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UNITED STATES NUCLEAR REGULATORY COMMISSION'S ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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661ST MEETING

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

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THURSDAY

MARCH 7, 2019

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ROCKVILLE, MARYLAND

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The Advisory Committee met at the Nuclear Regulatory Commission, Two White Flint North, Room T3D50, 11545 Rockville Pike, at 8:30 a.m., Peter C. Riccardella, Chairman, presiding.

COMMITTEE MEMBERS:

PETER RICCARDELLA, Chairman

MATTHEW W. SUNSERI, Vice Chairman

JOY L. REMPE, Member-at-Large

RONALD G. BALLINGER, Member

DENNIS C. BLEY, Member

CHARLES H. BROWN, JR. Member

MARGARET SZE-TAI Y. CHU, Member

MICHAEL L. CORRADINI, Member

VESNA B. DIMITRIJEVIC, Member

WALTER L. KIRCHNER, Member

JOSE A. MARCH-LEUBA, Member

HAROLD B. RAY, Member

GORDON R. SKILLMAN, Member

DESIGNATED FEDERAL OFFICIAL:

MICHAEL SNODDERLY

ALSO PRESENT:

PROSANTA CHOWDHURY, NRO

BRIAN GREEN, NRR

MARVIN LEWIS*

MIKE MILTON, NuScale

LAUREN NIST, NRR*

MARIE A. POHIDA, NRO

MAURIN SCHEETZ, NRR*

TIM TOVAR, NuScale*

*Present via telephone

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P R O C E E D I N G S

8:32 a.m.

CHAIRMAN RICCARDELLA: The meeting will now come to order, please.

This is the first day of the 661st meeting of the Advisory Committee on Reactor Safeguards. During today's meeting, the committee will consider the following: NuScale Safety Evaluation Report with open items for Chapters 13 and 18 and preparation of ACR reports.

The ACRS was established by statute and is governed by Federal Advisory Committee, FACA. As such, this meeting will be conducted in accordance with the provisions of FACA. This means that the committee can only speak through its published letter reports. We hold meetings to gather information and support deliberations.

Interested parties who wish to provide comments can contact our office regarding time after the Federal Register Notice describing the meeting is published. That said, we set aside ten minutes for spur of the moment comments from members of the public attending or listening to our meeting.

Written comments are also welcome. Mr. Mike Snodderly is the designated federal official for

the initial portion of this meeting.

Portions of the session on NuScale Chapters and 13 and 18 may be closed in order to discuss protected information designated as proprietary. The repeat discussion portion of this meeting will also be closed because we will be discussing sensitive internal information.

The ACRS Section of the U.S. NRC public website provides our charter, by-laws, letter reports, and full transcripts of all full and subcommittee meetings, including all slides presented at the meetings.

We have received no written comments or requests to make oral statements from members of the public regarding today's sessions. There will be a phone bridge line but to preclude interruption of the meeting, the phone will be placed on a listen-in mode only during the presentations and committee discussion.

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

Please silence your cell phones or other

items that could make noise and disrupt the meeting.

With that, I will turn the meeting over to Mike Corradini, who is chairman of the subcommittee.

MEMBER CORRADINI: I'm going to wait until the public line is open, okay?

CHAIRMAN RICCARDELLA: Yes.

MEMBER CORRADINI: I think that's important.

May we begin? Okay.

So for the members, this is our third full committee meeting, where we are going through some of the chapters of the DCA. This session we are going to be looking at Chapter 13, Conduct of Operations, and Chapter 18, Human Factors Engineering. We had a subcommittee meeting on this in January and I think we had most of the members here. We were missing I think two or three. So most of you have gone through this discussion but I think it is important we go through it all now.

Dr. Chowdhury will lead us off with the staff. NuScale doesn't have a formal presentation but they have people in the room and on the phone line that can answer our questions if we want to break in with questions.

I'm going to leave it to Dr. Chowdhury to

discipline us if we ask something that should be in closed session. We have about 45 minutes to an hour scheduled at the end of the morning for a closed session, if need be. Okay?

So with that, I will turn it over to Dr. Chowdhury. I remind all the members the mics are always live.

DR. CHOWDHURY: Thank you. Good morning. My name is Prosanta Chowdhury. I am a project manager in NRO, Officer of New Reactors of the U.S. Nuclear Regulatory Commission.

I joined the agency in 2005 and I joined NRO in 2008 as a project manager. Prior to joining the NRC, I worked for 18 years at the State of Louisiana as a radiation specialist. So I have a master's degree in nuclear engineering and also a master's degree in electrical engineering. That's my educational background.

So what I plan to do today is briefly cover the presentations that the staff already presented at the subcommittee meeting on Chapter 13 on January 23, 2019. So I am just going to briefly summarize what the staff covered. And I should have Ms. Maurin Scheetz on the phone to answer questions on Section 13.1, 13.2, and 13.5. I have Ms. Amanda

Marshall in the audience to answer questions on 13.3. And 13.4 is just a COL item.

So with that, the three technical staff who presented on January 23rd are listed on this slide, including myself and the lead project manager for this NuScale Design Certification Application review is Mr. Greg Cranston.

I would like to remind everyone that this review that was presented on January 23, 2019 is based on Revision 1 of the Design Certification Application that NuScale submitted.

So 13.1, that is one of the sections Maurin Scheetz is the lead reviewer for. And the scope of the review was the organizational structure. Essentially, the COL applicant will have the necessarily managerial and technical resources to support the plant staff in construction, operation, maintenance, and in the event of an emergency. And there were two -- sorry -- three COL action information items provided in Chapter 13.1 of the DCA Part 2, Tier 2. Those COL items are 13.1-1, 13.1-2, and 13.1-3 that describe the corporate level management and technical support organization and the on-site operating organization.

And the staff reviewed those COL items and

found them acceptable and there are no open items for this section of the SE, safety evaluation.

Likewise for 13.2, which is training, the purpose of this section is to provide assurance that the applicant has established acceptable COL information items pertaining to a description and schedule for the licensed operator training program for reactor operators and senior reactor operators, including the licensed operation requalification program, and number two, the training program for the non-licensed plant staff.

Again, there were two COL items, 13.2-1 and 13.2-2 that were presented in DCA Part 2, Tier 2, Section 13.2 by NuScale. The staff reviewed those and found them acceptable and there are no open items in this section of the SE.

MEMBER BALLINGER: I have a question. I was going through Chapter 9, and there is an open item in Chapter 9, and it is related to the sampling system, and it's related to shielding. At least one of them is related to shielding and things like that for the sampling system.

These two are connected?

DR. CHOWDHURY: If you are talking about the Process Sampling System, right?

MEMBER BALLINGER: Right.

DR. CHOWDHURY: That has -- Chapter 13.3 has an open item related to that. So I will get to that soon.

MEMBER BALLINGER: All right, I got it. All right, thanks.

DR. CHOWDHURY: So here we are at 13.3, Emergency Planning. So the focus areas were the Technical Support Center, Emergency Response Data System, Technical Support Center Engineering Workstations, Decontamination Facilities, Process Sampling System, Operations Support Center, Emergency Operations Facility, and Emergency Plan and Emergency Planning ITAAC.

So there is an open item, as you just mentioned. The open item here in Chapter 13 is designated as 13.3-1. The capability to obtain a post-accident sample is an interface item between 13.3 and 9.3.2. That's the one that we just talked about.

So if this Process Sampling System is determined to be acceptable as a means for obtaining a post-accident sample in accordance with the definition cited here, 10 CFR 50.34(f)(2)(vii) and (viii), then this open item will be resolved.

The staff presented the interface

interactions on January 23rd and if there are any other questions related to that, Amanda Marshall is in the audience to answer the questions.

So with the exception of this open item, the staff concluded for 13.3 that on the basis of its review of the NRC EP design-related features included in the Design Certification Application, that the applicant has met the applicable regulatory requirements.

13.3, there is no requirement for operational programs for a DC applicant, however, there is a requirement in 10 CFR 52.79 for COL applicants to describe operational programs.

There is a COL information item provided by the applicant, which is 13.4-1 and the staff reviewed it consistent with the Standard Review Plan, Section 13.4 Draft Revision, which was in September of 2018, I believe. And the staff found it to be acceptable, comprehensive, and there are no open items in this section.

MEMBER SKILLMAN: Dr. Chowdhury, let me ask a question here and it's either in 13.4 or 13.5 that I will ask it again in 18.

What is unique about this plant is heavy load lifting. And heavy load lifting is going to be

a constant activity on a 12-module plant, 24-month fuel cycle. There will be heavy lifting including module shield blocks, and other paraphernalia constantly.

Is there a basis for a special review of a special organization dedicated to handling the modules, the shield curtains, all of the heavy lifting gear associated with the heavy lifts to ensure that those are conducted in a manner that does not present disproportionate risk to the then-operating modules?

DR. CHOWDHURY: Okay, if I understand correctly, there is a lot of module movement in --

MEMBER SKILLMAN: Well, let me be very clear. In my view, this is a subcommittee meeting -- this is a full committee meeting but it is one member's view -- you will have three reactor operators and three senior operators. Their focus is going to be on live cores. There is going to be a dominant leader that is assigned watching the plant and two additional supporting that individual. At any one time, one person is in charge.

Even while those operating reactors are functioning, there is going to be another crew completely independent moving very heavy loads adjacent to those live cores. And I assert that that

activity demands as much attention as keeping watch on the operating cores.

So my question is: Because of the uniqueness of the NuScale design, is there a requirement in the organization for dedicated focus to what we would have called fuel handlers but they are really module and heavy load handlers? And the reason I ask that question is because they're doing this alongside of live cores.

DR. CHOWDHURY: Right. Yes, I understand that and I also reviewed the transcript that has your comments and questions about it.

I believe NuScale provided a response to this inquiry before, stating that they had dedicated procedures in place and organization in place to handle it outside of operating the plant.

So beyond that, the staff looked at all these on the organizational aspect of the reactor operation. So I will defer it if Maurin Scheetz is on the line or Brian Green is in the audience that maybe you can supplement our answer to this question.

So Brian is going to come.

MEMBER CORRADINI: If I might just jump in. I think what Member Skillman is wondering, it appears here but it's also connected to 18. It's also

connected to Chapter 9. So they are all connected. He just wants to make sure it's not lost in the connection.

DR. CHOWDHURY: Oh, yes. No, it is because, as Brian is going to probably cover -- add also is that we had extensive interactions and communications between Chapter 18, 13, Chapter 19, and Chapter 15, and also part of Chapter 7.

So, Brian.

DR. GREEN: Hi, it's Brian Green, Chapter 18 reviewer. I don't think that maybe the discussion in the subcommittee meeting maybe got as deep into this as we probably should have.

