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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

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 NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS (ACRS)

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NUSCALE SUBCOMMITTEE

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OPEN SESSION

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FRIDAY,

MARCH 24, 2017

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ROCKVILLE, MARYLAND

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

COMMITTEE MEMBERS:

MICHAEL L. CORRADINI, Chairman

RONALD G. BALLINGER, Member

DENNIS C. BLEY, Member

CHARLES H. BROWN, JR., Member

WALTER L. KIRCHNER, Member

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JOSE MARCH-LEUBA, Member

DANA A. POWERS, Member

GORDON R. SKILLMAN, Member

JOHN W. STETKAR, Member

MATTHEW W. SUNSERI, Member

DESIGNATED FEDERAL OFFICIAL:

MICHAEL SNODDERLY

ALSO PRESENT:

THOMAS BERGMAN, NuScale

LUIS BETANCOURT, NRO

MARK CARUSO, NRO

TIM DRZEWIECKI, NRO

SARAH FIELDS, Public Participant*

ROBERT FITZPATRICK, NRR

BILL GALYEAN, NuScale

ROBERT GAMBLE, NuScale

VIJAY GOEL, NRR

MICHELLE HART, NRO

RAUL HERNANDEZ, NRO

TED HOUGH, NuScale

JOHN LUBINSKI, NRR

OMID TABATABAI, NRO

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ANDREA D. VEIL, Executive Director, ACRS

* Present via telephone

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P R O C E E D I N G S

8:30 a.m.

CHAIRMAN CORRADINI: The meeting will come to order. This is a meeting of the ACRS=s NuScale Subcommittee. My name is Mike Corradini, Chairman of the Subcommittee.

Current members in attendance are Ron Ballinger, Matt Sunseri, Dick Skillman, Dana Powers, Dennis Bley, John Stetkar, Joy Rempe, Charlie Brown, and Jose March-Leuba. I think we will expect to see Dr. Kirchner, but we=ll wait on that. Mike Snodderly is the Designated Federal Official for this meeting.

The purpose of today=s meeting is to discuss the staff=s evaluation of NuScale=s topical report TR-0815-16497-P, Safety Classification of Passive Nuclear Power Plant Electrical Systems. Today, we have members of the NRC staff and members of NuScale Power to brief the subcommittee.

As a matter of background, the ACRS was established by statute and is governed by the Federal Advisory Committee Act, (FACA). That means the

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committee can only speak through its published letter reports. We hold meetings to gather information to support our deliberations.

Any interested parties who wish to provide comments can contact our office requesting time after the meeting announcement is published in the Federal Register. That said, we do set aside ten minutes for extemporaneous comments from members of the public attending or listening to our meetings. Written comments are also welcome.

The ACRS section of the U.S. NRC public website provides our charter, bylaws, letter reports, and full transcripts of all our full and subcommittee meetings, including slides which are presented here. The rules for participation in today=s meeting were announced in the Federal Register on March 14th, 2017.

The meeting was announced as an open/closed meeting. This means we will close the meeting after an open portion to discuss proprietary material, and presenters can defer questions that should not be answered in the public session to that time. And I=ll just make sure that, if we start going down a path, if NuScale or staff will let us know, that we hold off our questions, as appropriate.

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No written statement or request for making an oral statement to the subcommittee has been received from the public concerning this meeting. A transcript of the meeting is being kept and will be made available, as stated in the Federal Register notice. Therefore, we request that participants in this meeting use the microphones located throughout the room when addressing the subcommittee. Participants should also first identify themselves and speak with sufficient clarity and volume so that they can be readily heard.

We have a bridgeline established for the public to listen in to the meeting. To minimize disturbance, the public line will be kept in a listen-in only mode. To avoid disturbances, I request that attendees put all their electronic devices, like cell phones, in the on/off noise-free mode.

We'll now proceed with the meeting, and I'll call upon Ted Hough of NuScale to begin today's presentation. Before I do that, I'll just give you some personal comments. So I've tried to read through everything. I'm not an electrical engineer. It was a fun read for both the topical report and the staff.

I'm hoping, either between NuScale or the

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staff, I get some answers to questions like what equipment are we talking about that fits within this new classification or this new designation, what reliability is expected of it, and also under what environmental conditions? I'm a bit vague on these three things, and I think that, in just speaking with other members that have been trying to keep up on this, they might also be vague.

