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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

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FUTURE PLANT DESIGNS SUBCOMMITTEE

+ + + + +

WEDNESDAY

SEPTEMBER 9, 2015

+ + + + +

ROCKVILLE, MARYLAND

+ + + + +

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 L. CORRADINI, Subcommittee Chairman

RONALD G. BALLINGER, Member

DENNIS C. BLEY, Member

CHARLES H. BROWN, JR., Member

DANA A. POWERS, Member

JOY REMPE, Member

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HAROLD B. RAY, Member

STEPHEN P. SCHULTZ, Member

GORDON R. SKILLMAN, Member

DESIGNATED FEDERAL OFFICIAL:

MAITRI BANERJEE

ALSO PRESENT:

GREGORY CRANSTON, NRO/DNRL/LB1

JEFFREY SCHMIDT, NRO/DSRA/SRSB

MARK E. TONACCI, NRO/DNRL/LB1

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

8:31 A.M.

1  
2  
3 CHAIR CORRADINI: This is a meeting of  
4 Future Plant Designs Subcommittee of the ACRS. My  
5 name is Mike Corradini. I am chairman of the Future  
6 Plant Designs Subcommittee of this subcommittee.  
7 ACRS members in attendance are -- let's see who's  
8 here today -- Harold Ray, Steve Schultz, Dick  
9 Skillman, Dana Powers, Ron Ballinger, and Joy Rempe.  
10 A couple other members will join us later.

11 Ms. Maitri Banerjee is the Designated  
12 Federal Official for this meeting.

13 Today, we have members of the staff to  
14 brief the subcommittee on the staff's development of  
15 the Design-Specific Review Standard, DSRS, for the  
16 NuScale Small Modular Reactor. This document is  
17 being developed in anticipation of the NuScale Design  
18 Certification Application for the integrated  
19 pressurized water reactor technology.

20 The discussion topics of today's agenda  
21 will be DSRS Section 6.3, ECCS systems.

22 The rules for participation in today's  
23 meeting were announced in the Federal Register. The  
24 meeting was announced as an Open Public Meeting. No  
25 request for making a statement to the subcommittee

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1 has been received from the public.

2 We have one bridge line established.  
3 That bridge line and password were published in the  
4 agenda posted on the NRC public website.

5 To minimize disturbances, the public line  
6 will be kept in listen-only model and the public will  
7 have the opportunity to make a statement or provide  
8 comments at the designated times at the end of the  
9 subcommittee meeting.

10 Dr. Rempe has a conflict of interest in  
11 the area of NuScale severe accident consideration  
12 because of her prior work as she completed it with  
13 NuScale in this area. And Dr. Rempe will recuse  
14 herself from discussion in this area.

15 Okay, let me invite Mr. Greg Cranston,  
16 the NRO Project Manager, to introduce the presenters  
17 and we'll start from there.

18 Greg?

19 MR. CRANSTON: Good morning. My name is  
20 Greg Cranston. I'm the Senior Project Manager for  
21 the NuScale project. This is the second in a series  
22 of meetings on selected draft DSRS sections for the  
23 NuScale project.

24 Since our last meeting, we've started to  
25 receive comments. The vast percentage of the

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1 comments received so far are from NuScale, so just  
2 under 700. And we did receive some general comments  
3 from NEI and we are told that there are some more  
4 comments that are going to be coming in as soon as  
5 they're processed through document control that we  
6 haven't seen yet. So we're currently putting those  
7 into a comment matrix and we're going to be getting  
8 them out to the respective technical branches for  
9 incorporation.

10 This will give us an opportunity for  
11 updates during the comment and incorporation, where  
12 appropriate, based on the comments that we've got and  
13 any other information that we've received since the  
14 DSRSs were originally drafted.

15 Some DSRS sections may revert back to  
16 Standard Review Plans after we've had a chance to see  
17 what the comments look like, what we know now about  
18 the design compared to what we knew previously. So  
19 that's something that's just out there, but no  
20 decisions have been made specifically in that area.

21 What we want to do is provide ACRS with  
22 the approach staff took in developing the DSRS  
23 sections and you can see there what the presentations  
24 intended to cover, as far as what change between the  
25 SRP and the DSRS, why the change was made and any

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1 questions that you may have on the design information  
2 available to date.

3 This is a brief history which I did cover  
4 last time, but the only thing that's really changed  
5 is that we do have comments in-house that we are  
6 processing.

7 That's all I have as far as the  
8 introduction. If there are no questions or comments,  
9 I'd like to turn the meeting over to Jeff Schmidt who  
10 is going to cover Section 6.3, Emergency Core Cooling  
11 Systems.

12 CHAIR CORRADINI: So let me just give a  
13 comment to the subcommittee and get your guys'  
14 reaction so you can see where I'm coming from. So I  
15 am sure you're reading this word for word in great  
16 detail. My problem with this is it's so much detail  
17 I can't see the forest for the trees. So I've kind  
18 of alerted Greg that what I'm looking for is some  
19 sort of connection so that we understand the key  
20 innovations, unique features of the NuScale design  
21 and how it's being reviewed so we can map that on to  
22 the safety issues, whether it be for high pressure  
23 decay heat removal or low pressure decay heat removal.  
24 Right now we're going to look at ECCS systems. But  
25 if you have general comments like that to me that you

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1 see ways to improve how we look at this, I'd welcome  
2 it from the committee members because I see a lot of  
3 trees, but I'm having a hell of a time seeing the  
4 forest.

5 MEMBER SKILLMAN: Mike, I appreciate your  
6 comment, but let me direct my question right to Greg.

7 CHAIR CORRADINI: Sure, go ahead.

8 MEMBER SKILLMAN: Greg, I read 6.3 very  
9 carefully and in order to understand the changes from  
10 the SRP and get a fix in my mind on the type of thing  
11 that Mike is talking about, I also reviewed 4.4 which  
12 is thermal-hydraulic design and 15.6.5 which is the  
13 loss of coolant accident.

14 What I was looking for in 6.3 was an  
15 overwhelming direction towards confirmation that the  
16 thermal-hydraulic capabilities of the passive system  
17 would be successful. The overwhelming direction was  
18 towards the passive functions. And I would agree  
19 that that is very slightly provided in 6.3, but not  
20 as firmly or as I would say articulately as it needs  
21 to be.

22 We're dealing with another passive issue  
23 on another design, and what we found is the  
24 assumptions for heat transfer, the assumptions for  
25 the rate of condensation, the collection of the

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1 condensation are critical in the success of the decay  
2 heat removal function. My sense is that that issue  
3 will be on the NuScale design on steroids.

4 So I would just comment that what I read  
5 in 6.3 doesn't firmly communicate the sensitivity of  
6 the passive thermal-hydraulic function that is the  
7 heart of decay heat removal. And I'll be glad to  
8 give Dr. Corradini my specific comments, but that is  
9 my over-arching comment. Where is that fully  
10 communicated? It isn't really there in the current  
11 draft.

12 CHAIR CORRADINI: We're going to -- I  
13 think Jeff is going to address 6.3, but I want to  
14 make sure I understand your point, Dick. Is it that  
15 you're looking for some sort of over-arching play  
16 book as to this is what we're concerned about and  
17 here's where we're referring each of the pieces? Is  
18 that what you're after?

19 MEMBER SKILLMAN: I would expect that the  
20 Design-Specific Review Standard would force the staff  
21 to interrogate the passive features to the same extent  
22 that they would have examined a hardware type system  
23 for decay heat removal.

24 On this design, the decay heat removal is  
25 really tied up to opening two valves, but a complete

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1 passive process. And it is the effectiveness of that  
2 passive process that removes the decay heat as opposed  
3 to the size of the pumps, the redundancy of the pumps,  
4 the size of the heat exchangers, the UA of the heat  
5 exchangers, literally down to the ultimate heat sink.

6 6.3 is an SRP section that once had all  
7 of those details. 6.3 has been changed for NuScale  
8 and it doesn't have that same level of rigor down on  
9 the passive pieces that are essential for decay heat  
10 removal to be successful.

11 MEMBER RAY: Mike, that triggers a  
12 question that I wouldn't have asked at this point in  
13 time, but let me ask. Thank you, Stephen.

14 That triggers a question that I would  
15 have probably postponed, but I think it fits here now  
16 in terms of what Dick is saying, at least in my mind  
17 it does.

18 Does Appendix B apply to the work that is  
19 done to support the information that's provided by  
20 the Applicant?

21 MR. SCHMIDT: I'm not sure I understand  
22 the question.

23 MEMBER RAY: You don't understand the  
24 question?

25 CHAIR CORRADINI: I don't understand the

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1 question either, so help.

2 MEMBER RAY: Okay, Appendix B calls for  
3 a lot of things to be done like Dick is asking about,  
4 to validate and verify the information that's used in  
5 the design. And I'm just asking at this stage, the  
6 information provided by the Applicant, will it have  
7 to comply with Appendix B?

8 CHAIR CORRADINI: You've got to get  
9 closer.

10 MR. CRANSTON: Yes, Appendix B, Appendix  
11 A from the general design criteria or whether it's  
12 getting into quality issues, they both apply to  
13 NuScale as they would for any application from a  
14 pressurized water reactor.

15 MEMBER RAY: All right, things that are  
16 asserted are subject to being challenged on the basis  
17 of whether or not adequate design verification, for  
18 example, has been done to satisfy Appendix B?

19 MR. CRANSTON: Correct.

20 MEMBER RAY: All right, thank you.

21 CHAIR CORRADINI: Do you want to take up  
22 Dick's comment now or wait until we go through your  
23 presentation and then come back to it?