Chapter 19 reviewers have been looking at this and I don't know if they've had a chance to bring their SER to you yet. There was an RAI issued by the Chapter 19 reviewers that addresses precisely your concern. It is currently, I believe the status is closed, unresolved in there. They issued some additional RAIs in the last few weeks that are going into many of the concerns that you have brought up. So they've seen the transcripts but this is still -- it's still in process.

So in one sense, the Chapter 19 reviewers are working to have this discussion. They've been

aware of it and they don't have the final solution to it yet.

As far as -- maybe I should save this for Chapter 18 in a little bit. We have a process where we go back and reconcile to make sure that if there are new insights from the PRA, let's say that you know your question -- maybe what you're saying is something that needs to be done. If that becomes a part of the NuScale operations, we would go back through our design implementation process to make sure that the appropriate tests are done or that there are valid analyses that help to help us make a conclusion.

This way this helps to prevent any new sorts of important actions like this from slipping through the cracks.

MEMBER BLEY: Please don't leave yet.

DR. GREEN: Okay.

MEMBER BLEY: I was going to wait for Chapter 18 but I think this is the right time.

Just a quick summary because these things that cover multiple chapters are easy to lose track of.

DR. GREEN: Yes, it spans a bunch of them.

MEMBER BLEY: Chapter 19 with the PRA looked at seismic event impact on the crane. I have

to go back and look more carefully at the regular part of the PRA and see if they looked at crane drop accidents there and they should have.

In Chapter 18, the staff had asked the applicant about the HSI for the crane and, at least by implication, any human errors associated with that. The applicant came back and said the crane vendor is going to supply that information.

I'm personally, well other than being a little uncomfortable with that, what I would like to hear from the staff is how, once the crane vendor gives their information on the HSI and any associated human actions with these lifts, that NuScale will actually own that part of the analysis and the staff will have reviewed it, if not for their design cert, certainly I think for the COL. It's really kind of crucial.

And the PRA, given the kinds of things that have happened in crane drops in the past, the PRA ought to be looking at human errors in rating the crane, such that things get dropped. That's kind of the most commonplace, other than breakage of some of the small components, the lifting the components themselves, rather than the crane.

Is there anything more you can say about

that?

DR. GREEN: I can say that there have been some RAIs issued in Chapter 9 space to try and find out what those words of futures would be so they could be included in specs but I would not be the person to answer further details on it.

The Chapter 19 reviewer is planning on showing it for the Chapter 18 discussion. So she may be able to provide the level of detail you are looking for but I --

MEMBER CORRADINI: I think the essence of what Dennis is asking, and I don't know maybe if this is an easy yes or no, is that as we understood it from the subcommittee meeting, staff identified this as a risk. Staff has asked NuScale. NuScale has said their vendors are going to take care of it.

We want to make sure the circuit is completed so that the vendor comes back to NuScale, and NuScale owns the plan, and staff has reviewed the plan.

DR. GREEN: Understood. I think where we're seeing it right now is these are essentially screening criteria that would screen this into the HFE review and I don't think that that answer is solved yet.

So the Chapter 19 review might say you need to provide this, you need to provide some sort of testing on the front end, rather than to delay it. So the results of the Chapter 19 about how this ranks in the risk may bring this more forward in the human factors space, or it may go more to the lower end.

MEMBER BLEY: Okay. Well --

DR. GREEN: That screening question is still where it is still under some dispute.

MEMBER DIMITRIJEVIC: All right, so I'm familiar with those two RAIs which are issued on the movement of the modules and they are related to the numerous operator action related to that. Some of them are action of Commission which are not even modulating the Chapter 19.

So if those actions are part of that initial to give in frequencies, they will never show up in the ranking. Obviously, this is the most important event in actually in the PRA. If they are separated, they will show as important.

Well we will discuss that maybe more in the Chapter 18. However, what I think Dick is bringing, and this is how I feel, what is really specific for this design is this module movement. It is not -- I mean the other plants have the crane drop

during shutdown you know damaging but this is completely different. This is the module movement which can damage operating modules and misplace module -- I mean you know disposition module in position where it cannot be cooled.

So therefore, this has to be identified somehow, not the details which we are waiting from this RAI but this is some type of safety function. Because the critical safety functions identified in the Chapter 18 are just typical, you know the reactivity control, if removal. This is something very design-specific and has to be stated somewhere independently of the results, which I think is going to bring importance of those events in. But that should be stated as very design-specific function to be considered in operation -- module movement.

DR. GREEN: I understand that there is potential for this and this is something that we are still working on. I know Maurin is on the line. She's been doing some thinking on this but I don't believe there is a decision made about what that critical -- if there should be another critical safety function.

I believe NuScale's position is three is enough but the staff is still --

MEMBER DIMITRIJEVIC: Well, it doesn't have to be core critical safety function because it's something we use for yes, so the staff to change some of its mind, but it has to be identified as an important function of something you know. At least the function it has to show somewhere in both chapters.

DR. GREEN: Understood.

MEMBER RAY: Dennis, you referred to NuScale in the context of the crane vendor, I believe.

MEMBER BLEY: But NuScale's response has said that the crane vendor would supply this information.

MEMBER RAY: Understand but I thought there was some element of oversight review, approval, or whatever of what the crane vendor did. I'm not sure that wouldn't be the COL.

MEMBER BLEY: I'm not sure either but I think it ought to be before the COL is completed.

MEMBER RAY: Right.

MEMBER BLEY: Because it could be a major crumble.

MEMBER RAY: Yes, but it could vary from plant to plant in terms of who the vendor was, how they approached the problem, and so on and so forth,

as far as I can tell.

DR. GREEN: I believe they've selected a vendor. I'm not sure how they plan -- if they plan on using the same one throughout the process.

MEMBER RAY: I don't think when you look over the potential for many plants that have the NuScale reactor that we should assume that all of this is going to be supplied by NuScale, unless they've said so. It would be something procured, I would imagine under normal circumstances, by the COL holder.

So what --

MEMBER BLEY: I'm sorry. NuScale did say that they would be including requirements about this in their request for proposal or whatever it is from the crane vendor.

DR. GREEN: The procurement vendor.

MEMBER BLEY: So they were saying that they would own it.

MEMBER RAY: Okay, so you're satisfied then that that's been addressed.

MEMBER BLEY: I'm satisfied that they are going to do it.

Now, if you come along and buy one of these things, you might put in an exception to switch the crane vendor but then it ought to be covered at

the COL stage.

That's my opinion.

DR. GREEN: And the human factors process has a portion that starts after the Integrated System Validation which occurred in the summer of last year that aims to ensure that any human actions -- that new human actions may arise between now and startup get analyzed and potentially tested, if they rise to that. And one of the criteria that's in that is that they need to go back to the conclusions of the Integrated System Validation and ensure that these changes do not invalidate those conclusions.

The crane was not tested in the Integrated System Validation that was conducted. So some assessment would have to be done and potentially new testing if this were to become new critical safety functions or new operator actions involved.

Now, we do have an open item in our review. We don't have an agreed upon process at this point for how this is all going to be managed. That is one of our outstanding open items but the collection mechanism for new actions to come up between now and then is addressed in that.

MEMBER SKILLMAN: Let me thank you for your response and it gives me confidence that the

concern that I have is going to be addressed.

Just for the record, let me explain how I arrived at my questions. I started in Chapter 18 looking at human factors and I said there is going to be a constant lift activity necessarily because of the way this plant is designed. Where are the human actions covered? Well, in 18 there is a statement that says we're going to cover the human actions in Chapter 9.

So I went into 9 and dug through 9 and I concluded, first of all, the vendor is going to provide the information, as Dr. Bley says, and the owner, NuScale, are going to have to make sure that the vendor information is appropriate for the number of those types of lifts, the traffic in the tunnel that separates five active and six active cores.

And I said well what's going to be lifted. Well, it turns out it's just not the module, 734 tons. To get to the module, you have to lift a 75-ton shield block and stack it on the shield block of a live reactor. So okay, now I've got to undo, latch, stack, grab, disconnect, move. I've got six live here, five live here. What do I know about everything that is below the main hook?

That led me back to 19, to Dr.

Dimitrijevic's comment. If you look at 19, 19 says module handling is the greatest core safety risk in the plant. And I figured well, what does Chapter 15 communicate? And I got to Chapter 15 and Chapter 15 communicates neither cask drop nor module drop are examined because of the crane being a single failure.

And I said to myself, boy, that just lets the air out of all my tires. I don't understand. So I accept accountability for lighting this fire but I think it deserves enough attention so that when this application is finally reviewed, we can say with confidence we have a solid grip on heavy load handling. And it's not just the module. It's a module. It's everything associated with the module. It's everything associated with the fixtures into which the module fits for disassembly and refueling, reassembly and transport back to its home. These need to be pulled together and we need to be comfortable that they really have been integrated.

DR. GREEN: Understood.

MEMBER SKILLMAN: Thank you.

DR. GREEN: Thank you.

MEMBER REMPE: Before you leave, excuse me. When you did the review, and I read the transcript -- I missed the meeting -- but it looks

like, and I know NuScale wants it to be, for where all 12 modules are installed and operating. But in Chapter 18, they explicitly say in the open document that it is anticipated that you might have some modules up and running while you are still installing other modules.

Where do the modules come in? Do they come in over the spent fuel pool? What end of the building do they come in at?

DR. GREEN: Lauren, do you have the answer for that off the top of your head? I don't remember specifically. I know that installing the new modules is quite similar in activity to the refueling module but I don't remember --

MEMBER REMPE: Well okay.

DR. GREEN: -- when the new module comes in.

MEMBER REMPE: It's not -- it may not be. And I guess because you are still bringing in a module for the outside world, I guess, unless they have a requirement which I didn't see in what I reviewed, to say even though we may not have them all up and running, we've got to bring in all the vessels into the building before we start up.

And you're saying no, they can bring it in

from the outside world.

DR. GREEN: I believe that was one of the assumptions but I don't remember off the top of my head.

MEMBER REMPE: Okay then I'd like to know how -- if you --

DR. GREEN: Lauren, are you on the line?

MS. NIST: Yes, I'm on the line. So I also have to do some research to answer that question with accuracy.

MEMBER REMPE: Because I am curious because in Chapter 9, with the staff interactions, they actually had NuScale change the DCA to day don't bring in a new fuel assembly over the existing fuel assemblies. And if we don't know how they're bringing in the module, I think that some attention might be warranted to make sure that the DCA explicitly states how this is going to happen.

DR. GREEN: We can look into that.

MEMBER REMPE: Okay, thank you.