So I think, to the extent that this is discussed either in open session or in closed session and we get some of the details, this will help me because I think this is a bit new ground and I want to make sure we're clear on these sorts of things.

Before I go to Mr. Hough, do other members want to say anything to begin, or should we just go on to the open session? Okay.

MEMBER BLEY: I'd sneak one in. This new classification we speak of, you guys speak of comparing the reliability of these systems with 1E safety-grade systems, since 1E is a functional requirement, I want to hear sometime today how you go about determining what the reliability of a 1E system is since they have wide variety of reliabilities and how you thought about that uncertainty range, all of

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that related information.

MEMBER STETKAR: And since we're getting in shots in the beginning, the reliability of a stand-alone reliability of something is meaningless outside the context of its affect on overall plant risk.

CHAIRMAN CORRADINI: Okay.

MEMBER STETKAR: So I want to understand what that stand-alone reliability comparison has any relevance at all to anything.

CHAIRMAN CORRADINI: So those were two electrical engineers speaking, so they know better than I. Okay. Mr. Hough, you're up. You need the green light on.

MR. HOUGH: There we go. I'm sorry. Again, my name is Ted Hough, the Supervisor of Electrical Design at NuScale Power. With me at the table here is Robert Gamble, our Vice President of Engineering, and Tom Bergman, our Vice President of Regulatory Affairs.

As noted, this is a review of the topical report that we submitted on the classification of electrical systems for passive plants.

Moving on to the next slide, the slide two here is our acknowledgment and disclaimer for taking

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money from the Department of Energy. Slide three here, just some brief abbreviations that we do use in the open session here. It's pretty straightforward.

Slide four here, again, the purpose is to go a little bit over the topical itself in this open session, talk a little bit about the regulatory requirements associated with this topical in electrical systems, and then what we refer to as the conditions of applicability within the topical. Unfortunately, those are proprietary items that are preserved for the closed session.

Slide five. The purpose of the topical itself is to get staff review and approval of the conditions of applicability, as well as the methodology that's employed to develop this thing. To answer your question about what it applies to, it is applicable only to the electrical systems, the off-site and on-site AC and on-site DC systems of a plant.

It is not applicable to I&C equipment or circuits. So a lot of those, it would still be 1E obviously.

Slide six. One of the --

MEMBER BROWN: Can you, before you go, when you say not to the I&C, does that mean, I read through this stuff also and I had a hard time figuring

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out some of the stuff. Does that mean the reactor trip systems and safeguards, whatever configuration they end up being would then be supplied by the classical Class 1E electrical --

MR. HOUGH: No.

MEMBER BROWN: So they're not going to be supported?

MR. HOUGH: Correct.

MEMBER BROWN: So it does apply.

MR. HOUGH: The I&C systems themselves will be open to 1E.

MEMBER BROWN: Yes, but --

MEMBER STETKAR: I'm sorry. Let's be specific here. The sensors are classified as 1E. If they lose power in a licensing basis, you take credit in a licensing basis for those sensors always failing safe?

MR. HOUGH: Correct.

MEMBER STETKAR: Thank you.

MR. HOUGH: That's correct. Okay.

MEMBER BROWN: I'm sorry. I'm trying to connect the dots here between a load is what's important, the electrical system supplies the load. If the electrical system doesn't meet certain

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requirements, then the load is not going to perform in the same way. So you've got to somehow walk through what systems require stuff, and, after I read through that, I lost the bubble in terms of what was important and what was -- you talked about it, but sometimes I just couldn't connect the dots as to how you got the logic there.

MR. HOUGH: Well, hopefully I'll get into that --

MEMBER BROWN: Thank you.

MR. HOUGH: -- and explain that in no uncertain terms for you. Moving on to slide six, the regulatory requirements associated there. We're doing the staff presentation, and you'll see that there's a lot of GDCs talked about in there. That's a major piece of it because all the systems in the plant obviously have to conform to the GDCs and stuff.

A lot of times, like maybe used during construction and stuff, the electrical folks are like the tail on a dog where, you know, they move cable and stuff around everybody else and, whatever needs power, we give them power, etcetera.