24 MR. SCHMIDT: I would say that there's -  
25 - I think there's some truth to that. There is

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1 another component which you have to look at which is  
2 the containment portion. I don't think you listed  
3 6.2 -- I can't remember if it said 6.2.5 or 6.2.2 off  
4 the top of my head. Because that has a lot to do  
5 with the condensation which we were referring to which  
6 is true, I think that's an important piece.

7 So I would just ask you to look at that  
8 component as well because it's not clear, it's not as  
9 straight forward how you separate out the ECCS  
10 function from the containment function in this  
11 design, right? The containment is crucial to the  
12 ECCS system, so it's -- it might be split in two  
13 different spots.

14 MEMBER SKILLMAN: Jeff. Thank you. I  
15 accept that, but I would respond by saying that  
16 subtlety should be made clear in probably both 6.2  
17 and 6.3.

18 MR. SCHMIDT: Right, agreed.

19 MEMBER SKILLMAN: Thank you. I would  
20 like to reinforce Harold's question. What I am  
21 really getting at is the validity of the analyses and  
22 the assumptions of the analyses to ensure decay heat  
23 removal under emergency core cooling conditions. And  
24 if Appendix B applies, then that would apply to the  
25 codes, to the calcs, to the record keeping, so that

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1 when the NuScale design is complete, we've got  
2 confidence that the functions that they communicate  
3 will be performed, are performed.

4 MR. SCHMIDT: Yes, they're currently  
5 doing testing or trying to do testing with basically  
6 the ECCS system probably as we speak. They're  
7 running tests. When we went out for inspection, I  
8 guess it was two weeks ago, and they were going to  
9 run an ECCS test. Unfortunately, they weren't able  
10 to because of some hardware problems. But all that  
11 is under Appendix B program.

12 CHAIR CORRADINI: You mean the whole  
13 testing program?

14 MR. SCHMIDT: Yes.

15 CHAIR CORRADINI: I think we should let  
16 you go forward, but let me -- I think we're all kind  
17 of going around the same issue which is everybody is  
18 trying to find a way to get their hands on it. But  
19 if it were just me, I'm looking for when we had the  
20 initial presentation, I think it was in June or May,  
21 I can't remember when, from NuScale. As Dick  
22 mentions, they essentially have -- they look through  
23 a series of potential accident scenarios and they  
24 have to have a certain set of functions which were  
25 either active valve functions or the equivalent of

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1 the passive behavior, just natural circulation.

2 I'm trying to figure out in the review,  
3 okay, this is how the system behaves, now you're going  
4 to look at this part of the system here, and this  
5 part of the system here and here and somehow we're  
6 down here into the pieces and I'm having a hard time  
7 connecting back up to everything else. I think  
8 that's kind of what you're saying.

9 MEMBER SKILLMAN: Correct.

10 CHAIR CORRADINI: Right? Because at  
11 least in this design, the ECCS requires the action of  
12 four valves to one set of valves and a redundant set  
13 and life is good. But then we have to see things  
14 that I would expect and I'm not sure when we'll see  
15 it is since it's all passive, they're going to have  
16 to have a scaling logic for all their thermal-  
17 hydraulics so we can understand when they tested, you  
18 feel the integrated response really matches up and is  
19 scaled appropriately. So if it's not here, where is  
20 it? If they're going to look at needing some sort of  
21 DC power for valve actuation, we already brought this  
22 up in the meeting in August. Where are you looking  
23 at it and where is it being tested? That's where I'm  
24 -- I'm kind of down here in these individual pieces  
25 and I'm having a hard time coming back up and around

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1 to where it connects. I kind of repeated myself, but  
2 I can't -- I was struggling this weekend, to put it  
3 mildly.

4 MR. CRANSTON: And I think that's  
5 something that when we talk this afternoon, I think  
6 that fits right in to what we were looking for to try  
7 to bring to you the right DSRs and put a package  
8 together.

9 CHAIR CORRADINI: So I'll ask my first  
10 question and then I'll let you start. So my first  
11 question was how does the accident -- how do the  
12 various accidents evolve relative to high pressure  
13 and low pressure? Because I understand the way the  
14 system behaves that if I'm able to remove decay heat  
15 at high pressure, the DHRS, the Decay Heat Removal  
16 System, is the key system and all individual  
17 functions. And then if I can't maintain it, then I  
18 depressurize, I essentially cause myself to have a  
19 LOCA or I have a LOCA of some size. And now the ECCS  
20 systems have to behave.

21 And so when we walk through this one  
22 today, I'm kind of curious about details how the two  
23 interaction, right?

24 MR. SCHMIDT: You know, this is really  
25 for loss of coolant accident. The decay heat removal

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1 system is primarily for the non-LOCA loss heat sync  
2 incident. And that's their primary function.

3 CHAIR CORRADINI: If they fail to do it  
4 there, then they cause essentially just like the  
5 AP1000 --

6 MR. SCHMIDT: Right, they have a back-up  
7 capability effectively which it says in the first  
8 paragraph here that if you don't have the decay heat  
9 removal system, you can use the ECCS system to remove  
10 decay heat.

11 CHAIR CORRADINI: Why don't you go ahead  
12 and we'll ask some other questions. Go ahead through  
13 your presentation. We won't stop you now for a while.

14 MR. SCHMIDT: This is the NuScale ECCS  
15 system. Probably the presentation isn't really set  
16 up for what you're looking for, unfortunately.

17 CHAIR CORRADINI: That's all right, we  
18 have questions. I'm ready.

19 MR. SCHMIDT: So there's no change in the  
20 applicable GDCs. No change in the acceptance  
21 criteria. Major changes were due to NuScale design  
22 specifics. Major changes included eliminating BWR  
23 material, eliminating references to active flow  
24 systems and references to piping and added a general  
25 description of the RVV and RRV function.

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1           We talked about nine public comments.  
2           People recommended deletions, one a rewording, and  
3           preliminary staff review of those questions or those  
4           comments, staff would agree with those changes.

5           CHAIR CORRADINI:    Okay, so I have a  
6           question.  So as I understand it, we have to have --  
7           we have a pair a RVVs and RRVs that have to actuate  
8           to essentially initially ECCS either because I want  
9           to depressurize because I haven't been able to do it  
10          at high pressure or I have some sort of line break,  
11          right?

12          MR. SCHMIDT:  Right.

13          CHAIR CORRADINI:    Feeding into the  
14          integral vessel.

15          MR. SCHMIDT:  Right.

16          CHAIR CORRADINI:    Are those the only  
17          valves that need to be closed or check valves that  
18          need to operate properly?  Where in the review is  
19          containment isolation specifically, the staff is  
20          looking at containment isolation to make sure that  
21          everything closes appropriate?  Or is this design  
22          such that I don't need everything to close?  I can  
23          essentially still remove decay heat at low pressure  
24          with leaky valves.  Where is that in 6.3?  Or is it  
25          somewhere else?

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1 MR. SCHMIDT: I think it's in 6.2  
2 something.

3 CHAIR CORRADINI: Let him answer.

4 MR. SCHMIDT: Containment isolation is  
5 in 6.2.4, I believe.

6 MR. CRANSTON: Yes, 6.2.4 is containment  
7 isolation.

8 CHAIR CORRADINI: So in this design, do  
9 I need to have all the connective systems isolated  
10 for effective ECCS operation? Or can I get away with  
11 leakage through a check valve of CVCS and still  
12 essentially remove decay heat? Is that being checked  
13 in 6.2 or going to be checked in 6.3?

14 MR. SCHMIDT: I would say it's probably  
15 going to be checked in 6.3.

16 CHAIR CORRADINI: Okay. Can you point  
17 to where it is in there because I had trouble. We  
18 can come back to that.

19 MR. SCHMIDT: CVCS will talk about the  
20 check valve related to the CVCS system. This  
21 discusses the check valves related to the ECCS system.  
22 So I guess what I would say is it's probably in the  
23 CVCS system if you're talking about the CVCS slide.

24 CHAIR CORRADINI: Okay. But is staff --  
25 I don't know how to ask the question. But so is the

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1 function separated such that -- or is one individual  
2 or one group looking at the whole concept of it for  
3 NuScale? Because as I understand it, you could have,  
4 as I understand the design, you don't necessarily  
5 need to have complete containment isolation to remove  
6 decay heat. Or am I wrong about that?

7 MR. SCHMIDT: I have not heard that  
8 before.

9 CHAIR CORRADINI: Okay, so I'm probably  
10 misinterpreting.

11 MR. SCHMIDT: I have not heard that.

12 CHAIR CORRADINI: So CVVS is done in  
13 where, I'm sorry?

14 MR. SCHMIDT: 9.3.4.

15 CHAIR CORRADINI: Okay. And all of  
16 containment isolation discussion here is only for the  
17 ECCS system.

18 I have another question, unless members  
19 have others. Are the CVCS lines normally open to the  
20 reactor coolant system piping connections?

21 MR. SCHMIDT: Yes.

22 CHAIR CORRADINI: So they would have to  
23 isolate or the check valve would have to function?

24 MR. SCHMIDT: I think the CVCS, if I  
25 remember correctly, the one safety function of the

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1 CVCS is isolation.

2 CHAIR CORRADINI: Okay. What about the  
3 -- you have other systems which I'm not familiar with.  
4 The CFDS, Containment -- I can't remember what all  
5 these -- Containment Flooding and Drain System and  
6 Containment Evacuation System. Is that part of the  
7 necessary isolation for operation of ECCS?