MEMBER MARCH-LEUBA: Joy, I am looking at one of the cartoons, the pictures of NuScale, and the module seems to be coming horizontally into the refueling machine. So the new module will come horizontally and then drop into the -- above the fuel

pool.

MEMBER REMPE: So it does --

MEMBER MARCH-LEUBA: I can show you in the picture.

MEMBER REMPE: So it is coming in over the spent fuel pools.

MEMBER MARCH-LEUBA: Over the fuel pool, yes.

MEMBER REMPE: It's interesting, since we're not supposed to be bringing a fuel assembly in over the existing fuel elements but they have the modules coming in over the spent fuel elements.

MEMBER MARCH-LEUBA: Yes, we don't have enough detail to know if it might be a little to the left or to the right.

MEMBER REMPE: Yes, okay, so the cartoon isn't explicit.

MEMBER MARCH-LEUBA: I'm going to look at it.

MEMBER REMPE: Yes.

MR. MILTON: Mike Milton with NuScale. And we have a team on the phone that can help. It does not come in over the spent fuel pool.

MEMBER REMPE: And that is actually stated somewhere in the DCA?

MR. MILTON: I will check on that.

MEMBER REMPE: Because, again, the staff had some interactions and say I want to know where -- you know there ought to be something in here that precludes and allows a safe pathway. And you may have plans but it ought to be somewhere in the documentation.

MR. MILTON: Right. It's definitely not over the pool and we'll check on the words. It does come in through the railway bay and that's located there.

MEMBER REMPE: Okay, thank you.

Someone is on the phone.

MEMBER CORRADINI: Can you guys please speak up? We can barely hear you. You've got to get close to a mike or get off the speaker phone. Still too low. Louder.

MEMBER REMPE: We're old.

PARTICIPANT: I'm as close as I can get. I apologize for that. But it is not typically possible to bring a module in over the spent fuel pool. There is no equipment to life a module over. It comes to the side of the spent fuel pit and then enters the pool. It is then, I think people are familiar with the travel path going to the -- from the

dry dock basically in the pool submerged -- partially submerged, to the operating bay, and to the disassembly equipment.

MEMBER REMPE: Where is this documented in the DCA, what chapter?

PARTICIPANT: Yes, I don't have that information right now. We're looking but I just wanted to mention it is not physically possible to lift it up over the spent fuel pool. There is no equipment above it that would be able to hoist any portion of the module up over the spent fuel pool.

MEMBER REMPE: So is there like some big large overhead door where it comes in the building? I'm just trying to figure this out. And if you could point me somewhere into the available documentation we have, whether it's proprietary or not. And you can do this later, give it to Mike Snodderly. But I would be curious in understanding how it gets in -- a new module would get into the building when you've got modules up and running.

And so can you provide us some sort of detailed response on that or something or point us to where we should be looking for it?

MR. MILTON: This is Mike Milton. Yes, we will.

MEMBER REMPE: Thank you.

MEMBER CORRADINI: Go ahead.

DR. CHOWDHURY: My last slide on plant procedures, 13.5. There are open items -- there is one open item. In 13.5 there is one. So the NuScale submitted a Generic Technical Guideline Document, Rev. 0. The staff reviewed it.

The staff had extensive interactions with NuScale on this document. We had two public closed meetings. I think one in February of 2018 -- February 9th and February 15. We had two really extensive meetings and I was part of it. There were feedback from the staff, extensive feedback provided to NuScale on what they had identified as their concerns.

And also staff issued six RAIs with 17 questions on this matter regarding the Generic Technical Guidelines. And NuScale responded to those and NuScale provided Revision 1 draft of the Generic Technical Guidance and the staff has seen that.

And the staff still has an open item because I think based on the ISV, Integrated System Validation testing and other validation activities, the GTGs may be revised, updated as necessary. So this is an open item that the staff is tracking.

MEMBER BLEY: Prosanta, can I ask you a

couple of questions about this?

DR. CHOWDHURY: Yes.

MEMBER BLEY: I know you haven't finished your review but the GTGs are called out in Chapter 13 for developing procedures as a reference. They aren't called out in Chapter 18 but some of the citations in Chapter 18 use them as a secondary reference, which is truly important over there as well.

In the development of procedures -- well this question is one you can save until later until you've finished your review of GTGs -- but there is a section on symptom-based procedures and there's a section on -- I lost it here -- I turn pages too quickly -- on essentially how you use the GTGs to develop procedures. And those aren't -- to me, are not fully transparent. So after you've finished the review, we want to ask a number of questions about those.

There are places where it sounds like the automated version of the GTGs are almost procedures and there's really no clear indication of how procedures will be developed from them. You know if one looks at those flow charts as what we'd call ESDs in doing risk assessment, they certainly aren't complete. If they are tools for developing

procedures, it's important to really understand how they're going to be used.

I'm going to come back to these with a couple more questions when we get to Chapter 18.

DR. CHOWDHURY: Okay.

MEMBER BLEY: For Chapter 13, those are my main concerns right now.

DR. CHOWDHURY: Okay. Do you think that we have to go into proprietary discussion in answering those questions?

MEMBER BLEY: Since the whole document is proprietary, yes, probably.

DR. CHOWDHURY: Okay.

MEMBER BLEY: And I don't think we need to do it today. I think that's something -- unless you've finished your review or it's almost done and you're ready to address it.

DR. CHOWDHURY: No.

MEMBER BLEY: Okay.

MEMBER CORRADINI: I didn't think so. Okay.

DR. CHOWDHURY: Okay so there are several COL items for this section of the SE, 13.5-1 through 13.5-5 and then 13.5-7 and 13.5-8 for plant procedures. Those the staff found to be appropriate

and acceptable.

So the staff will make a conclusion on the GTGs at a later time after they review the -- complete their review.

I believe Maurin she is on the line. Maurin, are you on the line?

MS. SCHEETZ: Yes, good morning. This is Maurin Scheetz.

DR. CHOWDHURY: Okay. So thank you for joining. And Maurin, is the key reviewer for this section of the DCD. So if you have any questions in the public discussion time, then she can answer.

MEMBER CORRADINI: Any further questions.

DR. CHOWDHURY: Any further questions.

MEMBER BLEY: Oh, when I said I couldn't find the section I was looking for, the two sections are 4.1 symptom-based procedures and 4.3 structure and use. I had actually used these to develop the procedures.

DR. CHOWDHURY: Okay.

MEMBER BLEY: Those were the ones I had seen. They're hard to track.

And I was looking at the one.

DR. CHOWDHURY: Okay.

MEMBER MARCH-LEUBA: I don't have a

question. I have a comment that I wanted to follow-up in the subcommittee meeting. Is now the time?

Well first, ACRS is going to have a meeting in the facility where we are going to see the control room. And I am eagerly awaiting to see the whole thing but I've seen pictures of it.

And the way I envision it is there are going to be 12 big screen displays, one for each module. And each of those is driven by some logic, you can call it software or not. There is a logic implemented in there that gives you a green light and tells you this module is okay.

So I imagine if somebody is moving a module in the middle with a crane and you have a big seismic event, so I need the whole attention of the operator who is going to be on the module that will be moved. And he will quickly glance around and see 11 green lights, saying I don't have worry about those guys. Let me worry about this one.

One concern I have is there is too much over-reliance on computer-aided procedures and computer-aided green lights. When we discussed this in the subcommittee, NuScale told us that they trained their operators when the screen goes black how to go and use the backup information, the tablet, or

possibly on paper.

But I write software for a living and I've never written software that produces a green light when it should be red. I mean often. That happens very often.

And so one of my recommendations and I believe the committee can follow up on that is that there should be some recommendations to have some training for the operators where the computer lies to them. It makes a green light show green when it should be yellow or red. And they should have an emphasis on don't believe the green light completely. Use it to your advantage but go and check yourself all of them during this special event.

That is just a comment I wanted to put on the record.

DR. CHOWDHURY: Thank you.

MEMBER CORRADINI: Why don't we move on?

DR. CHOWDHURY: That's all I have.

MEMBER CORRADINI: Okay, so we can move on to Chapter 18.

DR. CHOWDHURY: Okay.

MEMBER BROWN: While they're doing that, I'd just make one observation relative to your green lights. Like you say, it's a software and computer-

generated safety indication, which seems to go against the old dictum that you believe your instrumentation and the operators look at their instrumentation, not an amalgam of a bunch of algorithms to tell you don't bother with all the instrumentations, I've telling you everything's okay. I am just not comfortable with that. Like you, I'm not comfortable with that thought process. Too many screens and not enough people to look at them.

MEMBER MARCH-LEUBA: Yes. And they will tell you it is not a computer. It's not software. It's an FPGA-based logic but it does the same thing.

MEMBER BROWN: But still, somebody has got to design the pathway for that information to get through, whether it's a microprocessor or FPGA.

MEMBER MARCH-LEUBA: Maybe the probability of failure is lower. Maybe it's a little more deterministic but still probability of failure exists.

MEMBER BLEY: Before we leave that little side discussion, I'd like to join in.

Well, I don't disagree at all. The instruments can give you misleading signals. On the other hand, there are some kinds of activities that, and quite a few of them, especially the routine checking of many things, for which computers are much

more reliable than people.

So it's not that we're going to be recommending that these things run in manual but being aware of what can go wrong and how to survive that situation, I certainly agree with.

MEMBER MARCH-LEUBA: My recommendation is to have the best of both worlds. Have a computer use them but train the operator to check the computer.

MEMBER BLEY: No, I agree.

And before we get started, let me ask my question about Chapter 18 at this point.

I said this in the subcommittee. Chapter 18 is sparse on detail. It tells what they're going to do and it doesn't report back all of the human events, and human actions, and all of those things. They are all in subsidiary documents that are cited in Chapter 18.

As we go through this discussion, I'd be happy if the staff would tell us how they gain confidence that this set of human actions is complete, is reasonable, or needed, given they have to go through this whole chain of documents to track it down.

The GTGs seem to be the main source where one would develop human actions to be examined both

for developing procedures, for understanding operations, and truly to support the PRA, although they imply that they get their source of human actions from many different places, including the PRA. And that goes both ways. That's a little reasonable.

They're very particular in saying that both errors of commission and errors of omission, which are really analyst terms, they are not the operators always commit something but we know what we are meaning by errors of omission and commission.

On the other hand, when you go through the details of the actions that get identified and used in the PRA, and I just simply identified, I find no errors of commission in that list. My experience is if you want to look for errors of commission, you don't run a couple of tests. You have to really come up with some carefully thought out search schemes, kind of like a HazOp in the chemical business. And that can be based on the set of event trees and scenarios that are in the PRA. It can be based on knowledge of the functions of all the systems. To come up with a list of things people might do that are errors of commission, that might be the problem. I think the crane is a place where certainly they ought to come up.