In this concept, we kind of reverse that a little bit. So if you do this kind of concept, all

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those elements and everything grounded in the plant have to conform to that. So starting at 50.55(a)(h), that will get you to 603 in law 50.55. That will direct you to IEEE-308. 603 is the safety systems, 308 is the IE power systems IEEE standard. That walks you right into 946 for DC systems, and that's one of the main systems we're talking about here.

Of course, 308 is endorsed by Reg Guide 1.32 and also applicable is Reg Guide 1.81 for sharing, because we have 12 minutes, the sharing of electrical systems is important, too. And then, of course, IEEE-497, Reg Guide 1.97, for Post-Accident Monitoring.

So those are items that apply. As I said, it's kind of a reverse concept if you think about it.

The plant has to be able to be designed and maintain safety functions without electrical power. Safety analysis has to support that concept. But at the same time, per PAM, Post-Accident Monitoring, we have to acknowledge that that is an active system that uses electrons and E lights and things like that.

Moving on to slide seven here, part of the foundation of this whole thing is the definition of Class 1E and the definition of safety function. The

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definition of Class 1E, I'm not going to read it there to you, but you'll see in that first paragraph a lot of elements of the 50.2 definition of safety related appear there. A key word in there is essential to those functions that you see. And as noted earlier, 1E is a functional term, just like safety function.

So if you need power to achieve that safety function, that's a 1E power supply, no question asked. But if you don't need power to achieve that safety function, then the use of the term of 1E in that situation is not appropriate, as endorsed here by Reg Guide 1.32.

MEMBER MARCH-LEUBA: Maybe we need to answer this question in the proprietary side, but for my clarification, what does a Class 1E system entail?

Why does it cost so much? And what part of -- because what I've been reading is that you're going to have a Class 1F, and I'm making up the name, right, which is just as reliable, just as good, does the function, it just doesn't have the Class 1E cost.

So maybe in the proprietary session, I'd like to hear what are we missing from the Class 1E? Just the paperwork?

MR. HOUGH: We'll go into that. We have a

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table built for that.

MEMBER MARCH-LEUBA: Thanks. Thank you.

MR. HOUGH: Okay. An example of what we're talking about there, rod drive system. Those are all non-safety power items. The trip breaker itself is 1E, but that's the same kind of concept right there.

So moving on to --

MEMBER KIRCHNER: Since you brought that up, I know that you're following the non-LWR guidance in DG-1330, which strikes the reliability of the control system as a GDC. And I, for one, personal opinion only, don't think that's a good modification to the GDCs as we know them.

So you just said that the rod drive systems would not be IEEE 1E?

MR. HOUGH: Correct. I'm not aware of a plant in the country that has rod drive motors powered by a 1E power supply. The trip breaker, obviously, so the rods fall, you know, but the power supply is typically a non-safety related power supply.

Okay. Slide eight, safety function. Again, the first paragraph talks about within design basis events, those functions that you would see

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typically showing up in 50.2 definition safety related. But, again, it is a functional definition, and the footnote there, safety function is achieved by completion of all required protective action. Protective action, if you go to IEEE-308, I think paragraph 323 defines protective action. It's the initiation of the sense and command function or the actuation of the execute function, which would be the containment isolation valve, the rods or whatever going in. So it's an or situation there to achieve the safety function. Again, the key item there is this is a functional definition endorsed by Reg Guide 1.32.

Moving along to slide nine there, the topical report itself is really a structured methodology or a structured way to review the regulatory requirements and determine whether you really need 1E power or not, as noted in the definition. If you don't need 1E power, if you don't need the power to actually achieve that function, then it's not appropriate to use the term 1E.

And then the third sub-bullet there, that's probably the most important item on this slide.

You know, after looking at Fukushima, this concept,

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if you can design a power plant that didn=t need electric power to achieve your safety functions, you know, why wouldn=t you do that? So that=s very important to us here, and we think this concept solves an important industry item that kind of moves the industry forward a little bit.

And then as I noted in the opening slide there, the conditions of applicability are actually deemed appropriate, or proprietary -- I=m sorry -- and will be discussed further in closed session.

So that is the --

CHAIRMAN CORRADINI: All right, good. So questions from the members before we turn to the staff.