8 MR. SCHMIDT: I'm not sure. I don't  
9 really know.

10 CHAIR CORRADINI: Is 6.3 the place  
11 they're supposed to worry about that?

12 MR. SCHMIDT: Again, I would probably  
13 think it would be isolation for containment  
14 isolation.

15 CHAIR CORRADINI: So it's not clear, but  
16 it should be in here where it's checked?

17 MR. SCHMIDT: Yes.

18 CHAIR CORRADINI: So let me ask my  
19 question in general then. So there should be no, at  
20 least as you understand the system design, there  
21 should be no open lines connected to containment  
22 volume. There's either got to be what I remember as  
23 double isolation or check valve isolation for the  
24 CVCS?

25 MR. SCHMIDT: Right. I'm not aware of

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1 any identified leak path in the pre-application  
2 information that I've been given.

3 CHAIR CORRADINI: Okay. Let me ask a  
4 different question. So going back to the CVCS, if  
5 the check valve leaked, we would have containment  
6 bypass essentially an interfacing systems LOCA?

7 MR. SCHMIDT: Right.

8 CHAIR CORRADINI: So it's in 6.2 where -  
9 - or it's in 9.3.4 where that -- the reviewer would  
10 have to worry about that and verify?

11 MR. SCHMIDT: There's an isolation valve  
12 -- if there is a check valve in the system, you're  
13 saying?

14 CHAIR CORRADINI: Yes.

15 MR. SCHMIDT: Inter-system LOCA is  
16 usually covered in 6.3.

17 CHAIR CORRADINI: Okay.

18 MR. SCHMIDT: At least it has you look  
19 for inter-system LOCA potentials. But I think the  
20 CVCS person would also be looking at potential  
21 bypasses.

22 CHAIR CORRADINI: And that's  
23 both probably here in 6.3 and in the CVCS?

24 MR. SCHMIDT: Right.

25 CHAIR CORRADINI: I'm just making notes.  
I'm sorry. If others have questions, feel free to

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1 jump in.

2 MEMBER SKILLMAN: I do. At the areas of  
3 review which is the draft one, you've deleted SAR and  
4 replaced SAR with technical submittal. And I  
5 question why you removed SAR. I would think SAR is  
6 a required component of NuScale's submittal.

7 MR. SCHMIDT: Could you point to where  
8 that --

9 MEMBER SKILLMAN: Sure. It is the draft  
10 6.3. It is Roman numeral I, areas of review, and it  
11 is the first sentence.

12 MR. SCHMIDT: Oh, first sentence.

13 MEMBER SKILLMAN: "The reviewer reviews  
14 the information presented in the Applicant's  
15 previously SAR, now technical submittal." Why is SAR  
16 removed?

17 MR. SCHMIDT: I'd have to get back to you  
18 on that. It is probably a legal change. I don't  
19 think it's a change that I made.

20 MR. TONACCI: Jeff, this is Mark Tonacci  
21 on the side. I think this also applies to topical  
22 reports as well which goes beyond just Safety Analysis  
23 Report?

24 MR. SCHMIDT: Usually 6.3 is just the DC.

25 MR. TONACCI: But they're submitting

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1 topicals.

2 MR. SCHMIDT: Yes, they are submitting  
3 topicals.

4 MR. TONACCI: So as written, it's broader  
5 and covers both aspects.

6 MEMBER SKILLMAN: But wouldn't the SAR  
7 identify a topical as a reference?

8 MR. TONACCI: If it comes in -- if the DC  
9 comes in first, but if the topical comes in first,  
10 I'm just looking at this just grammatically. If Jeff  
11 gets a topical report in next month and the DC is not  
12 submitted yet, he would use this DSRS if it were  
13 approved to review the topical if he needed it.

14 There are a number of topical reports on  
15 the order of 15 to 18 coming in prior to the DC  
16 application.

17 MEMBER SKILLMAN: Then it would seem as  
18 though the sentence should reflect the capability to  
19 either address the topical or the SAR, whichever is  
20 the -- if you will, the final document for the design  
21 cert.

22 MR. TONACCI: I agree. I mean you could  
23 write it several ways, but just writing it broadly as  
24 the submittal allows you to -- the way I read it,  
25 allows you to do it either way.

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1                   MEMBER SKILLMAN:       Thank you.       I  
2       understand.   One of the -- I'll tell a story and then  
3       I'll ask a question.   In April of '79, we stopped the  
4       reactor coolant pump at the TMI-2.   We didn't know  
5       whether or not one loop or both loops would go into  
6       natural circulation.   That had never been done before  
7       and certainly not full-scale tests and certainly not  
8       a full-scale test with a LOCA.   And I was involved in  
9       that and I will tell you we held our breath.   We  
10      stopped that reactor coolant pump and we didn't know  
11      what was going to happen.   And after about 45 to 50  
12      seconds, we began to see the trace and both loops  
13      went into forward natural circulation and what drove  
14      that was the difference in density between the hot  
15      core and the cold water and the same elevations in  
16      the cold legs in steam generators.

17                   I was one of probably several hundred  
18      people that were holding our collective breath.   We  
19      didn't know what was going to happen.   We shouldn't  
20      be in that situation here.   We should know that these  
21      loops will go into natural circulation and we should  
22      also know that gas binding cannot threaten the success  
23      of that function.   So as Dr. Corradini pointed out,  
24      kind of having this angst around at least several of  
25      us, how this DSR\$ applies to NuScale because of the

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1 essential passive nature of this decay heat removal  
2 which is last stand system or last stand function to  
3 protect the core, we should have confidence that when  
4 this system is called upon it can't be cast-bound.  
5 It is a thermal driving head system, so it really is  
6 a thermal siphon. It needs to function as long as  
7 the core is not blocked.

8 It seems that the essential elements of  
9 those words ought to be perhaps the front piece of  
10 6.3. I guess that's my -- that's the comment that I  
11 would ask that you hear me communicate.

12 CHAIR CORRADINI: Can I ask Dick's  
13 question a little bit differently? Is this a  
14 separate function or is there a separate review of  
15 the experiments that are going to be the basis of the  
16 scaling logic that shows the system functions or is  
17 it in 6.3 that you're asking the reviewer to go look  
18 at these tests that show at some scale, like the scale  
19 we saw, we both saw when we toured NuScale that gives  
20 us confidence that everything is going to function as  
21 expected.

22 MR. SCHMIDT: Well, there are topical  
23 reports that inform the 6.3 review. There's going to  
24 be a scaling report. There's going to be a natural  
25 circulation report. There's going to be probably

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1 LOCA will have its own reports.

2 CHAIR CORRADINI: So it's a normal set  
3 of state of affairs that you write the review under  
4 the assumption that somewhere else there's a topical  
5 staff has already looked at, audited, and done some  
6 we'll call check calculations or review, right? But  
7 it isn't called out in the review stint. That's what  
8 I guess I'm getting at. Do you know what I'm asking?

9 MR. SCHMIDT: That's typically true of  
10 the DCs in general is that there will be 15.6.5 is  
11 usually supported by multiple topical reports and  
12 those reports are reviewed. And a lot of the details  
13 of code applicability and methodology are all covered  
14 in those topical reports.

15 CHAIR CORRADINI: Okay. So we shouldn't  
16 have expected this -- what I'm trying to get at is  
17 just the specific. Dick's worried. How do we allay  
18 his worry? Your answer is there's a separate set of  
19 topical reports that will be reviewed, audited and do  
20 check calculations that will give confidence to the  
21 staff to check off in 6.3 that life is good.

22 MR. SCHMIDT: You're right, absolutely.

23 CHAIR CORRADINI: All right.

24 MR. SCHMIDT: There has to be.

25 CHAIR CORRADINI: But there's no word

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1 linkage to that effect. It's expected. And that's  
2 the way it was done in the past?

3 MR. SCHMIDT: Right, that's correct.

4 MEMBER BLEY: Can I follow that up just  
5 a little to understand better. For the ones we've  
6 already done, you have the SRP as written which was  
7 used as a basis, but there we had the submittal first.  
8 We had the application and in the design cert.  
9 document, these things are called out, are  
10 referenced. I take it that's really the link that  
11 ensures that we cover these reviews that we've been  
12 talking about for the last 15, 20 minutes.

13 MR. SCHMIDT: I guess I'm not sure I  
14 followed your question.

15 CHAIR CORRADINI: I think what he's  
16 asking is in some sense we're going in a different  
17 order than we're used to which is we're looking at  
18 the review standard. We've yet to see the  
19 application that would say gee, I want to see that  
20 topical report. I want to see that calculation. I  
21 want to see that experiment so I feel comfortable.

22 MR. SCHMIDT: Right.

23 CHAIR CORRADINI: Before we come back to  
24 if staff's comfortable or in some simultaneous. So  
25 we're kind of ahead of it. We've never done this

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1 before.

2 MEMBER BLEY: I go back to the first one  
3 we did since -- when I got here, the ESBWR. And as  
4 we were looking at that we started asking some more  
5 questions and on some of the details, people told us  
6 if it's not in the DCD, we don't have to have to look  
7 at it. And we had long discussions and that went on  
8 for many, many months. And eventually, yes, in fact,  
9 everybody agreed that it needs to be reviewed in  
10 detail.

11 I'm not sure what the link is that makes  
12 that happen other than good management and the ACRS  
13 chiming in at some point in time. Or is there a  
14 process that makes that happen? That's all. And  
15 it's kind of following up the same thing. Somebody  
16 new comes in and they're doing the review. How do we  
17 make sure -- how does this review guidance make sure  
18 they look at all the things that are going to be --

19 CHAIR CORRADINI: So I'm going to broaden  
20 this question. So this is my ultimate worry. You  
21 guys have looked through it. You think you  
22 understand the system. You've taken the Standard  
23 Review Plan and said okay, we've got to change this,  
24 this, and this, so we catch all the features of this  
25 -- we'll call it innovated design. Fine. You send

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1 it out. You get multitudinous hundreds of comments  
2 from the vendor that says wait a minute, that's not  
3 right. This is not right. But there's a  
4 completeness part of this which is not them looking  
5 over it in this detail. It's somebody looking over  
6 to make sure there's the integral behavior is still  
7 being looked at.