I don't see any of the results of a search like that or definition of such a search and I certainly don't see any errors of commission, although they say they're covered.

So I don't know what you guys have done about that and if getting into the details of that would require us to be in closed session or not.

DR. GREEN: This is probably the more appropriate time to address it but I will mention that there was an RAI -- this goes way back. I don't remember. I'll have to get you that -- but where NuScale had credited some analysis that kind of goes into what you're looking for, errors of commission that may happen. We would have to find that for you.

MEMBER BLEY: Okay.

DR. GREEN: It was in a related topic but it was not specifically addressed to find that.

MEMBER BLEY: So you didn't find it in the document. You only got it in response.

DR. GREEN: It was in an RAI response.

MEMBER BLEY: Interesting. It seems to me if they really did something like that, there ought to be a document. That's just stuff I'm concerned about in that area.

DR. GREEN: Do you want a closed session?

MEMBER BLEY: If there is anything to be said in closed session. Otherwise, if you can just get us the RAI.

DR. GREEN: I think getting you the RAI would be more appropriate but it's been quite a while since I've looked at that. I would rather get that to you than just say something untrue.

MEMBER BLEY: Is the staff comfortable that the applicant did a thorough job of searching for errors of commission that they say they've looked for?

And I don't think you can just run an experiment, a test to find them because they're rare.

DR. GREEN: I agree.

MEMBER BLEY: You won't see them in a test.

DR. GREEN: It would not be likely to show up in the types of tests that we run because they happen so infrequently and with the number of scenarios and the number of trials we do, you would have to run hundreds, maybe thousands of tests to maybe catch one.

MEMBER BLEY: Maybe.

DR. GREEN: Yes, I agree that would not the best --

MEMBER BLEY: And you're not going to do

that.

DR. GREEN: Right. That's not within the scope of what we do.

MEMBER DIMITRIJEVIC: But a couple of errors of commission identified during module movement. I know you look in seismic but there is actually module movement regular operation, not seismic related where there is I think three errors of commission identified the operator can actually make that are in error.

MEMBER BLEY: In Chapter 19.

MEMBER DIMITRIJEVIC: IN the RAI for Chapter 19.

MEMBER BLEY: Oh, okay.

MEMBER DIMITRIJEVIC: I will give you connection to this.

Those three are actions are related that actually operator can make mistake without the module drop. And those are extremely important, actually, errors of commission.

However, we don't see them in the PRA and, when we go to visit, I will look in this document because they are part of the module drop frequency. And that's just one event.

MEMBER BLEY: That's one, yes.

MEMBER DIMITRIJEVIC: Yes, and we don't see what is inside.

MEMBER BLEY: And it's an amalgam of stuff from everywhere.

MEMBER DIMITRIJEVIC: Right. However, there is the technical report which describes those errors of commission and also errors of omission also related to the module drop. That technical report I hope to see when we go to visit.

MEMBER BLEY: Okay, yes, I would like to see that.

Also, until they really get a crane, they're going to have to revisit this --

DR. GREEN: That's true.

MEMBER BLEY: -- because those sorts of things are very dependent on the design that they've actually done.

DR. GREEN: Our Chapter 19 reviewer is here. If you'd like, we could ask Marie Pohida to perhaps discuss some of where the -- what the discussions are. I know she's issued some RAIs recently.

MEMBER BLEY: Well I think the seismic part we'll wait because we haven't had any meetings on that.

It would be delightful to hear from her.

MS. POHIDA: Good morning. I'm Marie Pohida from the PRA Group in NRO and I am the tech reviewer for Chapter 19 on module drop.

So are there any questions that I need to answer?

MEMBER SKILLMAN: Well, I would ask one. Module drop, to me, is code word for heavy lift. So does your review go beyond just module? For instance, to refuel module, one must remove the 75-ton shield ledge and emplace it on an adjacent heavy lift over a live module.

MS. POHIDA: Uh-huh.

MEMBER SKILLMAN: So it's called stacking.

So in your review, maybe yes or no is an appropriate type of question, have you looked beyond just the module lift and looked at all of the other, if you will, subordinate lifts that are essential in order for the module lift to be successful.

MS. POHIDA: Okay. We looked at all movements of the module you know from the operating bay all the way up to the lift at the reactor internals with the upper portions of the CNV and the upper portions of the RPV when they're loading onto their fueling deck for inspection. We looked at the

entire path of the crane.

In Chapter 19, the impact of putting the bioshield on top of another operating bay for refueling, that has been looked at and we do have one open item on multi-module drop in Chapter 19.

MEMBER SKILLMAN: Thank you.

MS. POHIDA: Does that help?

MEMBER SKILLMAN: Yes, thank you.

MS. POHIDA: Thank you.

DR. GREEN: Well, thanks. I guess we've covered a lot of what I thought we might get to. So my next presentation is already half done for me.

DR. CHOWDHURY: Let me go first.

DR. GREEN: Sure.

DR. CHOWDHURY: So this is Chapter 18 and, again, I am the project manager.

And Chapter 18 --

MEMBER CORRADINI: Is there slides for 18?

DR. CHOWDHURY: Chapter 18, a review of Safety Evaluation Report once again is based on Revision 1 of the Design Certification Application. I just want to make sure it's clear that's what was presented on January 23rd.

And the technical staff involved are Dr. Amy D'Agostino from Research, Dr. Brian Green who is

here to cover the next slides, Ms. Lauren Nist, she is on the phone, and Maurin Scheetz is on the phone as well. Greg Cranston is the lead project manager.

So with that, I will turn it over to Dr. Brian Green to cover the following subsequent slides.

DR. GREEN: Thank you. Today my plan is to summarize the progress of the human factors review that we've completed thus far and discussed certain areas of interest during the review, describe the activities we plan to complete in the near term, and to address the open items that remain in the review.

The purpose of the review is to determine whether human factors engineering design of the NuScale standard plant control room supports operators in the safe operation of the plant. In addition, the applicant requested the minimum license operator staffing requirement specific to the NuScale power plant design. It adopted as requirements applicable to licensees referencing the NuScale power plant design certification in lieu of the requirements stated in 10 CFR 50.54.

To provide technical justification for this proposed operator staffing requirements, the applicant conducted a Staffing Plan Validation test or SPV, as we've often used too many acronyms here. My

apologies for that.

This test used personnel trained on NuScale operations to perform a set of challenging and high workload situation scenarios in the 12-unit main control room simulator. In addition, an Integrated System Validation has been conducted, or ISV, in September of 2018, which provided performance-based data of operators performing, in this case, a wide variety of tasks throughout a range of normal and accident conditions.

MEMBER BLEY: So as I understand it, you have not completed your review of these tests.

DR. GREEN: The Staffing Plan Validation is complete.

MEMBER BLEY: It is complete?

DR. GREEN: That one is complete. The Integrated System Validation is not complete.

MEMBER BLEY: Okay.

MEMBER CORRADINI: But you have -- because in January we were under the impression something has been submitted.

DR. GREEN: It has not been submitted yet.

MEMBER CORRADINI: Oh.

DR. GREEN: I believe we're expecting it at the end of the month.

MEMBER CORRADINI: Oh, okay. All right, so it still has not been submitted.

DR. GREEN: Yes, the testing was conducted in August and September and they've been using the last few months to analyze and generate the report.

MEMBER BLEY: And your SER did not include the SPV reports, did it? I thought they were still to come.

DR. GREEN: I believe the qualifications chapter discusses it.

MEMBER BLEY: I'll have to go back and look but I thought it showed --

DR. GREEN: I'm not sure to what degree. I don't remember.

MEMBER BLEY: You still have to review it I think is what it said but I'll take a look.

MS. NIST: Good morning. This is Lauren Nist. I would point to chapter -- I'm sorry -- Section 18.5 the Chapter 18 of the Evaluation Report provides an analysis of our review of the applicant's Staffing Plan Validation results.

MEMBER BLEY: Thank you.

DR. GREEN: Shall I continue? Okay.

I just want to take this opportunity to remind us that many of the specific details of the

applicant's test methods and results are proprietary. Therefore, if we have questions about those, we should hold those for the closed session.

To conduct our review and develop the safety evaluation, we reviewed the following parts of the application: The DCA Tier 2, Chapter 18, which summarizes the more detailed parts of the many technical reports that were submitted with the application; we reviewed many of the technical reports, which include a description of methods the applicant uses for various analyses; and a summary of the results of the testing that was conducted for those.

As you mentioned, the ISV is not yet complete. So that's where many of our open items are in that area. But most of the rest of the HFE process is complete at this time.

The technical reports also contain a description of the HSIs or the human system interfaces available to operators on the main control room.

We reviewed the concept of operations, which describes the rolls and responsibilities of the control room operators and how they are expected to interact with each other and use the HSIs to operate the plant.

We reviewed a description of the methods the applicant used to conduct the Staffing Plan Validation and the results. And we've also reviewed a description of the methods the applicant used to conduct the Integrated System Validation test, including things like reviewing the types of scenarios that were going to be implemented, the types of methods, data collection methods and whatnot.

We also conducted an audit of the testing and we will be looking at the results as well.

As we have already done so today, the staff referred to parts of Tier 2, Chapters 7, 15, and 19 that were related to human factors engineering topics. The insights from those chapters are used to risk-inform the human factors review.

We also reviewed the information in Tier 2, Section 3.15. The Tier 1 information in this section includes an ITAAC for HFE.

Chapter 14 of the staff's Safety Evaluation Report also documents the staff's review of HFE ITAAC and there is some overlap in Chapter 18 of this SER.

And perhaps I think one of the more important parts we did is the staff conducted a series of audits to review the applicant's human factors

analyses and design activities. Staff confirmed that the applicant conducted these activities consistent with applicable guidance and that appropriate considerations unique to small modular reactors were included.

In addition, the staff performed audits of the Staffing Plan Validation and the Integrated System Validation tests, both of which provide performance-based evidence suggesting the plant could be safely operated using the NuScale human system interfaces and staffing levels described in the application.

Next slide, please.

In preparation for the review of small modular reactor designs, the staff developed two guidance documents that identify potential human performance issues that are uniquely related to small modular reactors. These include NUREG/CR-7126, Human Performance Issues Related to the Design and Operation of Small Modular Reactors, and NUREG/CR-7202, NRC Reviewer Aid for Evaluating the Human Performance Aspects Related to the Design and Operation of Small Modular Reactors.

Staff used audits to confirm that these issues identified in these NUREGs were adequately addressed by the applicant's human factors program.

Staff confirmed that the various databases used by the applicant during the human factors activity have adequately addressed these concerns and that these considerations were ultimately used to influence the HSI design. I'll get to an example of how that works in a moment.