MEMBER SKILLMAN: Yes, let me ask this: in my preparation for this meeting, I went back to the GAP analysis and we talked about the GAP analysis last year, and the GAP analysis kind of looks at the general design criteria and identifies which are applicable and which are not. And NuScale has done a comprehensive job in defending not Criteria 17 and not Criteria 18, GDC 17 and 18. And your whole thrust has been, since no electric is needed for safety, no 1E is needed, no Class 1E power is needed and, hence, no

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requirement for testing in General Design Criteria 19.

The flip side of that is, to run this plant properly, you need electrical power. And to respond to an accident, you need information. I understand your logic with your battery system. I understand the words that are very clever in saying here=s why none of that needs to be 1E. But I must tell you I almost feel like we=re involved in a walnut and pea game here. You=ve done a thorough job in justifying why you do not need a 1E system, but, at the end of the day, you=re depending on your small containment and all of that water in that common pool for 72 hours of no action. That=s the bottom line.

But I=ve been through an accident, and I will tell you the one thing you crave in the middle of the accident is information. Unless there have been actions to make sure that abundant information is available to the operators, they=re blind.

This plant is almost have an accident, walk away, come back in three days and we=ll pick it up from there. I don=t think that=s what you mean.

MR. HOUGH: No, not at all.

MEMBER SKILLMAN: But that=s where the documents get you. So I share Dr. Kirchner=s somewhat

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awkward expression of perhaps the same thing I'm trying to express. As Mike said it when he opened, I'm looking for this bold confidence that shows that the reliability of the valve-regulated lead-acid batteries, their QA, the way they are configured ensures, particularly if you've had an accident, the operators can get a hold of this thing. And it's even more important because you might have 12 of these things operating simultaneously or somewhat simultaneously.

So I'm expressing my frustration that you've been very stalwart in defending not using General Design Criteria 17 and 18, which many of us have used for many years, but it's almost as if you didn't even acknowledge that that General Design Criteria is in existence and serves a purpose. And it isn't accounted for except in your GAP analysis. So that's the point I'd like to make.

MR. HOUGH: If I may, we labored a lot over GDC 17 and 18. There's no question about it. You know, the idea that you can have a plant that doesn't need that umbilical cord, doesn't need electricity, doesn't have to have this single thing or, you know, give one, give two, or two different

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sources coming in, things like that. You know, how do you do that? How do you get to that point? And it=s, fundamentally, I can achieve all those functions without power; and, therefore, it doesn=t need to be 1E power.

Now, from that point on, we=re absolutely with you. Those people in the control room, they have to know what=s going on. I have to have a reliable power supply for the monitoring instrumentation that they=re looking at. I can=t let the control room go dark. That=s a given. You just can=t be there.

So, hopefully, I can get into that with you in the closed session and demonstrate how we achieve that. So it=s like we=re on the same page there.

MEMBER SKILLMAN: Thank you.

CHAIRMAN CORRADINI: Okay. We=ll have the staff come up for a presentation. I don=t know if you guys want to stay or go or whatever. They=re not allowed to sit together and consorting with the others.

MR. TABATABAI: Good morning. Thank you very much, Dr. Corradini and ACRS members. I=m Omid Tabatabai, Senior Project Manager with the Office of

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New Reactors. I'm the lead project manager for this topical report. And as you mentioned during your opening remarks, we will be having two separate presentations, one open, which I'll be making, an overall overview of the project and where we are and staff findings. And later on, we will go into the detailed technical discussions of the staff review.

Just as a background, I'll go through the time line of review. NuScale presented this topical report to the staff in October 2015. We held some phone calls and meetings to better understand the content of the topical report. We issued some RAIs in October of 2016. NuScale responded, and we basically developed our SER based on Revision 0 of the topical report.

Following responding to those RAIs, NuScale incorporated those RAI information, additional information that they have presented in the topical report and they submitted Revision 1. And we plan to brief the ACRS full committee in June of this year, and, hopefully, we'll issue the final SER by July of 2017.

I just wanted to recognize many staff who worked on this topical report, reviewed it, and this,

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as you mentioned, this is a very unique topical report and it involves many systems, structures, and components. And that=s why we have seven different technical branches involved in this review. You will hear from them later during their presentation. We had review from the Reactor Systems Branch, from Instrumentation and Control, Containment and Ventilation, Plant Systems PRA, Electrical Engineering, and Radiation Protection and Accident Consequence Branch.