8 And I don't think -- so I'm speaking for  
9 myself but I'll include a few of us. I don't think  
10 most of us here have (a) the time, nor the -- I'll  
11 use me personally, the patience, to go into that  
12 detail, but I need some sort of confidence that the  
13 integral behavior is being looked at. And the only  
14 way to do that is wait, get the design certification  
15 in and say wait a minute, you forgot about this. But  
16 in some sense that's going to cause -- that's like  
17 the horse has gone out of the barn and we're trying  
18 to drag them back in. So I'm trying to catch it now,  
19 but I'm having a hard time.

20 So I think that's what Dennis is saying.  
21 Where, at this point, can we put in the input that  
22 we're missing something? Or at least we don't  
23 understand where you're looking at. Am I making  
24 sense?

25 MR. SCHMIDT: I'm having a little trouble

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1 following it, to be honest.

2 CHAIR CORRADINI: Okay.

3 MR. SCHMIDT: You can put it -- I mean  
4 one place to put it if there's concerns about the  
5 interactions say between the containment branch and  
6 reactor systems branch, more integrative review would  
7 be in the review interface sections of the document.

8 CHAIR CORRADINI: Okay.

9 MR. SCHMIDT: I mean that's the way we  
10 normally catch, if there's other pieces of  
11 information we need. I don't know if that answers  
12 your question per se, but that's where you would try  
13 to put it, I believe.

14 MEMBER REMPE: What do you mean by the  
15 review interface document?

16 MR. SCHMIDT: Interface section of the -  
17 -

18 CHAIR CORRADINI: There's a section in  
19 each of these where it says we don't do it here. Go  
20 over there.

21 MR. SCHMIDT: Right.

22 CHAIR CORRADINI: That's what's worrying  
23 me is that this interface connection, I have a hard  
24 time following all of that. I'm not sure I want to  
25 follow it all. I just want to feel some sort of

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1 overall integrative comfort that things are being  
2 looked at.

3 And where I think Dennis is coming from  
4 is similar is that if we go through all of this and  
5 we say yes, the design specific standard looks okay,  
6 then the design certification comes in. And then  
7 something pops up, a technical report or a set of  
8 experiments and we go wait a minute, why are they  
9 doing that? We have heard in the past that says  
10 well, we weren't asked to that, so we're not going to  
11 do that, right?

12 MEMBER BLEY: Yes, sir.

13 CHAIR CORRADINI: So we might end up  
14 calling full stop at that point and I would prefer to  
15 catch it now. That's what -- that's where my kind of  
16 underlying uneasiness fits in. So that's why I think  
17 Dick was asking questions about since it's an all-  
18 natural circulation system, at full operation and  
19 under all accident modes, to me that's the over-  
20 arching thing that the staff would be looking at.  
21 And I don't want to say things are coupled, but there  
22 is a lot of coupling between the systems.

23 MR. SCHMIDT: I think there is a lot of  
24 coupling between the systems, especially between  
25 containment and reactor systems or ECCS system. I

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1 mean you can't -- one can't function without the other  
2 in this design. So that review is going to have to  
3 be very integrative. I'm not sure how to capture  
4 that, other than to acknowledge it, that it is  
5 integrated and it could be maybe highlighted  
6 especially in the review interface section of the  
7 containment function and the ECCS system are tightly  
8 coupled.

9 CHAIR CORRADINI: Well, I have more  
10 specific questions, but I wanted to get the general  
11 ones out of the way.

12 MEMBER SCHULTZ: I appreciate that  
13 comment, Jeff. I think it's very important that what  
14 you've just described, the document clearly, because  
15 otherwise there's the possibility that something  
16 could be at least construed as having the possibility  
17 to fall through the crack.

18 MR. SCHMIDT: Right.

19 MEMBER SCHULTZ: And if you describe it  
20 clearly, it in fact can prevent something from being  
21 missed. This interface approach sounds very good,  
22 but it in itself doesn't guarantee that one group is  
23 going to believe that the other group is doing the  
24 review and it's not happening. So it really does  
25 need to be documented carefully.

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1           And this is a design-specific review, so  
2           you've got the opportunity to identify those key  
3           things as we're trying to do here, identify those key  
4           things up front so that both the staff as well as the  
5           Applicant understand that everything is going to be  
6           appropriately reviewed, carefully reviewed and  
7           validated.

8           MEMBER RAY: Well, leave the microphone  
9           on. Let me just add again if you read Criterion 3 of  
10          Appendix B, and you say what you tell us has to meet  
11          that standard, there should never be a circumstance  
12          in which somebody says well, I didn't do it because  
13          you didn't ask me to do it, because you're required  
14          to do what's necessary to validate the design.

15          And I think we -- in listening to this,  
16          it just would concern me that we're trying to make a  
17          checklist for what the Applicant is required to do  
18          and we don't want to get ourselves in that position.

19          CHAIR CORRADINI: No, we don't. No, we  
20          don't.

21          MEMBER RAY: That's all I'm trying to  
22          say.

23          MEMBER SCHULTZ: No, I was thinking about  
24          what the staff needs to do to assure that the review  
25          is complete.

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1 CHAIR CORRADINI: But on the other hand  
2 to Harold's point, I have a few questions and our  
3 beloved chairman left me a couple of questions that  
4 I at least want to get answered because there are  
5 certain things that I'm having a hard time figuring  
6 out where it might be, either here or somewhere else  
7 in the --

8 MR. TONACCI: Dr. Corradini, if I may  
9 interject at this point? So the SRPs have been used  
10 for a number of years in a number of different  
11 designs, ESBWR, ABWR, all the others. It represents  
12 a lot of our collective history and knowledge, but by  
13 no means is it going to capture everything in every  
14 situation and that's what we have to rely on our  
15 training and qualifications and depth of our staff.

16 CHAIR CORRADINI: Sure, sure.

17 MR. TONACCI: And supervisors to think  
18 out of the box so you're not using this as a  
19 checklist. I did this and I've done far enough.  
20 You've got to be able to think well, what if this and  
21 what if that? And I've witnessed the staff do a lot  
22 of that, not that these can't be enhanced.

23 I think where we started I thought was a  
24 really good point from -- is it Dr. Skillman, where  
25 you're focusing on the key safety functions that

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1 really have to -- that are essential and if we have  
2 not emphasized that enough in this particular SRP to  
3 drive home that you've got to think broadly, you can't  
4 narrow yourself down to one specific aspect of the  
5 design because it could change between now and a year  
6 from now. They're still tweaking pieces and parts of  
7 their design. So you have to write these broadly.  
8 But the essential function of heat removal and a  
9 passive nature and how important it is here is not  
10 going to change and I thought those points were good.

11 And so I think they're enhancements, but  
12 we have to recognize for the most part this DSRS is  
13 being called an SRP and it's been used for many years  
14 successfully by the staff. So just kind of put that  
15 over-arching theme on it.

16 MEMBER RAY: Well, okay, it's been used  
17 successfully, but let me tell you we're soon going to  
18 have a meeting on a certified design in which we're  
19 going to look at how it came to be that we didn't  
20 recognize the need for something to be done and  
21 reviewed. The plant is well under construction at  
22 this point. So we need to learn from that experience  
23 as well. It's not up to us to make a list of things  
24 that they need to do. There is an over-arching set  
25 of requirements that we need to make sure are met.

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1 I'm talking about programmatic requirements when it  
2 comes to the Applicant identifying what he needs to  
3 do to validate the design.

4 CHAIR CORRADINI: Okay, does anybody have  
5 other specific questions? I have a couple.

6 Dick, do you have any? You get another  
7 one.

8 MEMBER SKILLMAN: This is under the  
9 revised 6.3(I)(2). I believe you initiated the  
10 discussion towards the passivity requirement for heat  
11 removal and I would assert that that Arabic 2 is just  
12 not thorough enough to get to the full body of the  
13 functional performance requirement that you're asking  
14 the reviewers to review or the Applicant to fulfill.

15 I read from Arabic 2, "The design basis  
16 for the ECCS is also reviewed for its capability to  
17 actuate automatically so as to assure timely and  
18 sufficient core coverage by cooling water in the event  
19 of loss of coolant accident and the valuation of the  
20 need for operator monitoring and manual action and  
21 control as a backup to automatic actuation."

22 I think you've got the key thought, but  
23 what is absent is another add on to that that says  
24 this is fundamentally a passive function and the  
25 passive features that are relied upon must be reviewed

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1 and demonstrated effective. Those words don't show  
2 up anywhere in current Roman I and they also do not  
3 show up in reviewer interface which is the next major  
4 set of comments.

5 I would agree that you get partially into  
6 it, but I'm looking for something that's really  
7 unambiguous. It's very clear and it really points to  
8 the essential need in decay heat removal to show that  
9 the passive features are fulfilled and that includes  
10 the analysis, the assumptions, the variations, the  
11 permutations and combinations of heat transfer  
12 coefficients. Because in this design, the function  
13 that is carried is carried by the passive features,  
14 not the plumbing. Once you get the valves open, it's  
15 all passive.