In addition, the staff reviewed the methodologies associated with the Integrated System Validation and audited portions of that testing. Staff observed an ISV test that was consistent with NUREG-0711, which contains guidance for conducting valid and reliable HFE tests.

So far the preliminary test results have been -- that have been shared with us have been positive, suggesting that the HSI design is sufficient to support safe operation. Staff plans to review the final ISV results when they are complete later this month to confirm that the data do in fact support these conclusions.

MEMBER REMPE: Excuse me.

DR. GREEN: Yes.

MEMBER REMPE: So I, unfortunately, missed the January subcommittee meeting but I know Member Bley brought up some of my concerns about shared systems during this interim period before all the

modules are installed.

Did your review look at some of these human actions during this interim period? For example, when they did install a new module coming in, it seems like you'd have to be lowering the water level of the pool as you put this big volume in. If there is shared systems, such as the backup diesel generators, and they may not all be installed from day one, what shared systems need to be considered and did their -- what they submitted, did it consider that interim period prior to all this being there or do they assume all shared systems like the backup diesel generators, et cetera, are there from day one when a module is operational?

I know they said the operators -- six have to be there if you only have one module but I didn't see anywhere where they identified when all the shared systems have to be installed.

DR. GREEN: I can't say I have the answer for that. I know that much of the refueling work has been scoped out because of the way the risk-informing process works. So much of it is not included within the HFE review currently.

If it gets scoped in by changes to Chapter 19, 15, or Chapter 7, then we would have to go back in

and retest them.

MEMBER REMPE: This is not refueling. This is basically interim period during startup of all 12 modules, when you have a couple in the pool and your bringing more in. And then when do you have to add the backup diesel generators?

And I thought during the transcripts, I reviewed it before this meeting, that NuScale answered and said no, we haven't documented anywhere what has to be -- when you have to put those shared systems in.

DR. GREEN: I don't know the answer to it so I would have to look but I can't recall.

MEMBER REMPE: Is anyone on the line from NuScale who can provide some sort of information?

MEMBER BLEY: Someone's here.

MEMBER REMPE: Or if someone from NuScale could answer those kinds of questions for me because I am concerned about that interim period. We have a lot of plants that never built some of the units that were originally proposed.

MR. MILTON: Sure, it's Mike Milton. I'll open up to the NuScale team if they'd like to answer that question about the pool level. I believe the pool level does not change.

MEMBER CORRADINI: I think it's more than

the pool level. I think what Member Rempe is asking is, to put it as I -- do shared systems get installed, whether it's one or ten, or one or n, and two, the activities occurring during the operation of less than --

MEMBER REMPE: Interim.

MEMBER CORRADINI: -- the interim period.

MEMBER REMPE: Yes and that's true. It's more than just dropping -- that's one example that came to my mind. But I'm just wondering has someone from NuScale been thinking about this.

MR. MILTON: Sure. I'll give Corvallis a chance to comment. If not, we'll take it away and come back.

MEMBER REMPE: Did we lose them?

MEMBER CORRADINI: Anybody out there?

MR. TOVAR: This is Tim Tovar, NuScale Power. The answer to that question is yes, we have looked at that but we don't have the expertise in the room to answer it in detail.

MEMBER REMPE: So this is a multi-chapter question. And so can you provide some information so that we can look at that because it is of interest to me? And again, the transcript says no -- again, maybe it was just the guy up on the podium, and it was a

person from NuScale and I don't remember his name, but said no, it's not documented anywhere.

But the other part of the question is to the staff, which I don't think Member Bley ever got around to during the meeting was you have not reviewed that probably yet. It's not been part of your review.

DR. GREEN: I don't recall it. I'm not sure if one of the other reviewers might have looked at that at some level. Lauren or Maurin, do you have anything to add on this? We may need to get back to you on that.

MEMBER REMPE: Okay, thank you.

DR. CHOWDHURY: One thing -- this is Prosanta Chowdhury -- I would like to mention is that not to the details that you may be looking for but some concept has been provided in Chapter 21, Multi-Module Design Considerations while they are talking about construction and operation phase how modules are placed and what shared systems are installed at what point.

MEMBER REMPE: Chapter 21 --

DR. CHOWDHURY: Chapter 21.

MEMBER REMPE: -- explicitly says when the shared --

DR. CHOWDHURY: They have some high level

information in there.

MEMBER REMPE: I will look at that before we get to our review coming up in Chapter 9.

DR. CHOWDHURY: This is unique NuScale design certification application has Chapter 21 and it is Multi-Module Design Considerations.

MEMBER REMPE: Okay. Well, I will look at it and anything NuScale can provide before this mid-March meeting I think would be helpful in our discussion. Thank you.

DR. GREEN: Let's see, are we on the right slide? Next slide, please.

All right, before I go into the open items I would like to take a moment to illustrate how potential HFE issues associated with small modular reactors was considered by the staff throughout the HFE process.

One unique feature of this design is that it allows for operation of all 12 units from a single operator workstation. Therefore, we were interested to see what kinds of design features would help to prevent operators from taking actions intended for one unit on a different unit or we might refer to these as wrong unit type of errors.

The staff started with audits of different

HFE analyses. One of these would be the operating experience review. NuScale has a database where they've collected information related to these sorts of errors and other sorts of issues that were identified in NUREG/CR-7126 and NUREG/CR-7202, where they have done analyses of different industries, nuclear and non-nuclear, because many of the sorts of operating experiences that we might see, these wrong unit sorts of errors, would come from military applications or from medical applications where you might have one person monitoring many patients using teleoperative medicine and whatnot.

And so they looked, performed an analysis to see what they could learn from other similar industries where these wrong unit sorts of errors might be possible.

MEMBER BLEY: Did the Navy share information with you on this topic?

DR. GREEN: I don't know if the Navy did but there are publishable articles out there about these sorts of issues. The UAVs were one particular area.

MEMBER BLEY: Okay. When you said the military, I assumed you were talking about the Nuclear Navy.

DR. GREEN: No, no.

MEMBER BLEY: I'd be surprised if they shared.

DR. GREEN: I would not ask NuScale to discuss all of their sources but this is a common human factors problem that has been in our industry for quite some time. UAVs being one that's quite publishable, where the thought was always that one operator would fly a fleet of UAVs and that was very challenging at first because of the many sorts of mission-related things. So it turned out they needed many operators.

And then they were approved on the designs and now I believe they are applying this. But it didn't get there quickly so there are sorts of analytical research papers and things that NuScale had reviewed in this process.

The staff audited their database, where they collected these sorts of insights and found that it was consistent with NUREG-0711 Chapter 3, which is related to our practices for 0711 -- for human factors operating experiencing review and that it consisted of the sorts of things that we would expect from NUREG/CR-7202.

If we move a little bit further into the

human factors process we looked at the HSI design and looked for features that would help to prevent these sorts of errors from occurring. These are some of the observations that we had:

The applicant used consistent and clear schemes for unit labeling on the HSI displays that were used for monitoring and control as a means to reduce the probability of wrong unit type errors.

Also the concept of operations defines the roles and responsibilities for each of the control room operators. The operators have different responsibilities for different units, which may help to prevent some of the errors.

Although the HSIs at the operator workstations can be used to operate safety-related components, the operator must first deliberately operate the enabled non-safety control switch. No automatic or manual safety actuation signals can be present. Operation of the enabled non-safety control switch to allow operation of the safety-related components from the operator workstations is only necessary under a limited set of conditions.

Also, it is an action that is intended to be controlled by procedures, which gives us some more confidence, and because it occurs in the control room

within sight of the control room supervisor's workstation, it can be overseen by the control room supervisor.

Additionally, if an event occurs, given that the unit requires actuation of a protection signal from the module protection system, the module protection system will position the safety equipment, if necessary, regardless of the position of the enabled non-safety control switch or the safety-related components, giving us extra confidence.

So we kind of took these sorts of HSI design features and found that they are building a case to show that there are protections to help prevent these sorts of wrong unit errors.

And then to go one step further, we observed the Integrated System Validation testing, which is where we might see some of these sorts of errors. This is where the operators go into the control room and perform various scenarios under lots of different conditions.

The staff observed good data collection practices that would likely identify any of these errors, if they had occurred. And the staff is awaiting the results to see if we see any of these, and if they had safety consequences, and if there are

any changes to the NuScale design at this point to prevent -- to further prevent or mitigate these types of errors.

MEMBER BLEY: I'm curious. You observed those tests.

DR. GREEN: We observed portions during the seven weeks.

MEMBER BLEY: The crews being tested actually have procedures? Did they use those GTGs to guide them through? What did they --

DR. GREEN: They did have procedures.

MEMBER BLEY: They did have procedures.

DR. GREEN: They have a computer-based procedure system.

MEMBER BLEY: Okay.

In your review, did you go through the GTGs and look at how they would be used to develop procedures?

DR. GREEN: I did not. That's typically --

MEMBER BLEY: Did anybody on the staff do that?

DR. GREEN: Maurin Scheetz is both on the Chapter 13 and 18. So she would be the person to answer that question about the GTGs. She should be on

the line.

MEMBER BLEY: Okay.

MS. SCHEETZ: Yes, this is Maurin. I'm on the line. And I did use -- I looked at how the GTGs were used to develop procedures. They are basically there as a basis for COL applicant procedures.

MEMBER BLEY: Could you say that last one again?

MS. SCHEETZ: We'll have another opportunity to review --

MEMBER CORRADINI: You're breaking up. Could you say that again, please?

MS. SCHEETZ: Okay. There's like considerable feedback when I talk so it's very confusing.

DR. GREEN: Maurin, they're asking for you to repeat your comments. We couldn't hear you the last time through.

MS. SCHEETZ: So I did look at how the GTGs would be used for a COL procedure in the future. The GTGs are a basis, a starting point. We will have another opportunity when there is a COL to look at the actual emergency operating procedures, severe mitigation guidelines, et cetera.

So this isn't the end of it. It's not

over. As I'm trying to say, this is a basis and we believe that these are an adequate basis, a starting point for future procedures.

MEMBER BLEY: Since you have the open item in Chapter 13, I assume the final SER on 13 will go into the GTGs and what you found there and your conclusions about them. Is that true?

MS. SCHEETZ: The open item is related to NuScale's validation of the GTGs. So we are waiting for information back from NuScale on the results of that validation before we make our final decision on the GTGs, which the purpose of the GTGs is a basis for plant-specific technical guidelines.

MEMBER BLEY: I may have understood that. Go ahead.

MEMBER CORRADINI: I heard that as a yes.

MS. SCHEETZ: Yes, we have an open item. Yes.

MEMBER CORRADINI: And it will be discussed -- let me just make sure. What Member Bley was asking, it will be discussed as you resolve it in Chapter 13, assuming --

MS. SCHEETZ: The resolution of our open item will be discussed in Chapter 13, yes.