The scope of the staff=s review, per request from the NuScale, we reviewed the topical report for any passive design. We did not review this topical specifically for NuScale design, but, rather, we reviewed for any passive design who basically met those conditions that NuScale had listed in its topical report.

CHAIRMAN CORRADINI: So let me pursue that. So if that=s how you guys did it, is this a policy issue or is this a technical issue? Because if that was kind of the swing the staff was looking at it, this has much more generic applicability. So can you help me?

MR. TABATABAI: Sure. We actually went

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through that question, and we discussed among the staff when we were talking about GDC 17 GAP analysis that you mentioned earlier, and, at that point, being September of 2015, we reached a conclusion that this is not a policy issue. It is a technical issue that can be addressed at staff level. So that=s why we reviewed it as we did. We did not raise it as a policy. We didn=t write a safety paper for it, or we didn=t ask any input from the Commission.

So, Dr. Corradini, I=m not sure if I answered your question but --

CHAIRMAN CORRADINI: You kind of told me how you guys got to where you are. The only reason I=m asking the question is, coming into this, so this is just my background, so members may probably have seen it differently, my background, I was thinking this is strictly NuScale specific. And so, as you noted, when you read the topical, it seems generic. So you guys considered on a generic basis --

MR. TABATABAI: That=s right.

CHAIRMAN CORRADINI: Okay. And you felt that this was not a policy, this was technical matter.

MR. TABATABAI: Right. We --

CHAIRMAN CORRADINI: So then let me ask a

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different question. So if and when we get to a full committee meeting, when you present it after you've looked at Rev 1 and we have a final draft SER that's possibly different, this, if approved, is for passive, I'll just use it for passive plants.

MR. TABATABAI: Right.

CHAIRMAN CORRADINI: Okay. So if APR1000 or APRXXX came back -- or not APR. Sorry. AP1000 or AP200, if a small modular AP appeared on the books, they could apply to this also?

MR. TABATABAI: That's correct.

CHAIRMAN CORRADINI: Okay. So I'm off-base, but maybe when we go into closed session, I'm not sure where it fits, how appropriate it is. So why isn't AP1000 allowed to approach this? What's different about that plant that makes it different than this one?

MR. TABATABAI: Everything goes back --

CHAIRMAN CORRADINI: Open session-wise.

MR. TABATABAI: Yes. Everything goes back to those conditions of applicability. That's all. I mean, if any plant can meet those conditions --

CHAIRMAN CORRADINI: Okay.

MR. TABATABAI: -- of applicability, they

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can reference this topical report.

CHAIRMAN CORRADINI: Okay.

MR. TABATABAI: As long as they meet them.

CHAIRMAN CORRADINI: Right, I got it.

MR. TABATABAI: Okay. That=s a good --

MEMBER KIRCHNER: The conditions of applicability is then your definition of a passive plant?

MR. TABATABAI: Not necessarily. Any plant who can demonstrate that they comply with those conditions of applicability. For instance, if you don=t rely on power to manipulate some safety equipment, then, yes, as long as you meet all of those conditions, not one or . . .

MEMBER BROWN: But the trick of that is there was also this augmented stuff that came at the second table, which was -- oh, I=m sorry. I=m referring to it generically. I=m not going to say anything specific. But it was huge.

MR. TABATABAI: Right. And I can answer that generically here that I think one of the questions that was raised during NuScale=s presentation was that are you telling me that this plant does not require power to run, basically, and

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the answer is, of course, no. It's not that the system that NuScale is presenting is not Class 1E, it's not nothing, no power. It's something in between. We'll get to the detail of that later.

MEMBER BROWN: Most assuredly.

MR. TABATABAI: Okay. Second bullet on this slide. As I mentioned, we focused our review on the conditions of applicability. And Table 3-2 that Mr. Brown alluded to here, as I mentioned, we reviewed this topical report when Revision 0 had been submitted to the staff. And based on that, we reviewed and wrote our SER. Because all of the information in those tables that I'm referring to are proprietary in nature, we will discuss them later.

Staff review approach. Again, we looked at what was in those tables. We looked at the General Design Criteria, Codes of Federal Regulations, and other guidance documents that were relevant to this topic, and, basically, we reviewed them or evaluated those items on those tables against those criteria. Specifically, we identified about 20 General Design Criteria that were applicable to this design, to this topical report but not Code of Federal Regulation and other guidance documents.