16 MR. SCHMIDT: Agreed.

17 CHAIR CORRADINI: So can I -- I didn't  
18 mean to interrupt you. So since he brought up passive  
19 features, so in item 21 of Section 3, there is a  
20 discussion about that the design must be capable of  
21 sustaining a single active or passive failure without  
22 a loss of function. So what do you mean by passive  
23 failure?

24 MR. SCHMIDT: Yes --

25 CHAIR CORRADINI: Of course, this is not

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1 my comment. This is our beloved chairman's comment,  
2 but I --

3 MR. SCHMIDT: You know, passive failure  
4 is considered like a pipe.

5 MEMBER BLEY: What about a check valve?

6 MR. SCHMIDT: Check valve, I thought that  
7 was considered an active failure?

8 MEMBER BLEY: Well, that's why the  
9 question was asked, one of the reasons the question  
10 was asked. We've heard some people sometimes say  
11 check valves are passive devices, but they have to  
12 change state.

13 MR. SCHMIDT: Right.

14 MEMBER BLEY: If that's considered --  
15 where the heck is that defined? I was nosing around  
16 trying to find that in other documents and I'm not  
17 sure any longer.

18 MR. SCHMIDT: I'm not sure I can find --  
19 I can point to a specific document for you right now.

20 MEMBER BLEY: I think IEEE has done it  
21 for electrical, but I haven't looked at that in a  
22 long time and I'm not sure at all where it's defined  
23 for mechanical. So how does a reviewer know what  
24 things are passive here?

25 MR. SCHMIDT: I think it's just tribal

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1 knowledge. I can't think of -- I can't give you a  
2 specific document.

3 MEMBER BLEY: Maybe before the next time  
4 you guys could dig into that a little because I --

5 MR. SCHMIDT: I think I know a person to  
6 ask.

7 CHAIR CORRADINI: So let me expand on Mr.  
8 Stetkar's question. I guess where I'm coming from is  
9 I was guessing it was piping, but as I understand the  
10 design is, at least the current version of the design,  
11 everything that comes out of containment is going to  
12 have isolation valves. So typical of everything on  
13 either side of the containment.

14 So does that essentially preclude the  
15 worrying about a piping failure? Because I don't  
16 know of any other -- so my question really kind goes  
17 is -- are there any connections that are coming out  
18 of containment of NuScale that doesn't have an  
19 isolation valve logic to it that I'd essentially  
20 isolate in and out to make sure that if I have -- to  
21 make sure that I've got isolation? Because except  
22 for valve the RVVs and the RRVs opening, everything  
23 else is either natural circulation driven or I've  
24 buttoned up the system so that nothing -- no inventory  
25 is leaking out. So it's like a little more than what

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1 Dennis is asking.

2 Is it piping that you were thinking of or  
3 is it what?

4 MR. SCHMIDT: It's basically piping or  
5 the containment vessel, but all that we're assuming  
6 that containment is isolated in this.

7 MR. CRANSTON: Just one minor comment,  
8 the containment isolation valve arrangement that  
9 NuScale is proposing is basically both valves outside  
10 containment.

11 CHAIR CORRADINI: And why is that?

12 MR. CRANSTON: Based on the accessibility  
13 and space inside -- there is precedent for having  
14 both valves outside on PWRs and that's the approach  
15 that they are currently indicating that they are going  
16 to be taking.

17 CHAIR CORRADINI: So okay, so the  
18 standoff then would be a pipe break that you'd have  
19 to consider as part of the containment function I  
20 assume? In other words, if I've got the containment  
21 and I've got some sort of connection point that goes  
22 out a foot, then I've got my set of isolation valves.  
23 So I've got to consider that portion as part of  
24 containment.

25 MR. CRANSTON: That would be like a super

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1 pipe extension of containment, yes.

2 CHAIR CORRADINI: Okay. All right.  
3 Another question from our colleague, in item 20 you  
4 put in that ECCS operation ought to occur in  
5 sufficient time and 20 minutes is put in. Where did  
6 that come from?

7 MR. SCHMIDT: That's language from the  
8 SRP.

9 CHAIR CORRADINI: Okay, so we're back to  
10 legacy questions. So either it's got to be explained  
11 or at least -- it's not necessarily appropriate for  
12 NuScale is what I'm saying.

13 MR. SCHMIDT: Not necessarily, but it's  
14 still something that I think we'd want to meet if it  
15 was applicable. I mean I wouldn't necessarily delete  
16 it.

17 CHAIR CORRADINI: And then you'll come  
18 back -- well, let me ask the question differently.  
19 You would come back with their analyses to see if  
20 that's more than sufficient, less than sufficient?

21 MR. SCHMIDT: Right.

22 CHAIR CORRADINI: Okay. So now I have a  
23 relatively big question. In review procedures,  
24 Section 3, I guess it is, 25(b) implied that you're  
25 going to require them to do full flow testing of open

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1 valves. What does that mean? That strikes me --  
2 I've now gone to the dark side and I think that's  
3 inappropriately tough, but I want to understand what  
4 you meant by it.

5 MR. SCHMIDT: It's a current requirement  
6 to do full flow testing on current ECCS systems and  
7 we left that in there --

8 MEMBER POWERS: Because we've had  
9 incidents in the past where valves were not tested at  
10 full flow and when they were called on to work under  
11 full flow they failed to work.

12 MEMBER BLEY: Forty years ago.

13 MEMBER POWERS: Forty years ago, yes.

14 MEMBER BLEY: A number of cases.

15 CHAIR CORRADINI: So this is asking for  
16 periodic test surveillance. Is that doable?

17 MR. SCHMIDT: That's a very good  
18 question. One of the big issues that I'm not sure I  
19 understand either is how are they going to test these  
20 valves on some type of periodic basis? How are they  
21 going to test our ECCS function?

22 CHAIR CORRADINI: So it's more than a  
23 preoperational test.

24 MR. SCHMIDT: Yes.

25 CHAIR CORRADINI: I remember back in the

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1 time of Zion, there were full flow preoperational  
2 tests, but not periodic tests after the plant was up  
3 and running. But the way I read this, you want  
4 periodic testing once the plant is up and running?

5 MR. SCHMIDT: That is consistent with  
6 today's standards.

7 MEMBER BROWN: ECCS valves, Mike, you're  
8 still talking about the ECCS valves?

9 CHAIR CORRADINI: Yes, sir.

10 MEMBER BROWN: That's the reactor vent  
11 valves and the reactor recirculating valves.

12 CHAIR CORRADINI: Yes, sir.

13 MEMBER BROWN: I guess I had the same  
14 question. They also talk about pressure in that  
15 testing section. They wanted it to be full flow and  
16 maximum -- I've forgotten what the exact words were,  
17 but maximum operating pressure or something like  
18 that, but that's what it used to say. Now they've  
19 changed it to say whatever pressure they can do and  
20 then they can use an analysis to extrapolate on the  
21 pressure side, but not on the flow. They still have  
22 to do the design flow, but they can extrapolate from  
23 whatever pressure they conduct the test out up to the  
24 maximum operating pressure or the consideration under  
25 the circumstances. So that's another change. It's

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1 difficult to see how you can test these.

2 CHAIR CORRADINI: That's what I'm  
3 struggling with.

4 MEMBER BROWN: They're in the evacuated  
5 part of the reactor recirculation valves are in the  
6 evacuated part of the containment and they connect  
7 right in to the reactor itself. You've got to get  
8 the vent valve stuff going back in. How you ever  
9 open and close those --

10 MEMBER POWERS: They have to open and  
11 close.

12 MEMBER BROWN: I understand that.

13 MEMBER POWERS: It's absolutely crucial.

14 MEMBER BROWN: And then they're under  
15 water once they're in service also, so I have no idea.

16 MEMBER POWERS: How are you going to --  
17 what computer code is going to convince me that they  
18 haven't degraded over time?

19 MR. SCHMIDT: I agree. The staff has not  
20 gotten information in the pre-application phase that  
21 would help us understand how they're going to test  
22 the system. We left it in there on purpose because  
23 we were hoping to elicit a comment from NuScale.

24 MEMBER POWERS: How did you just apply  
25 the not having full pressure?

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1 MR. SCHMIDT: Well, I'm not sure we did  
2 a good job justifying that.

3 MEMBER POWERS: Well, I mean if you're  
4 going to --

5 MR. SCHMIDT: We accepted some  
6 extrapolation based on --

7 MEMBER POWERS: If you accepted an  
8 extrapolation there must surely be an extrapolation  
9 that you would accept. I just don't know what that  
10 is. Because why did the valves not work when you go  
11 to full flow and full pressure. It's things that I'm  
12 not sure we can model. There are aging effects.

13 CHAIR CORRADINI: I guess -- I'll go  
14 against him for a moment. So I'm still trying to  
15 remember back in AP1000 ESBWR what the requirement  
16 was because I seem to remember since I had a little  
17 bit of a conversation with somebody over here about  
18 that the -- I'll call it the chemical charge was  
19 tested, but not the actual --

20 MEMBER BLEY: On the explosive valves.

21 CHAIR CORRADINI: On the explosive  
22 valves, but not the actual opening of the valve. And  
23 staff felt this was comfortable. We had a big round  
24 and round here that we maybe agreed to disagree on  
25 some portions of this, but --

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1 MEMBER POWERS: You all agree to disagree  
2 with me. I never agreed to this. I disagree with  
3 agreeing with you.