MEMBER CORRADINI: Thank you.

DR. GREEN: Okay, so now we're onto our open items.

The Phase 2 SER currently contains 23 open items for the following topics. Nineteen of those are associated -- I guess we're using a different acronym here. I should have caught that -- V&V is a set of tests that includes the Integrated System Validation. So for the sake of consistency, let's say they're there. So these will be items that we should be able to close when we get the Integrated System Validation RSR later this month. And those are primarily involved with making sure that the results that are provided, and they are consistent with what we had seen and good analytic practice and whatnot. So you might bundle those into one open item but there are several RAIs that are there to mark that.

Other than that, there are four unique open items that are not related to the outstanding ISV analyses. One open item is about how we can ensure that there will be sufficient verification and documentation of the human factors activities that a NuScale licensee should perform. For example, there should be a viable mechanism we can rely on to ensure that any new or modified important human actions will be confirmed to be feasible and reliable.

And this -- the intent of this is to go back to make sure that if things change so that if the crane becomes elevated to a point where it needs additional analyses or testing, this would be a mechanism to help make sure that that focuses us into the human factors process at that point.

So this basically helps to ensure that just because the Integrated System Validation is done doesn't mean that human factors is a foregone conclusion.

There is one open item related to a topic that is also under review in Chapter 7. It's for the applicant to clarify how the design satisfies remote shutdown capabilities discussed in GDC 19. This issue was previously discussed at a Chapter 7 ACRS meeting. We'll need to update our SER to be consistent with Chapter 7 as that issue is resolved, depending on what, if any, changes are made to the design of the HSIs in the remote shutdown station.

There is an open item to confirm that the information in the Chapter 18 SER about the treatment of important human actions is consistent with the results of the Chapter 7, 15, and 19 reviews. This will help us to ensure that any changes in these analyses are adequately addressed within the human

factors process.

And this really has to do with the fact that those reviews are being conducted concurrently with ours and they also help us scope our reviews. So if something happens that broadens the scope, we need to go back and continually check with them. So we meet with them periodically to make sure there's no -- nothing on the horizon that is going to surprise us.

Is there a question?

MEMBER RAY: Well, I was waiting to ask one when you stopped. But I was going to ask, Mike, do you know when or if we see the ITAAC, for example, on the HFE, at a time when we comment or is that, the ITAAC, set after we're done?

MEMBER CORRADINI: I thought we were going to come to those later, yes?

MEMBER RAY: You know what the ITAAC says on this subject is somewhat important to --

MEMBER BLEY: Yes, I don't know the answer to that. Do we have a session set up for looking at all the ITAAC?

MEMBER SKILLMAN: Well we do for Chapter 14.

MEMBER CORRADINI: That's what I thought.

MEMBER SKILLMAN: But I'm not sure it is

as mature as Harold wants it. But it's a great question.

MEMBER RAY: Well, it seems really vague, at this point, what the ITAAC rule contains --

MEMBER SKILLMAN: For HFE.

MEMBER RAY: Yes.

DR. GREEN: It is still somewhat under -- there is one related to the remote shutdown workstation. There was a public call on this recently. So there are some changes coming in that way.

And we do have kind of an outstanding issue, potentially, with the design implementation part of human factors that is -- it's undetermined whether or not ITAAC is necessary. So we're still working on that one as well.

But my understanding is I believe you would hear that under Chapter 14 and see the full set of them there.

MEMBER MARCH-LEUBA: Okay. With respect to when you were talking about continuing the conclusions with Chapter 15 and 19 --

DR. GREEN: Yes.

MEMBER MARCH-LEUBA: -- how are you going to interface with it? You were now closing Chapter 13

and 18. If something happens in Chapter 15 that affects it, you will then redraw Chapters 13 and 14?

DR. GREEN: Well if something were to happen in Chapter 15, say that there were now suddenly a deterministic human action that was really very important, this could potentially be a really challenging situation for us. So we may have to go back to the applicant and see you know do you have testing that supports the operators can do that.

Perhaps they may have already tested it. In fact NuScale, when they put together the Integrated System Validation testing, used -- they had the Chapter 19 actions that are prioritized, they included more than what they thought they needed because you need to have scenarios that are useful. You can't just say there are these two actions that are important, let's go prove those. You need to put it into a context so that they don't know what's coming. And my understanding is that many of the other actions that were in there were the next ones that might raise to the level, if this sort of thing were to happen.

So there is a reasonable chance that these sort of actions that -- and I don't necessarily think there are going to be new actions in the control room, but if there were, there's a reasonable chance they

would have been included in the testing we've done and we could go back and analyze those.

MEMBER MARCH-LEUBA: So I am going to branch a little bit because you just said something. During this testing, were they using the final procedures? Do those procedures exist?

DR. GREEN: I'm not sure. Maurin, these are still considered a draft at this point, I believe, but I would ask Maurin to confirm that. There may still be some changes to those procedures but they would expected to be validated.

But I'll let Maurin answer.

MS. SCHEETZ: Okay, this is Maurin. I just want to make sure we're distinguishing between computer-based procedures that NuScale uses versus the GTGs. I think the question before dealt with the Generic Technical Guidelines that might have been about computer-based procedures.

In Chapter 13 space, we review the Generic Technical Guidelines to make sure that they are adequate as a basis for plant-specific technical guidelines. They are specifically more closely aligned with emergency operating procedures and the severe accident mitigation guidelines.

In Chapter 18 space, we looked at the

computer-based procedures to make sure that from a human factors standpoint that they are adequate.

So the ones that are in draft are the Generic Technical Guidelines.

MEMBER MARCH-LEUBA: Yes but my question was are you confident that -- are you satisfied in this validation test that they just performed last month that we're using procedures that are representative of what they will really be at the end?

DR. GREEN: We believe that they are. There are some -- some of our criteria that we look at, I'll give you some examples of some of the things, we wouldn't want them to put together a skeleton crew of procedures that only address the issues that they're expected to see. Because if they were to take the wrong path, they'd say oh geez, we don't have a procedure; we must be doing something wrong. It would tip operators off.

So there is a robust set of procedures. They do work through the processes that are there. I don't know that we would expect them to look exactly the same. Certainly, things are going to change in them between now and then but the normal validation procedures would be used to make those corrections.

MEMBER MARCH-LEUBA: And you would expect

NuScale, when they finally have final procedures, to make a 50.59-type evaluation that says yes, what we tested is similar to what we have.

DR. GREEN: Yes, I'm not sure what the practice is for that, for the validation of those changes at that point but I believe there is a process in place for that.

MEMBER MARCH-LEUBA: Okay, going back to my original.

DR. GREEN: Okay.

MEMBER MARCH-LEUBA: I was going to wait until the end of the presentation but I wanted to put something else on the record.

DR. GREEN: Sure.

MEMBER MARCH-LEUBA: And it is related to this relationship in Chapters 15 and 19 and is, in particular, ATWS, anticipated transients without scram. They sprinkle, the references sprinkle all over the SERs for 13 and 18 that says ATWS is okay and does not require any operator action.

And in particular, Chapter 13 has a paragraph which is a direct quote from an RAI response, which I particularly find offensive because I don't believe it's true.

I have been reviewing, the task was a

little heavy, I have been trying to find those adverse calculations before the subcommittee and after the subcommittee and I have to confess that I have not been able to find them. I am convinced by now that they don't exist and all these statements that you have in the SER is a figment of somebody's imagination because I have not seen those calculations.

The calculations that the staff has showed me a cover page of a report that hasn't been issued and that really added to my problem.

Let me put it on the record, yes to put it on the record I want them to explain in detail what happens. But I am worried that an isolation ATWS, that you have containment isolation, you have an ATWS and it's the beginning of cycle, when the moderator temperature coefficient is zero, which you are allowed to have. Therefore, you don't have any water reactivity feedback. All your feedback is only Doppler.

I ran some interim calculations and the few numbers I have been able to find from FSAR Topical Reports and there is not enough reactivity in the core to shut it down. Indeed, if we start saying numbers, we will have to go into closed session so I won't say it in this session but the reactor will not shutdown

where there is significantly high power. And I don't mean ten percent. Significantly higher power and we start boiling off the whole inventory. And it will die out and it will melt.

So I know that when we do the real calculations there will be other effects like boron concentration or things like that that saves us but right now I have a scenario that directly contradicts what they said in Chapter 13 and what they said in Chapter 19, and what they said in Chapter 15.

So I wanted to put that on the record and whenever we get in June to see Chapter 15, we'll have a lot of fun with this. There will be a calculation for us.

DR. GREEN: Understood. We did coordinate with the project manager for Chapter 15. So we've passed on the transcripts from the last meeting and we'll do the same so that your concern will be noted and I'll let them defend the position that they have.

MEMBER MARCH-LEUBA: I'm giving you -- you notice that when we finalize the review of Chapter 15 you may have to change some of the language.

DR. GREEN: We understand that that's a possibility and that's built into our process here. So that's why the design implementation element is --

it's the catchall in case something comes out there. And you know I don't think anybody wants to have to go back and do that retesting but if that's what's necessary, we can have that discussion at that time.

MEMBER MARCH-LEUBA: It probably wouldn't affect the human factors. I would only affect the language of the SER.

DR. GREEN: Well that would be -- I think NuScale be happy for us to rewrite the SE than to have to --

MEMBER MARCH-LEUBA: Well maybe not. I mean if everything, if all the planets align in the wrong way and my scenario turns out to be a core damage, it will be the dominant factor in the whole plant by three or four orders of magnitude.

DR. GREEN: Okay.

MEMBER MARCH-LEUBA: So yes, it could.

DR. GREEN: So it's on our radar and we will continue to coordinate with Chapter 15 in these other areas to make sure we don't miss anything.

And then finally, there is one other open item that is administrative in nature, which is to verify that the human factors reports, such as the V&V result summary report are incorporated by reference to make sure that they end up in the final application.

Next slide, please.

In conclusion, I'd like to summarize what we've determined thus far about the applicant's human factors design in the proposed staffing plan. Results of the applicant's Staffing Plan Validation test demonstrate that the applicant's proposed staffing plan can be used to safely operate the plant.

And based on our own observations of the Integrated System Validation test, we expect that the results will provide additional evidence that the human factors design supports plant personnel in the safe operation of the plant. However, we will be reviewing these ISV results to verify that they either confirm the proposed staffing plan or that the applicant makes any necessary changes in order to support the safe operation plan.

The open items identified in the safety evaluation need to be resolved during the Phase 4 review for us to find that the HFE design complies with all NRC requirements related to human factors and thus, the human factors design supports personnel in the safe operation of the plant.