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We are also following the Advanced Reactor Program=s work on developing design criteria for advanced reactors, and we are considering any implications that that work might have on this SER. And I think one of the ACRS members mentioned Draft Guide 1330 that=s being worked at the moment.

The staff approach to review this topical report was that if safety-related systems in a nuclear power plant do not rely on electric power to perform their safety function, then there is no need, there is no regulatory requirements to have a Class 1E power. That was one of the philosophies that the staff -- oh, sorry.

Okay. As I mentioned, we issued six requests for additional information, I think about eight questions. Four of those requests for additional information were related to design maintenance and QA provisions, batteries, VRLA batteries. And two of those questions were related to reactor safety, specifically to not having Class 1E power would not lead to an event escalation or how we could maintain safe shutdown state. We=ll get into the details of those questions later in the, during the closed session. And the staff has identified,

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basically, additional conditions to those that are already in Table 3-1 that would have to be met by applicants who wish to reference this topical report.

Staff conclusion. NuScale topical report is acceptable. However, the staff has identified additional conditions, I think about six additional conditions that applicants who want to reference this topical report have to address before they are approved to use this topical report.

We identified two confirmatory items in the SER, and, in the Revision 1 that NuScale submitted in February of this year, they have already incorporated that information, and those confirmatory items will be closed when we finalize the SER.

That concludes my presentation for the open session of this --

MEMBER SKILLMAN: Omid, let me ask this: the comments that the staff has made on the topical report point to additional issues pertaining to the valve-regulated lead-acid batteries. Supposing another applicant comes in and has different batteries, then what will be the applicability of this topical report after NuScale has resolved the VRLA comments that the staff has made? Because most

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plants, at least the ones I=ve been to, use just regular vented lead-acid batteries. So in theory, another vendor could come in with, as I said a couple of weeks ago, a big box of batteries and satisfy this very same criteria.

MR. TABATABAI: You=re talking about Energizer Bunny, for instance.

MEMBER SKILLMAN: A million of them lined up in exact perfect rows.

MR. TABATABAI: And the way that we actually reviewed that, we asked exactly the same question, and we referenced applicable IEEE standards that if a passive design wants to use or reference this topical report, they must meet these standards, industry-wide practices for maintaining and ensuring that the batteries that are going to be used in these passive plants can meet these criteria.

So if NuScale decides to use a specific battery, as long as they meet those standards, then it=s okay. If any other plant comes in with a different kind of battery and they also meet those standards, they are okay, as well.

MEMBER SKILLMAN: Okay. So your RAI and the conditions that you put on this approval, if you

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will, are not dependent specifically upon this exact battery?

MEMBER STETKAR: I'm sorry. It is. Condition 4.2, confirm that the VR -- this is open. The conditions are open.

MEMBER SKILLMAN: That's why I'm asking the question.

MEMBER STETKAR: Confirm that the VRLA batteries, VRLA batteries, VRLA batteries, VRLA batteries. Mentioned specifically four times in that condition. It doesn't say the batteries. That's generic batteries.

MR. TABATABAI: But we know for the NuScale design --

MEMBER STETKAR: It doesn't make any difference because I'm submitting John's plant. I'm coming in with my battery. It's not a VRLA battery. It's my battery, John's battery. I don't have a VRLA battery, I don't have to conform with Condition 4.2. This is not a NuScale topical report, despite the fact that they have their words all over it.

So how do I apply now to this? I check off the box, I don't have these. I don't have to comply with this.

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MR. TABATABAI: Okay. NuScale in this specific --

MEMBER STETKAR: I don=t say NuScale. Do not use the word NuScale. This is a topical report for anybody.

MR. TABATABAI: That=s correct.

CHAIRMAN CORRADINI: John . . .

MEMBER STETKAR: No, I=m serious.

CHAIRMAN CORRADINI: I know you=re serious.

MEMBER STETKAR: They keep going down, if I look at the NuScale, NuScale, NuScale stuff, I=m looking at it for John=s nuclear power plant, which is what --

CHAIRMAN CORRADINI: Well, let=s use ACME just as, ACME --

MEMBER STETKAR: So how does the ACME comply with that 4.2 in the staff=s opinion? Because I=ve got ACME batteries.

