA (116 DSRS sections, 134 SRP sections)
  - Facilitate early engagement between staff and applicant
- Development of DSRS based on applicant design information made available during pre-application phase
- Risk insights not reflected in DSRS
  - Risk information still being provided by NuScale (Received Risk Significance Determination Topical Report 7/30/15)
- Risk information applicable to DSRS or SRP section scheduled to be provided for use by reviewers prior to docketing the application

DSRS History

- Staff created draft DSRS for mPower SMR design in 2012
- May 2013 - mPower draft DSRS released for public comment
- NuScale provided generic comments on mPower draft DSRS
- NuScale provided NuScale specific comments on mPower draft DSRS
- All applicable comments on mPower DSRS were resolved by staff and incorporated into NuScale draft DSRS where applicable

The Status of the NuScale DSRS

- Draft NuScale DSRS issued for public comment on 6/30/2015
- Public comment period closes on 8/29/2015
- Staff's resolution of public comments will be ongoing
- ACRS Future Reactor Subcommittee briefing on public comments tentatively scheduled for 11/2/2015
- We are looking at the schedule for resolving comments and will develop final schedule based on magnitude and complexity of comments

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NuScale DSRS 5.4 Reactor Coolant System Component and Subsystem Design

by
Jeff Schmidt

August 18, 2015

Reactor Coolant System Component and Subsystem Design

- Chapter 5.4 provides review area responsibilities
- Review responsibilities were unchanged
- Reasonable assurance finding made in each subsection (e.g., 5.4.7)

DSRS 5.4
Reactor Coolant System Component and Subsystem Design

- Major changes where due to NuScale design specifics
- Major changes include,
  - Eliminating all BWR material
  - Eliminating RCP material
  - Referencing helical steam generator
  - Referencing reactor vent valves and reactor recirculation valves

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NuScale DSRS 5.4.7 Decay Heat Removal System

August 18, 2015

Jeff Schmidt ,Sr. Engineer
Office of New Reactors

DSRS 5.4.7
Decay Heat Removal System

- RHR SRP rewritten to address different design features and philosophy of NuScale decay heat removal systems
- Removed typical PWR and BWR RHR system language
- Added DHRS functions:
  - 10 CFR 50.62 ATWS
  - 10 CFR 50.63 SBO
- Added GDC 44 as DHRS transfers heat directly to the UHS
- Added GDC 45-46 to address inspection and functional testing of the DHRS

DSRS 5.4.7
Decay Heat Removal System

- DHRS
  - Passive, secondary side heat removal similar to auxiliary feedwater function
  - Safety-related means to reach a safe shutdown condition when normal shutdown heat removal systems are unavailable
- ECCS
  - Passive, primary side heat removal similar to RHR
  - Safety-related means to reach cold shutdown if normal shutdown heat removal systems are unavailable

DSRS 5.4.7
Decay Heat Removal System

- Normal cool-down heat removed by non-safety systems
  - Feedwater and turbine bypass to safe shutdown conditions
  - Containment Flooding and Drain System (CFDS)
- CFDS
  - Nonsafety-related
  - Used to reach cold shutdown if offsite or onsite ac power is available

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NuScale DSRS 15.9A Thermal Hydraulic Stability

August 18, 2015

Jim Gilmer, Engineer
Office of New Reactors

DSRS 15.9.A
Thermal Hydraulic Stability

- DSRS section was derived from SRP 15.9 (BWR Stability), since the Nuscale design will perform similar to a BWR thermal hydraulically
- Removed non-applicable BWR-specific references
- Natural circulation (density wave) oscillations anticipated

DSRS 15.9.A
Thermal Hydraulic Stability (con't)

- Wave propagates in an adiabatic riser (rather than a heated channel) – possible boiling in riser
- Potential exists for control rod pattern induced instability
- Potential helical coil steam generator flow pattern instability

DSRS 15.9.A
Thermal Hydraulic Stability (con't)

- Other potential instabilities include:
  - Xenon
  - Primary loop coupling to secondary side perturbations via the Helical Coil Steam Generator
  - Startup-induced
- NuScale developing analysis tool (overview provided in June 2, 2015 meeting presentation)

DSRS 15.9.A
Thermal Hydraulic Stability (con't)

- Applicable GDCs:
  - GDC 10: Reactor Design
  - GDC 12: Suppression of reactor power oscillations
  - GDC 13: Instrumentation and Control
  - GDC 20: Protection System Functions
  - GDC 29: Protection Against Anticipated Operational Occurrence

DSRS 15.9.A
Thermal Hydraulic Stability (con't)

- GDCs 12 and 29 require alternative means of controlling stability
- DSRS 15.9.A acknowledges 2 possible stability solutions:
- Exclusion region
- Detect and Suppress System

DSRS 15.9.A
Thermal Hydraulic Stability (con't)

- NuScale's preferred solution (based on the June 2, 2015 presentation) is operation with an exclusion region
- The draft DSRS is focused on the detect and suppress option, since it was prepared before NuScale's preferred approach was known to the staff

DSRS 15.9.A
Thermal Hydraulic Stability (con't)

- Staff expects some revisions to Draft DSRS once public comments are received and incorporated into Final DSRS
  - More focus on exclusion region option, including automatic functions and manual backup
  - Additional focus on analytical methods and qualification

Closing Remarks
ACRS SC Meeting

Gregory Cranston,
Sr. Project Manager
Office of New Reactors
August 18, 2015

Closing

- First in a series of briefings to the Subcommittee on selected Draft DSRS sections
- Sections were selected based on significant changes from SRP, nonexistent in SRP, or sets NuScale specific context for another section, e.g., section 5.4 relative to 5.4.7
- Please provide any feedback on whether the content of this presentation is what you are interested in seeing in future presentations.
- Comments or Questions?