That concludes our prepared remarks. I'm happy to take any more questions you may have.

MEMBER CORRADINI: Members?

MEMBER SKILLMAN: Let me ask one and I want to build on Dr. Rempe's question on shared systems.

Is there a commissioning sequence that one could review that would identify which systems must be operable when -- as the build out continues? For instance, I imagining that the base plan would be the concrete, the liner, testing the liner, installation of the crane because no heavy lift is going to come without that crane, closure of the containment building, filling the ultimate heat sink, bringing in the first module. The first module is going to require CVCS, CFDS, boric acid addition, demineralized water, vacuum system, a couple more. So there's a logical sequence and that's where Joy's question comes out in how many multiples do you need.

For instance, there is one CVCS per module, boric acid is shared among six. You're not going to use a module until you can dump heat. So you need at least one turbine. You need a condenser. You need a vacuum. You need circ water. You need chemistry control in the secondary on the primary.

So there must be -- and I'm confident that the NuScale team is a smart team. They probably put something like this together that would allow Joy's

question to be answered on shared systems. Is there such a thing?

DR. GREEN: I don't have it for NuScale. I am unaware of it.

MEMBER SKILLMAN: I've just been chewing on it since I kind of got the gist of it.

VICE CHAIRMAN SUNSERI: If I could jump in, in the DCD there is a Chapter 21 that talks about multi-module design consideration and it describes the things that you're talking about.

MEMBER REMPE: Well it does, but I actually looked at that because it was brought up earlier by the staff, but it doesn't have a lot of detail. And then what I don't know and maybe Vesna and Dennis can help with the PRA is when they did their analysis did they ever assume any cross ties. Because yes, it does in say 21, as well as 9, that sometimes the shared system is needed for six modules, sometimes the shared system is needed for four.

So clearly, they've been thinking about it but then do they ever say well, okay, as a backup, that one that is shared by the first six or the first four isn't going to work until I put a cross tie between the other one that's there. And the backup diesel generators are one that come to mind because

it's one of the important actions that is in Chapter 13 identified at the operator startup. And I think there's two backup diesel generators. Are both of those installed from day one or is it like the turbine generator building where they say no, you only need it for the first six?

MEMBER CORRADINI: I think we're going to have to wait.

MEMBER REMPE: Yes, well I think so but I think it's something that we ought to maybe, again, we can discuss when we do letter writing that we ought to mention, hey, we're interested in this unless the PRA folks can tell me no, they never did any cross ties or something like that.

And it's just something that when I was reading through that I was curious about and I was curious if the staff had thought about it, too.

MEMBER DIMITRIJEVIC: Well, we can discuss usually the 19. See all this, where the shared systems are considered when there is an initiator which will challenge all units like loss of offsite power, you know the side, all the units will require the use of generators. When it comes to the active feature, you need specifics like the ability the LOCA will happen in multiple units is very small so,

therefore, those shared systems are not as important as the ones which were credited for the carbon emission.

So and it's not also -- there is not also -- it is not clear, actually, and we will discuss this in Chapter 19 how those actions are considered with the multiple units. I am very curious about that myself.

Also, it is not clear from the operator actions when he has to tend to multiple units are the stress or are the difference in the evolution of the human actions.

MEMBER REMPE: Again, we can discuss it more but I think it might be -- again, I don't think it is a high level recommendation or conclusion. It is just a point that is something that we are curious about and we ought to keep in our minds.

MEMBER CORRADINI: Well I think -- I definitely think the staff and NuScale are aware of the fact we're interested in this and we'll keep on asking until we get an answer.

Okay, other questions by the members?

We have time for a closed session. What I would prefer to do is to get any more members' comments, go to public comments, and then essentially

go to break as we get organized for any questions in closed session.

Okay, so can we -- is there anyone from the general public who wants to make a comment that are in the room?

Hearing none, can we open the public line to see if anybody wants to make a comment that is on the phone? We'll wait until the powers that be turn it on.

MR. LEWIS: My name is Marvin Lewis.

MEMBER CORRADINI: You're going to have to speak louder, sir. I can't hear.

MR. LEWIS: My name is Marvin Lewis.

MEMBER CORRADINI: Mr. Lewis, go ahead.

MR. LEWIS: I have a comment about the crane stuff. While you are stacking, may I respectfully suggest you also look at the floor underneath where it drops?

In ANO, Arkansas Nuclear One, the drop wound up on a floor that gave way to a ceiling in the switchgear room, which led to no water addition to the fuel pools for 11 hours. A few more hours and we would have had a nice shamrock type fire in the fuel pools.

So when you stack, don't just stack

whatever you're stacking. You look at the floor underneath. Will it give way? Will there be a switchgear room underneath? Will the switchgear, when it blows, be able to somehow get water into the fuel pools?

Thank you.

MEMBER CORRADINI: Thank you.

Is there anybody else online that wants to make a comment, please?

Okay, hearing none, can we close the public line and we'll take a break -- or sorry. I'll turn it back over to the chairman. We'll take a break, if that's allowed and then we'll come back to closed session.

CHAIRMAN RICCARDELLA: Yes, I mean it's 10:07.

MEMBER CORRADINI: Well if I might just ask, I assumed we needed a closed session. Do the members have other questions? Otherwise, we're just going to be concluding the session completely.

MEMBER BLEY: I'm sorry, was there more of an answer to the question earlier about GTGs that you want to cover in closed session?

DR. GREEN: I didn't have anything more. Maurin, did you have anything else that you wanted to

discuss about GTGs in the closed session?

MS. SCHEETZ: I don't have anything for the closed session. I just want to clarify we're talking about two different things here and I didn't do a good job of saying this earlier.

For the Generic Technical Guidelines, the scope of our review was about the content of the Generic Technical Guidelines being adequate. That's -- the design of computer-based procedures so that they were adequate for use by operators in the control room. And I just wanted to differentiate those two things.

We're waiting on the results of the Integrated System Validation to confirm if the Generic Technical Guidelines were able to be implemented in that scope in Chapter 13.

MEMBER BLEY: Thank you. I think we got that. So I don't think we need a closed session.

MEMBER CORRADINI: Okay, so I'm hearing that -- yes, Charlie?

MEMBER BROWN: I just wanted -- throughout the earlier conversation relative to the crane, and it seems the crane is a key ingredient or a key element in terms of the all the module transfers, multiple modules, taking them out and moving them from one

place to the other. And I don't remember who said it, since I'm not as familiar with this type of a system in my past experience, it seemed like all of the requirements were being deferred to the vendor of the crane is going to satisfy the requirements. What requirements they are or why is the crane manufacturer, he's not a plant guy, how is going to be able to understand what he needs to provide in safety in the backups, the multiple whatever it is that makes that crane satisfactory.

MEMBER CORRADINI: Is that a question to NuScale?

MEMBER BROWN: Yes, it sounds to me like they're -- I just don't understand. It sounds like NuScale, to me, should be providing what safety requirements do we need to be imposing on the crane manufacturer, not the crane manufacturer is going to tell us well that's okay.

MEMBER SKILLMAN: My --

MEMBER BROWN: Did I get that -- do I understand that point?

MEMBER SKILLMAN: Charlie, I think the question is appropriate. I'm not going to try to answer the question because it really is a NuScale answer but it appears to me in the safety evaluation

that entire topic has been, quote, offloaded to the notion it's a single failure-proof crane.

We had single failure-proof cranes to do the defueling at TMI2 and we dropped parts of the defueling equipment into the reactor vessel on top of the pebble bed of fuel.

So I'm not convinced with a single failure crane everything is going to be fine, which is one of the reasons that I've got a fire on this. I think there needs to be as much focus and accountability on the design of that crane, in the operation of the crane, and the training of the people that operate that crane as we have on the men and women that are going to operate the cores.

Operating the crane on this plant, heavy load lifting on this plant is going to be a 24/7 job. If there are 12 modules, there's going to be a module change-out each two months. And if you look at the module change-out, that's what Marvin Lewis just mentioned, when you're stacking, where you're putting this stuff, whatever load has, how is all of that coordinated so that there is no risk to what could be 15 operating modules at 160 megawatts each.

So I think it's appropriate that you raise it. The lens through which I am looking at this is

the safety evaluation in Chapter 19 says it's a single failure-proof crane. If you look in Chapter 15, cask drop and module drop are excluded because of the single failure-proof crane. And I'm just not -- I'm not convinced that that is sufficient for the issues that we need to deal with.

MEMBER BROWN: Is the crane or the rails of the crane, is that part of the crane assembly?

MEMBER SKILLMAN: Yes.

MEMBER BROWN: He provided that as well?

MEMBER SKILLMAN: And to the credit of NuScale, the crane is a massive crane. It is encapsulated so it can't fall. It rides on rails overhead. It's qualified for 130 percent of its maximum load. Its maximum load is the 734-ton module. I understand all of that.

There's still the notion that a single failure-proof crane under NUREG-0554 and under heavy lifting, which is NUREG-0612. I'm not sure that that's a sufficient argument to say we're not going to do cask drop, we're not going to do module drop, and everything is going to be fine.

MEMBER BLEY: And we are coming to this in Chapters 9, and 15, and 19.

MEMBER SKILLMAN: And 6 and 9, yes, sir.

MEMBER BLEY: Yes.

MEMBER CORRADINI: Dennis, did you want to --

MEMBER BROWN: Thank you, I just wanted to make sure that I understood.

MEMBER BLEY: I did. Harold, you asked about human factors engineering and ITAAC. Chapter 14 doesn't do human factors engineering but Tier 1 has one ITAAC and that ITAAC is to ensure that the as-built configuration of the main control room HSI matches the design HSI and that's the only one.

MEMBER RAY: Well and I understood there is a consideration still that may be concluding that no ITAAC are required.

I think one of the things that is perhaps more common than not is the fact that although we are not in a position where we can perhaps expect more than we're being given, how we satisfy that, the assurance needed going forward without ITAAC to cover the things that we simply can't expect to understand fully now is an open issue in a lot of places for me here.

We keep saying well, we probably don't need ITAAC here; we don't need it there. And yet there's things that are left open that are to be

validated down the road. And I just -- since we don't know the criteria against which it will be validated in the absence of ITAAC, it's a problematic issue in general.

DR. GREEN: And this is related to one of our open items. For the ITAAC that was just read, some of the wording of that we believe needs to be changed. There are RAIs that have gone out on that. So there is some negotiating on that to make sure we've got the correct scope of activities that are included underneath that.

There has been discussion of a second ITAAC but I believe we're moving away from that at this point regarding the remote shutdown station. But we've just got some -- we're waiting for some new information on that. That would be more appropriate to discuss later.