MR. TABATABAI: Right. In that case, if you submitted a design certification application at the same time and you make that case for yourself that you meet those conditions and standards, then you=re okay.

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MEMBER STETKAR: I meet this one because I don't have this battery that you're requiring me to meet.

MR. TABATABAI: Maybe we can discuss during the closed session.

MEMBER STETKAR: No, this is open session. I want the staff on record to say how does that 4.2 apply generically to any plant that may come in that's so-called passive.

CHAIRMAN CORRADINI: Omid has a helper.

MR. LUBINSKI: John Lubinski, the Division of Engineering, NRR. As you say, this is a topical report, so it's one piece of what would be reviewed during a design certification and, subsequently, during a licensing action. The basis for the topical report would be the use of these types of batteries. So if they were using these types of batteries, they would have to meet this condition. If they were not using these types of batteries and using another type of battery, that would be outside the scope of this topical report, and we would need to look at that as part of the design certification as basically being a variation or a deviation, if you will, from the topical report.

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MEMBER STETKAR: I don=t remember whether the topical report, and I have to be careful, I don=t honestly know what=s, remember what=s proprietary and what=s not. I know that the conditions are not proprietary in the SER.

So my concern is that this seems to be focused on a particular technology and, if I come in with my ACME plant now and I do not have that particular technology, I can argue that I meet the conditions of the topical report, I satisfy the SER, because I simply don=t have that named battery. I=ve got ACME batteries.

CHAIRMAN CORRADINI: Can I just, before --

MEMBER STETKAR: So why isn=t, my point is why isn=t the SER written generically saying whatever batteries I use have to meet these conditions? They got to have reliability, they got to be housed in a seismic Category 1 structure, they got to be -- why does it have to be VRLA batteries from the staff=s regulatory perspective of accepting a topical report for a generic application?

MEMBER BLEY: And given the staff=s statements here that you are intending this to be generically applicable, it seems that that=s an

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excessive specificity in that one limiting condition.

CHAIRMAN CORRADINI: So can I pile on? I guess my thought was when John said all this, I thought you guys were going to say, well, if they don't meet the condition of probability, then this is not applicable; therefore, they've got to re-qualify in a different manner. That's what I heard you answer.

So is that just a misunderstanding of how this is written? Because you assumed I went one direction, and I assumed we'd go another direction.

MEMBER STETKAR: See, the intent of this, if I take out that acronym, if I read it without the acronym, it says confirm that the batteries and their structures are seismic Category 1. Okay. To provide reasonable assurance that the batteries will perform as intended, the applicant or licensee that references the topical report shall provide a COL action item to support that the batteries and their structures are seismic Category 1. Okay. That seems repetitious, but whatever. A qualification testing plan includes environmental and seismic qualification and a technical functional requirement for batteries to show they can perform as needed. That sounds pretty

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generic.

MR. LUBINSKI: I'll keep my response general with respect to topical reports in general. When we look at a topical report, we look at what was provided on that design. In this case, these types of batteries were specified. So that's what we did our evaluation on, and we put the conditions based on that. If someone were to come in with a different type of battery, we would have to look at the battery itself beyond just those conditions. So simply removing the four-letter acronym in front of those may not be sufficient because we have to look at the batteries more generally with respect to what the scope of the topical report is.

CHAIRMAN CORRADINI: So then just to be clear, so I think I understand what you're saying, so that means there was something in the staff's analysis that made you feel that these are good enough but others may not be?

MR. LUBINSKI: Correct. And that doesn't mean that others may not be, but we have not done that evaluation yet, and so we can't make a generic statement.

MEMBER STETKAR: And just to get it on the

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record here in the open session, I was trying to do a word search here, but I'm not fast enough, is that particular acronym only in proprietary version of this topical report or is it in the general portion of this topical report? In other words, you know, you refer to a particular design. This topical report is written, in principle, generically. The conditions of applicability are written for a generic plant. They certainly don't use that acronym. I see that acronym, as I do a word search, I see it in a lot of double-bracketed proprietary stuff.

MR. GOEL: This is Vijay Goel from Electrical Branch.

CHAIRMAN CORRADINI: Can you get closer to the mike, please?

MR. GOEL: Yes, this is Vijay Goel from Electrical Branch. Where they describe the augmented design, those are proprietary things.