4 CHAIR CORRADINI: But I guess what I'm  
5 getting at is --

6 MEMBER POWERS: Well, you and Sam held  
7 fast. I made comments and nobody paid any attention  
8 to them.

9 MEMBER BALLINGER: We all paid attention  
10 to them.

11 CHAIR CORRADINI: But I'm trying to  
12 relate this back to AP1000 ESBWR.

13 MEMBER POWERS: I'm not sure that that's  
14 the right way to go.

15 CHAIR CORRADINI: But in their cases they  
16 have to -- they are expecting essentially a series of  
17 experiments that would demonstrate its scale, the  
18 apex experiments and the experiments and then once  
19 those tests were done and staff approved them and  
20 they were reviewed by ACRS, there is no requirement  
21 for full flow or full pressure testing of AP1000  
22 periodically. Am I missing something?

23 MEMBER POWERS: No.

24 CHAIR CORRADINI: Okay. So if I were a  
25 vendor that's after that, I'd say what are you doing

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1 to me that you're not doing to the AP1000 ESBWR.

2 MR. SCHMIDT: Which is what we kind of  
3 expected as a comment, but --

4 MEMBER POWERS: From NuScale.

5 MR. SCHMIDT: Yes. But we did not  
6 receive a comment on that portion. We did receive a  
7 comment on they can't do testing while they're in  
8 refueling because they're disassembled which makes  
9 sense to me, but we did not receive a comment on their  
10 ability to do full flow testing.

11 CHAIR CORRADINI: I guess --

12 MR. SCHMIDT: I've conceived a way to --

13 CHAIR CORRADINI: I mean I don't want to  
14 tell them the way out of the box, but unless I  
15 misremember what happened with AP1000 ESBWR it was  
16 scaled testing with calculations and I don't remember  
17 any commitment to periodic testing through the life  
18 of the plant, but I could be wrong.

19 MEMBER RAY: Mike, I'll need to think  
20 about this before I answer your question, but there  
21 may be a more fundamental difference why.

22 CHAIR CORRADINI: Which is?

23 MEMBER RAY: That's why I said I need to  
24 think about it.

25 CHAIR CORRADINI: Okay.

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1 MEMBER RAY: But just leave open the  
2 possibility that there is a bigger difference than  
3 you're assuming in your question.

4 CHAIR CORRADINI: Well, I mean at low  
5 pressure you've got a series of actuated -- four stage  
6 actuate -- I mean, we'll just leave ESBWR out of it  
7 since I'll bring up past ghosts with some people.  
8 With the AP1000, you have four stages of  
9 depressurization, each with a series of larger squib  
10 valves, explosive opening valves. And then you rely  
11 on essentially natural circulation to let all this  
12 through.

13 In ESBWR, assuming the valves worked,  
14 where we got hung up was that we wanted to see very  
15 clearly that they essentially had done enough venting  
16 there would be no condensable gas trapped that would  
17 essentially choke off the natural circulation flow.  
18 And so we went through a series, but I don't remember  
19 in any case in both of those that once done every  
20 five years, ten years, whatever, they've got to go  
21 back and check it out.

22 MEMBER BLEY: Let me offer something up.  
23 If you go way back to the 40 year ago time frame,  
24 when we came up with the full flow requirements. My  
25 memory is and I could be wrong on this, Dana, is it

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1 wasn't aging problems, it was post-maintenance  
2 problems that was some manual valves left in wrong  
3 positions. It was debris, some places I know of it  
4 was even polyethylene left inside a monitor of a  
5 valve, things that prevented valves from moving to  
6 their full open position.

7 MEMBER POWERS: With the valves,  
8 actually, we had occasions when the valves would not  
9 turn. There was not enough force to open the valve  
10 against the full --

11 MEMBER BLEY: No, he did have those. We  
12 have those for a variety of reasons. Now one might  
13 look at the valves we're looking at in this system  
14 and what kinds of activities people can do to affect  
15 them. That's all I really want to say about that,  
16 but some of those cases where valves wouldn't operate  
17 or pumps wouldn't run following maintenance, had to  
18 do with people over tightening packing, that sort of  
19 thing beyond what the operators would handle.

20 It might be that for some of these there  
21 isn't much we can do to make them bad except aging  
22 kind of problems. But right now, it's not clear what  
23 -- why we're requiring it or how it would be done.

24 MR. SCHMIDT: I think it's not a bad  
25 thing to do if you can do it.

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1 MEMBER BLEY: It's certainly not a bad  
2 thing to do. It's kind of not a good thing to put  
3 requirements out in front of people that can't be met  
4 and then back off with them either, I think.

5 MR. SCHMIDT: Right. I mean one thing  
6 you could possibly do is when -- you can take these  
7 valves out when they do their refueling, maybe remove  
8 these valves and then do some type of bench testing.

9 MEMBER BLEY: Then you've got put them  
10 in and that --

11 MR. SCHMIDT: Or you have replacements  
12 that go in.

13 MEMBER POWERS: It doesn't obviate the  
14 problem.

15 CHAIR CORRADINI: That's right. That's  
16 where the problems occur. I've run out of questions.  
17 I will save the best one for last.

18 MR. SCHMIDT: I mean we were a little  
19 surprised we didn't get a comment on that, to saying  
20 that it was going to be infeasible to do. But like  
21 I said, we didn't receive a comment on that so maybe  
22 they have some strategy that we're not aware of that  
23 can do it.

24 CHAIR CORRADINI: I think I and Mr.  
25 Stetkar are kind of on the same page on this. I

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1 couldn't understand how you do it and I couldn't  
2 remember the precedent for the other passive designs  
3 that would be required to do it on a periodic basis.  
4 So that's kind of where I sit on this.

5 MR. SCHMIDT: I think this is the SRP  
6 that was used for those passive designs.

7 CHAIR CORRADINI: Probably, but if I  
8 remember the agreement was at least for the explosive  
9 valves as you would essentially test the chemical  
10 charge, but not the actual operation of the valve at  
11 full scale because that caused a little bit of a  
12 disagreement amongst us.

13 MEMBER BLEY: When we come to issues like  
14 this, going back to the real operating experience and  
15 basing arguments on those makes me a lot more  
16 comfortable than just having abstract requirements.

17 CHAIR CORRADINI: Right. Other  
18 questions by members of the committee? I've run out  
19 of questions. Thank you.

20 Any parting comments by members of the  
21 subcommittee?

22 MEMBER BLEY: I guess only one relative  
23 to that.

24 CHAIR CORRADINI: I'll start over with  
25 Dr. Rempe. I'm sorry, excuse me, I made a mistake.

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1 We still have the public.

2 So can we open up the outside line. Is  
3 there anybody here that wants to make a statement?

4 Is the voice from the control booth is the line open?

5 I don't hear any crackling.

6 Is there anybody out there that they can  
7 at least acknowledge their presence?

8 MEMBER BLEY: On the phone line.

9 CHAIR CORRADINI: On the phone line. I  
10 hear crackling. If anybody is out there, can you at  
11 least acknowledge you're there? I guess nobody is  
12 there and it's crackling, so we can close the phone  
13 line.

14 Now back to Dr. Rempe.

15 MEMBER REMPE: Listening to the questions  
16 from other members today and is there any motivation  
17 to find a way to graphically show all these  
18 requirements and interfaces instead of having that  
19 section?

20 CHAIR CORRADINI: I think that's a  
21 marvelous idea. I was thinking of that because I'm  
22 a graphic sort of person, but what are you thinking  
23 about?

24 MEMBER REMPE: I'm not sure. You guys  
25 have done this more than I. Maybe you've tried it

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1 and said this is a waste of time or something, and  
2 all that, but it just seems like if you've got this  
3 interface in one section has somebody methodically  
4 gone through and said well, the same interface  
5 connects the dots at least and it's consistent among  
6 different sections? But graphically might be easier  
7 sometimes for folks. It's just a comment to throw  
8 out.

9 MR. SCHMIDT: I've never heard anybody  
10 attempt that before, but that doesn't necessarily --  
11 it hasn't been attempted before. Not to my  
12 knowledge.

13 CHAIR CORRADINI: So can I ask her a  
14 question a little bit differently? So how do you  
15 convince yourself that you haven't fallen through the  
16 cracks on oh, sure, Mary would have looked at that  
17 because that's in the containment section, but Sam  
18 doesn't have to look at it because that's in the CVCS  
19 section.

20 How have you convinced yourself that all  
21 is good?

22 MR. SCHMIDT: Well, I think we know what  
23 -- I mean in this system, for example, we know what's  
24 interconnected. We're aware that the containment is  
25 a vital function of the ECCS system and we know

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1 condensation is a vital function to get recirculation  
2 flow. So I mean we try to do the best we can in the  
3 interface section, but there is just some basic  
4 knowledge that you have that we know is more important  
5 in this design than other designs.

6 I mean these SRPs, I think it was  
7 mentioned before, these SRPs are used for a lot of  
8 different designs, even BWRs, PWRs, so there's no  
9 catch-all here that can be in these documents.  
10 There's got to be some just basic engineering  
11 knowledge that's applied.

12 CHAIR CORRADINI: Okay.

13 MR. SCHMIDT: I'm not sure I could write  
14 a perfect interface document, even if I were to graph  
15 it out to capture all of the interconnections.

16 CHAIR CORRADINI: So to say it  
17 differently from your perspective, although there  
18 might be things that fall through the crack,  
19 graphically illustrating it doesn't necessarily  
20 guarantee completeness.

21 MR. SCHMIDT: We could try to take this  
22 and try to graph it out, but yes, I think there still  
23 could be a line in that visualization that doesn't  
24 exist because nobody thought of it.

25 CHAIR CORRADINI: Joy?

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1 MEMBER REMPE: Well, so it may not help  
2 the staff, but it might even help the Applicant a bit  
3 to try and meddle through this and all that or they  
4 will just have to take it and bring me a rock, and  
5 then well, you forgot that and the rock and that's  
6 just the way it goes.