MEMBER RAY: It's a generic issue that really goes to the question of what are we doing in a design certification. And to the extent that we are postponing, or necessarily -- and again, I don't mean it to be a negative comment, other than to say well, we're certifying a design and yet there's stuff to go that we don't know how it's going to be answered.

And if you don't have -- if you have ITAAC

that covers it, fine; that puts it to bed because it's part of the certification. But if you just say well we're going to get to it later and we'll look at it then, I'm troubled by that.

DR. GREEN: There's something I don't know that I've made this clear throughout the presentation but when we look at previous design certifications, they've all relied on DAC previously. So at that point, they submitted implementation plans. They said this is how we will one day fill all these blanks. That's not what NuScale did. They've designed their control room and it is done and tested at this point.

So in one very big sense, we have a lot more than we've ever seen before at this point.

MEMBER RAY: Okay.

DR. GREEN: Now, there are still some gaps to be addressed and our intent is that these open items should give us some regulatory assurance to make sure we're covering the right sorts of things.

MEMBER RAY: Well, I did, as many of the others of us did, but I chaired the subcommittee on the last design certification. We did Amendment 6 to AP1000. And I'm just -- it's different.

DR. GREEN: It is.

MEMBER RAY: Okay and I'm trying to get my

mind around that.

DR. GREEN: Yes, no I understand. It took us a while to wrap our head around it, too, because when we reviewed the previous ones, we had the -- you know we were looking at, essentially, IOUs. This is how we will one day conduct this analysis. And that's wonderful and you need a lot of details to make sure that works.

But now we have both the methodology or how they were conducting it and we were able to go an audit as we went. So in that very real sense, we have an awful lot more confidence that the outcomes of these processes are what we hoped they would be.

So it's been -- you know obviously an applicant picks their strategy but this one has been easier for us to oversee in that respect.

MEMBER RAY: Well we probably should --

MEMBER CORRADINI: I think we should move on.

MEMBER RAY: -- yes, move on. We just need to bear in mind that understanding what was just exchanged better on a generic basis is probably something that would be useful.

DR. GREEN: Understood.

MEMBER CORRADINI: So if I may then, we're

not going to have a closed session. I'll turn it back to the chairman. We'll go into break and go from there.

Chairman, it's back to you with no closed session.

CHAIRMAN RICCARDELLA: Yes, with no closed session. So I guess we will adjourn this portion of the meeting and take a break until 10:45. And after that, we'll start letter writing.

MEMBER CORRADINI: We have a draft.

CHAIRMAN RICCARDELLA: We have a draft.

MEMBER REMPE: So we don't need a transcriber for that, right? We're done.

MEMBER CORRADINI: We have it as one of the things in the schedule before lunch.

CHAIRMAN RICCARDELLA: I understand.

MEMBER CORRADINI: Okay.

CHAIRMAN RICCARDELLA: But the question is we don't need any more transcription.

MEMBER CORRADINI: No, not that I'm aware of.

(Whereupon, the above-entitled matter went off the record at 10:19 a.m.)

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

Safety Evaluation with Open Items: Ch 13, Conduct of Operations

NuScale Design Certification Application Review

ACRS Full Committee Meeting
March 7, 2019

NRC Staff Review Team

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

- **Technical Staff Presenters**
  - Maurin Scheetz, NRR – DCA Sections 13.1, 13.2, 13.5
  - Amanda Marshall, NSIR – DCA Section 13.3
  - Prosanta Chowdhury, NRO – DCA Section 13.4

- **Project Managers**
  - Greg Cranston – Lead Project Manager
  - Prosanta Chowdhury – Chapter 13 Project Manager

- Staff presented SER with Open Items to ACRS subcommittee on January 23, 2019

Note: Review is based on revision 1 of the DCA

Technical Topics
Section 13.1 – Organizational Structure

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Scope of Review

- The purpose of this section is to provide assurance that the applicant has established acceptable COL Information Items pertaining to the corporate-level management, technical support and onsite operating organizations necessary for the safe design, construction, testing and operation of the nuclear plant, including training and qualification requirements. That is, the COL applicant will have the necessary managerial and technical resources to support the plant staff in construction, operation, maintenance, and in the event of an emergency.

Conclusion

- The staff has reviewed DCA Part 2, Tier 2, Section 13.1, "Organization Structure," and determined that applicant's approach for COL Items 13.1-1 through 13.1-3 describing the corporate-level management and technical support organization, and the onsite operating organization, is acceptable to meet all applicable requirements. There are **no Open Items**.

Technical Topics
Section 13.2 – Training

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Scope of Review

- The purpose of this section is to provide assurance that the applicant has established acceptable COL Information Items pertaining to a description of, and schedule for, (1) the licensed operator training program for reactor operators and senior reactor operators, including the licensed operator requalification program, and (2) the training program for the nonlicensed plant staff.

Conclusion

- The staff has reviewed DCA Part 2, Tier 2, Section 13.2, "Training," and determined that applicant's approach for COL Items 13.2-1 and COL 13.2-2 pertaining to a description and schedule of training programs for licensed and non-licensed staff is acceptable. There are **no Open Items**.

Technical Topics
Section 13.3 – Emergency Planning

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Scope of Review

- The purpose of this section is to address those design features, facilities, functions, and equipment that are technically relevant to the design, that are not site specific, and that affect some aspect of emergency planning (EP) or the capability of a licensee to cope with plant emergencies. The applicant may choose the extent to which the application includes EP features to be reviewed as part of the design certification.

Focus Areas

- Technical Support Center (TSC); Emergency Response Data System; TSC Engineering Workstations; Decontamination Facilities; Process Sampling System (Post-Accident Sampling function); Operations Support Center (COL Item 13.3-1); Emergency Operations Facility (COL Item 13.3-2); Emergency Plan (COL Item 13.3-3); EP ITAAC (COL Item 14.3-1)

Open Item 13.3-1 – Process Sampling System (PSS)

- The capability to obtain a post-accident sample is an interface item between SRP Section 9.3.2, “Process Sampling Systems,” and SRP Section 13.3. If the PSS is determined to be acceptable as a means for obtaining a post-accident sample in accordance with 10 CFR 50.34(f)(2)(vii) and (viii), then this open item will be resolved.

Conclusion

- With the exception of Open Item 13.3-1, the staff concludes, on the basis of its review of the EP design-related features included in the DCA, that the applicant has met the applicable regulatory requirements.

Technical Topics
Section 13.4 – Operational Programs

U.S.NRC
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Scope of Review

- COL applicants are required by 10 CFR 52.79 to describe operational programs, but similar requirements do not exist for DCAs.

- The applicant provided COL Item 13.4-1 stating that a COL applicant that references the NuScale Power Plant design certification will provide site-specific information, including implementation schedule, for operational programs.

Conclusion

- The staff has reviewed DCA Part 2 Tier 2, Section 13.4, "Operational Programs," and determined that COL Item 13.4-1 is acceptable because the applicant appropriately directs the COL applicant to develop operational programs, consistent with the list in SRP Section 13.4, draft Rev. 4. There are **no Open Items**.

Technical Topics
Section 13.5 – Plant Procedures

U.S.NRC
United States Nuclear Regulatory Commission
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Scope of Review

- The purpose of this section is for the NRC staff to review the acceptability of COL information items for descriptions of plant procedures and the establishment of a program for development and implementation of plant procedures. The staff also reviewed the technical adequacy of the NuScale Generic Technical Guidelines (GTGs) for use as a basis for development of COL applicant Plant Specific Technical Guidelines (P-STGs).

Open Items

- The acceptability of the NuScale GTGs for use as a basis for the development of COL applicant P-STGs is contingent upon the achievement of satisfactory results from Integrated System Validation (ISV) testing and validation activities and the subsequent incorporation of any necessary changes to the GTGs and the associated Post Accident Monitoring (PAM) variables. This is being tracked as **Open Item 13.5-1**.

Conclusion

- The staff has reviewed DCA Part 2, Tier 2, Section 13.5, “Plant Procedures,” and determined that the COL Items 13.5-1 through 13.5-5, 13.5-7, and 13.5-8 for plant procedures are appropriate and acceptable. The staff will make a conclusion on the GTGs at a later time.

Safety Evaluation with Open Items: Ch 18, Human Factors Engineering

NuScale Design Certification Application Review

ACRS Full Committee Meeting

March 7, 2019

NRC Staff Review Team

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- **Technical Staff**
  - Dr. Amy D'Agostino, RES
  - Dr. Brian Green, NRR
  - Lauren Nist, NRR
  - Maurin Scheetz, NRR
- **Project Managers**
  - Greg Cranston – Lead Project Manager
  - Prosanta Chowdhury – Chapter 18 Project Manager
- Staff presented SER with Open Items to ACRS subcommittee on January 23, 2019

Note: Review is based on revision 1 of the DCA

Purpose and Scope

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- **Purpose**
  - Verify that the Human Factors Engineering (HFE) design of the NuScale Standard Plant control room supports operators in the safe operation of the plant
  - Verify there is sufficient technical justification for a new, design-specific staffing regulation
- **Scope**
  - DCA Part 2, Tier 2, Ch 18 as well as parts of Ch 7, 15, and 19
  - HFE technical reports
  - DCA Part 2, Tier 1, Section 3.15
  - Audits of HFE analyses, SPV testing, and ISV testing

Areas of Interest

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- Potential human performance issues specific to SMRs are identified in NUREG/CR-7126 and NUREG/CR-7202
- The staff considered the effects of the following on human performance and safe plant operation:
  - Multi-unit operation from a single operator workstation and from a single control room
  - Relatively higher amount of automation
  - Novel Human-System Interface (HSI) design features

Open Items

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- The Phase 2 SER contains 23 open items for the following topics:
  - Review of the applicant's V&V results (19 open items)
  - Scope of the HFE ITAAC and documentation of the HFE activities to be performed by the licensee (1 open item)
  - Evaluate whether changes to Ch 7 related to remote shutdown affect Ch 18 and verify accuracy of the SER (1 open item)
  - Confirm conclusions in SER Chapters 7, 15 and 19 about the treatment of important human actions are consistent with those in Ch 18 (1 open item)
  - Ensure that HFE reports are incorporated by reference into Tier 2 (1 open item)

Conclusion

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- The results of the Staffing Plan Validation (SPV) testing support the applicant's proposed staffing plan. The staff will confirm the Integrated System Validation (ISV) results also support the staffing plan or that any changes have been made if needed.
- Based on the staff's observations of the ISV test, the staff expects that the ISV results will provide evidence that the HFE design adequately supports plant personnel in safely operating the plant.
- The open items identified in the safety evaluation need to be resolved for the staff to find that the HFE design complies with all NRC requirements related to HFE and thus that the HFE design supports personnel in the safe operation of the plant.