7 MR. SCHMIDT: I don't know, I've never  
8 heard an applicant ask for it. I don't know what an  
9 applicant would say. They'd probably say yes.

10 MEMBER REMPE: Anyway, it was just a  
11 thought when I was listening to this today. But  
12 that's all I have.

13 Charlie?

14 CHAIR CORRADINI: Charlie?

15 MEMBER BROWN: Yes, just a follow up on  
16 the other question was the other reference in this  
17 6.3 was to go look at the containment heat removal  
18 system in 6.2.2 which I went to see what were -- how  
19 were they separated and whatever. And I was unable  
20 to figure out how you would connect the dots relative  
21 to making sure that the ECCS, what had to be done in  
22 this other system to make sure that worked and back  
23 and forth. There was no -- I think somebody brought  
24 up that integration thought process earlier.

25 I just wanted to comment. I did try to

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1 look at 6.2.2 which was referenced in 6.3 and was  
2 unable to get any basic confirmation or there was  
3 some connection that you had to do between the two of  
4 them to make one work and the other work or what have  
5 you. So somebody made that comment earlier, I just  
6 wanted to emphasize that somebody -- I did look at  
7 that and was unable to see anything.

8 CHAIR CORRADINI: Okay. Ron.

9 MEMBER BALLINGER: I have sort of the  
10 same comment that -- trying to fit things together  
11 it's like reading the old ASME Boiler and Pressure  
12 Vessel Code. You have to read it with your finger  
13 stuck in five or six different places to thumb back  
14 and forth. Has there been any thought -- it also  
15 seems like it's compartmentalized in a kind of a  
16 structural way. That's the way these things are.

17 CHAIR CORRADINI: Right.

18 MEMBER BALLINGER: But what about since  
19 this is so integrated, have you thought about putting  
20 like a little team of folks together from the various  
21 functions to sort of answer all these questions that  
22 we've been asking all along about how these things  
23 are all connected. And then come up with some of a  
24 -- I don't know, maybe it's a document or something,  
25 that has the discussion that we've been having here.

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1 CHAIR CORRADINI: Road map.

2 MEMBER BALLINGER: Something like that,  
3 yes.

4 CHAIR CORRADINI: I think Ron is still  
5 kind of looking at the same elephant that I was  
6 looking at. I just have a hard time understanding  
7 how the staff understands how this is all connected.  
8 So maybe you have it. Maybe it's all clear to you,  
9 but for me to gain confidence in that, I'm still  
10 having a hard time nailing it down. So for example,  
11 does the Containment Branch and what I'll call the  
12 ECCS --

13 MEMBER BROWN: Reactor Systems.

14 CHAIR CORRADINI: Reactor Systems Branch  
15 meet on a continuing basis and talk about this so  
16 that it's very clear where the interface is between  
17 them as individuals? That's what I think --

18 MEMBER BALLINGER: That's what I'm  
19 saying. That's what I'm saying.

20 MR. SCHMIDT: Well, I think we will have  
21 to for this design, certainly. This is a far more  
22 integrated design than we've dealt with before, so  
23 yes. But certainly like mass and energy into  
24 containment, we have to provide them that data. I  
25 don't know if it's actually written down anywhere

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1 that we provide them that information, but we do  
2 provide that information and they do their  
3 containment calculations based on it. So there are  
4 like preexisting interfaces that already occur for  
5 current designs that we work with containment.

6 MEMBER BALLINGER: But you've struck  
7 exactly on the problem. You know those are the  
8 obvious ones. But what about the not so obvious ones  
9 that you would not even think about until you sit  
10 down as a group and go through the analysis without  
11 sending people various things.

12 MR. SCHMIDT: Right. We haven't done  
13 that. We haven't done what you're --

14 CHAIR CORRADINI: So it's early in the  
15 game for that?

16 MR. SCHMIDT: Yes, it's early.

17 MEMBER BALLINGER: But you surely would  
18 like to know whether or not or make yourself feel  
19 comfortable that you really haven't missed anything?

20 MR. SCHMIDT: Oh yes, sure. Certainly.  
21 Certainly.

22 MEMBER BLEY: Yes, a couple of things.  
23 This is a design specific review and that's a real  
24 opportunity to kind of clean up some of the things  
25 that have always been troublesome. This is something

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1 we talked about not just here. Every design cert  
2 we've looked at we get this -- it's real hard. When  
3 you dig in deep enough, hundreds of RAIs and stuff,  
4 you find often that stuff has been covered. But  
5 whoever even comes here has a little trouble pointing  
6 out where that was looked at and it takes some work  
7 to bring it out.

8 I would have hoped for the design  
9 specific review standard, at least those common  
10 things that are really crucial to this design might  
11 have been highlighted. It seemed like a real  
12 opportunity. And some thought to this idea of a map  
13 would be nice. I don't know. It could be way complex  
14 and really too hard to do, but it smells like not a  
15 bad idea.

16 MEMBER BALLINGER: But it actually proved  
17 very beneficial going forward.

18 CHAIR CORRADINI: Charlie.

19 MEMBER BROWN: For Chapter 7 and I  
20 haven't looked at it, but what we did for mPower and  
21 what we were supposed to be doing for Chapter 7 is  
22 provide a road map, an architecture as part of the  
23 presentation that the vendor is required to submit so  
24 you can see the total connections of everything and  
25 the interfaces for each piece. In other words, how

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1 sensors are connected, what interconnections between  
2 channels, what other stuff they connected with and  
3 through what and all that other kind of -- not  
4 details, but just an architectural map.

5 And if you look in these chapters, either  
6 the ECCS one or the DHLS system or the ECCS or the  
7 DHLS system or the ECCS, you don't -- there's no  
8 request to say hey, give us just an interface with  
9 this system of other stuff that connects in. That's  
10 all you have to do. You don't need the whole plant,  
11 but you do need what stuff connects in or is required  
12 to make this system work. You could do that chapter  
13 by chapter. You don't have to know what the design  
14 looks like, but you ask them to provide that as part  
15 of the BSRS chapter for each of the major systems.  
16 So you get the connections or interfaces with other  
17 places. Very simple to do. It's not hard.

18 CHAIR CORRADINI: Since you've been  
19 leading the Chapter 7 part, is there an example of  
20 that for the mPower?

21 MEMBER BROWN: I haven't read it all yet,  
22 but mPower has got the requirement in the front of  
23 it. It's either 7.0 or 7.1. I'm not sure which,  
24 which talks about an architecture needs to be  
25 developed and shown as part of specifying what this

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1 thing looks like. Unless somebody deleted it  
2 subsequent to our reviews.

3 It was also in the ISGs that we developed  
4 about six or seven years ago that same ISG7 or 5 or  
5 7 or whatever, lost track of those, too.

6 CHAIR CORRADINI: Okay, thanks, Charlie.  
7 Dana? Dick?

8 MEMBER SKILLMAN: Yes, just one or two.  
9 In my review, I did find myself over 15.6.5. 15.6.5  
10 suggests that whoever is needs to take a look --

11 CHAIR CORRADINI: Is your mic on?

12 MEMBER SKILLMAN: It is now. Excuse me.  
13 My review took me into 15.6.5. And if you were to  
14 review 16.5.6 Roman I, Arabic 1, Golf, G, that  
15 paragraph references 5.2.2 as containment depressure  
16 and heat transfer capacity when in reality I believe  
17 it's 6.2.2.

18 MR. SCHMIDT: 6.2.2, yes.

19 MEMBER SKILLMAN: As is well described  
20 in your new paragraph which is the intro to your  
21 revised 6.3.3.

22 The other comment I would make is in your  
23 revised standard under acceptance criteria, you  
24 probably should include Appendix B to 10 CFR 50 as a  
25 reference guide and more specifically criterion 3,

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1 design control. Because criterion 3 of Appendix B is  
2 what really pulls together the requirement for the  
3 analytical integration for the functions that we're  
4 talking about. Thank you.

5 MR. SCHMIDT: Now that was also a 15.6.5?  
6 I didn't catch the --

7 MEMBER SKILLMAN: Oh, no, that's over in  
8 6.3.3.

9 MR. SCHMIDT: Okay.

10 MEMBER SKILLMAN: And that would be an  
11 acceptance criteria which is Roman II under revised  
12 6.3.5, page 6.3.5.

13 MR. SCHMIDT: Okay.

14 MEMBER SKILLMAN: Thank you.

15 MEMBER SCHULTZ: Having heard the  
16 comments that have been focused on establishing a  
17 structure, perhaps started by what mPower -- what had  
18 been specified for mPower, it sounds like a good idea.  
19 I would only caution that to do that one would want  
20 to be sure that the focus would start at a high level  
21 on those features that are important to safety,  
22 because if one goes into this process and believes  
23 that it's going to be a pictorial structure of  
24 everything that needs to be done, it will never be  
25 done.

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1 MR. SCHMIDT: You're saying it ought to  
2 be at a higher level?

3 MEMBER SCHULTZ: High level to identify  
4 those things that we talked about here to make sure  
5 that those things that are very important are  
6 identified and that the cross connects between review  
7 teams are going to be fully recognized and implemented  
8 in the review.

9 The other point is that what we've  
10 identified is a number of issues. We picked this  
11 section because of that reason, important to safety,  
12 let's start with this section, ECCS, because of its  
13 overall importance, we're now faced with the  
14 challenge of what we do next in terms of the review  
15 and it's in the face of 700 comments that are coming  
16 in that are going to change the documentation that  
17 we've been provided to make that decision of how that  
18 committee is going to proceed. Just to take under  
19 advisement that we need to follow that up and make  
20 sure we get information that will allow us to make  
21 those decisions.

22 CHAIR CORRADINI: Thank you, Stephen.

23 Harold?

24 MEMBER RAY: I guess, Mike, I don't know  
25 if this is in contrast or not, it's certainly not in

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1 contrast with some that has been said already, but  
2 this is a design specific review standard as has been  
3 pointed out. And some of us have occasion over at  
4 Forrestal to listen to how critical it is for new  
5 plants to get the NRC on board early and understand  
6 what the NRC's requirements are going to be. And  
7 this is one vehicle that may do that.

8 I am reluctant to see us go down a path  
9 in which we go further than we should and maybe  
10 Steve's reference to high level is the appropriate  
11 thing to say here. Again, it's my concern that we've  
12 become too much a captive of what we've said we're  
13 going to review before we really understand all of  
14 the elements of the design.

15 Now our role here on the ACRS is to try  
16 and push back against that happening that we not  
17 become so wedded to a design specific review standard  
18 that was developed years before we finally get to the  
19 certification point that we don't look at things that  
20 don't happen to be in that standard, but should have  
21 been.

22 So my concern is just that we prematurely  
23 become too specific at too low a level. I said this  
24 may be in contrast because I think it is somewhat in  
25 contrast over what might be implied from what Charlie

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1 said. If we say here are the things we want to know  
2 about this without yet understanding the design  
3 fully, it's just a matter of concern to me.

4 Like I said, we've got some experience  
5 now to indicate that we need to be cautious because  
6 we don't ask questions sometimes, that later on we  
7 wish we had, and everybody wishes we had actually.  
8 So that's my only comment here is that I'm kept at a  
9 high enough level and not being so specific that we're  
10 subject to being said well, you didn't say you wanted  
11 to look at that. The reference to Appendix as both  
12 Dick and I have said I think is appropriate because  
13 that allows you to always say listen, you have not  
14 verified this design. You need to do this test or  
15 you need to do this analysis. Because absent that,  
16 you can't claim that it has been verified or  
17 validated. That's always got to be something we can  
18 do.

19 So anyway, as I say, we don't want this  
20 to become just such a prescriptive checklist that the  
21 vendors can say all right, now, here are the questions  
22 I've got to answer. When I answer them, I'm done.

23 MR. SCHMIDT: Thank you.

24 CHAIR CORRADINI: I don't have any other  
25 further comments. I think I've captured most of the

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1 committee's -- I hope I've captured all of the  
2 committee's major comments.

3 The only one that --

4 MEMBER RAY: Mike, can I interrupt? I'm  
5 sorry, there's one thing, I've made a note here. I  
6 forgot to refer to it. Jeffrey made the point that  
7 this is a far more integrated design than we've seen  
8 before and that was really what I meant when I said  
9 maybe there's a reason why this is different in some  
10 respect. It's just an example of what I was saying.

11 CHAIR CORRADINI: So the only thing I  
12 guess I'll bring back up is that I'm still ruminating  
13 about this periodic testing. So at least in my mind  
14 we've only had two meetings about this. We're going  
15 to -- in fact, if we have enough time now maybe we  
16 can have our short meeting now and discuss how we  
17 move forward with subsequent meetings on the DSRS to  
18 try to reorganize ourselves on that regard.

19 But I haven't seen anything in the first  
20 two meetings that's a show stopper that worries me on  
21 what you're doing, except perhaps the last thing that  
22 worries -- which I brought up about this testing,  
23 this periodic testing, but generally speaking, I  
24 think we're looking at kind of the details of how  
25 this all fits together so that we feel comfortable

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1 that you're looking as comprehensively as we can into  
2 the design.

3 So with that, I have nothing more to say and we're  
4 adjourned.

5 MR. TONACCI: Dr. Corradini, before you  
6 adjourn, can I explore your last concern a bit to  
7 make sure I understand it?

8 CHAIR CORRADINI: Sure.

9 MR. TONACCI: So I look at these DSRs or  
10 SRPs as review guidance, not as regulation. And many  
11 of the paragraphs and bullets in them are to make  
12 sure we don't forget something and the staff has the  
13 latitude to shift and change and so forth once they  
14 get into and actually see the design, but I guess I'm  
15 feeling like -- reflecting on some of the comments  
16 that were just made if we start narrowing ourselves  
17 down too early and things shift, we may wish that we  
18 had left the comments in.

19 All its doing now is making sure Jeff or  
20 somebody that looks like Jeff a year from now, two  
21 years from now who does it, starts asking the  
22 question. It doesn't force us to do testing -- full  
23 testing like the plants do now, but it makes us think  
24 about it.

25 In that regard, I thought it was worth

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1 leaving there so they don't forget it. Maybe it's  
2 only prescriptive. Maybe we could make it a little  
3 more subtle, but that's -- I'm just more concerned  
4 with leaving something out.

5 CHAIR CORRADINI: I understand. I guess  
6 my reaction is that I don't want to propose that it  
7 get taken out. I just want to understand how it's  
8 possible to do so I'm still back in my thought process  
9 of is it possible to do and is this setting a  
10 precedent that I don't remember. And I could be  
11 misremembering from the current set of passive plants  
12 and what they're required to do. Because I seem to  
13 remember off bench scale testing of squib valves as  
14 the agreeable way to feel comfortable that things can  
15 work as expected. As an example. As an example.  
16 But I guess I don't want to take it out. I just want  
17 to understand it better. Because it seems like a  
18 very big requirement.

19 MEMBER BLEY: I agree with you, to want  
20 to understand it. On the other hand, there's a reason  
21 why plants were asked to do that a long time ago and  
22 existing -- not meeting that fully by exception seems  
23 more appropriate and I think I'm aligning with you,  
24 but more appropriate than removing it from everybody  
25 because there were special conditions that made it

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1 difficult for one actor.

2 CHAIR CORRADINI: I don't remember enough  
3 about -- I remember being part of some of these things  
4 back in -- for the full flow testing for the active  
5 system, so I don't remember enough, but I get your  
6 point.

7 Okay, any last parting shots? Okay,  
8 we're adjourned.

9 (Whereupon, the above-entitled matter  
10 went off the record at 9:57 a.m.)

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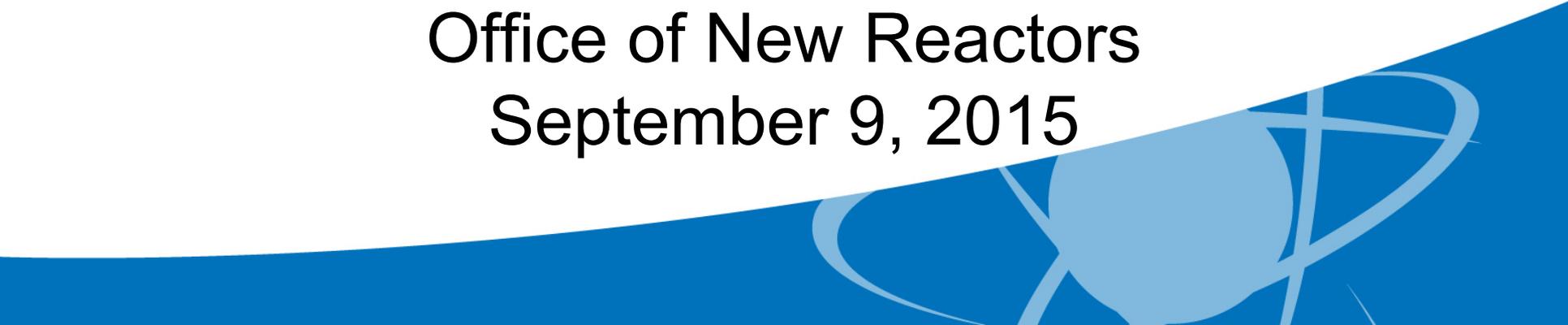
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# ACRS Presentation on the NuScale Design Specific Review Standard (DSRS) Section 6.3

Gregory Cranston,  
Sr. Project Manager  
Office of New Reactors  
September 9, 2015



# NuScale DSRS Briefings to the ACRS Subcommittee on Future Reactors

- Second in series of meetings on selected draft DSRS sections
- Comments being received and processed
- Opportunity for updates during comment incorporation
- Some DSRS sections may revert back to SRP sections

# NuScale DSRS Briefings to the ACRS Subcommittee on Future Reactors

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

# The Status of the NuScale DSRS

- Draft NuScale DSRS issued for public comment on 6/30/2015
- Public comment period closed on 8/29/2015
- Comments being processed and will be sent to staff for disposition
- ACRS Future Reactor Subcommittee briefing on public comments tentatively scheduled for November 2015
- Schedule for issuing Final DSRS based on magnitude and complexity of comments and DCA submittal date

# NuScale DSRS 6.3 Emergency Core Cooling System

by

Jeff Schmidt

September 9, 2015



# DSRS 6.3 ECCS

- No change in applicable GDCs
- No change in acceptance criteria
- Major changes where due to NuScale design specifics
- Major changes include,
  - Eliminated BWR material
  - Eliminated references to active flow systems and most references to piping
  - Added general description of RVV and RRV function

# DSRS 6.3 ECCS

## Public Comments

- Nine public comments
  - 8 recommended deletions, 1 rewording
  - Preliminary review staff agrees with changes

# Closing Remarks

## ACRS SC Meeting

# Closing

- Second in a series of briefings to the Subcommittee on selected Draft DSRS sections
- Sections were selected based on significant changes from SRP or nonexistent in SRP
- ACRS provided Compare DSRS sections vs SRP section to facilitate ACRS selection of DSRS sections for upcoming briefings
- Some DSRS sections may revert back to corresponding SRP section
- Comments or Questions?