MEMBER STETKAR: That's correct. That's what I was just saying, though. The non-proprietary stuff, which is generically applicable, does not -- I did just finish my word search -- does not contain that acronym anywhere. So I'm not sure why the staff's generic SER for generic proprietary conditions

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of applicability now suddenly mentions those particular batteries. It's on the record. We don't need to deliberate.

CHAIRMAN CORRADINI: We've got the comment. Other things from the members?

MEMBER STETKAR: Oh, yes, I had one more on the conditions for applicability. As I read them, Condition 4.5 says demonstrate the systems necessary to retain reactor coolant within the reactor coolant pressure boundary are designed with sufficient reliability such that a challenge to the containment does not occur with a frequency of an AOO. And then there's an alternative that says an applicant or licensee referencing the topical report can demonstrate that a failure of the containment would not impede the ability to maintain decay heat removal and radioactive material containment for the long-term. Sorry for the long quote.

What is a challenge to the containment in the staff's view?

MR. DRZEWIECKI: I'll answer that. This is Tim Drzewiecki, Systems Branch. As far as that is going, what we're talking about there is basically having your containment there, have it retained as a

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defense-in-depth fission product barrier versus having to be a primary fission product barrier.

Now, this is really tied in to GDC 15, and it had to do with there was, in Table 3-1, we felt as though it will be complete. So as far as what that means, we've gotten comments back before as far as that not being very clear.

MEMBER STETKAR: I'm not asking a legal question, by the way. I'm trying to ask a technical question because, if I lift a primary safety relief valve and blow down into a pressurizer relief tank, I'll use jargon for currently-operating plants, is that a challenge to the containment?

MR. DRZEWIECKI: No --

MEMBER STETKAR: Okay. Why not?

MR. DRZEWIECKI: -- basis of it.

MEMBER STETKAR: What is a challenge to containment? Because I come in with my ACME plant and now I'm going to argue with you whether I have a challenge to containment because I don't know what that word means.

MR. DRZEWIECKI: Yes, I understand. So we could add, you know, a sort of query there, but what we're getting after here is there's a scenario that I

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can show you during the closed session which is kind of the impetus for this. And what it is is, for example, so if you look at --

MEMBER STETKAR: Don=t go too far into the proprietary stuff. I understand that. But in the open session, I wanted to challenge the specificity of this because I can see, as I come in, if I=m going to use this topical report and the conditions in the staff=s SER, I can see that phrase leading to a lot of discussions about what the heck is a challenge to their containment. How close do I need to get to the containment design pressure, for example, to be a challenge? How much energy do I have to put into the containment for it to be a, quote/unquote, challenge?

MR. DRZEWIECKI: What this is getting at, the purpose of this is to retain it as a defense-in-depth barrier. So if you want to add, you know, some more clarity, we=ve gotten some of that feedback, and so that language will be tweaked.

MEMBER STETKAR: Okay. By the way, I probably couldn=t do feed and bleed cooling on a currently-operating plant because that would be a challenge to the containment.

MEMBER SKILLMAN: Mike, I=ve got one more,

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please. This one I think is delicate, so let me just lay it out there. In the safety evaluation that the NRC produced, the NRC defends the not safety grade instrumentation for monitoring after an accident. And let me read the text so I can put this in context.

The regulation in 10 CFR 50.34(f)(2)(xix) requires the monitoring instrumentation to be adequate for monitoring plant conditions following an accident that includes core damage. This was a TMI regulation, by the way. Because this regulation is a TMI-related requirement, staff reviews core damage in this regulation as a type experienced in TMI accident which is far beyond that which was allowed for the DBA. Well, yes, I would certainly agree with that. Losing half a core is beyond what you would anticipate.

Further, 10 CFR 50(f)(2)(xx) does not address the quality of electrical power supply. For these reasons, the staff does not review this regulation as a requirement for Class 1E electrical power supply.

Number one, I understand the words. I understand the admin behind the words. But those of us who were around when this legislation was proposed remember that the passion around this change was to

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make sure that operators could understand what happened when a major accident occurred. That was the passion beyond this and several other regulations.

Here=s my question: by accepting a non-Class 1E classification for post-accident instrumentation, are we dumbing down a regulation that was put in place for the very specific reason to enable the operators to understand that is occurring? Are we dumbing this down?

MR. TABATABAI: No, no, we are not doing that. I will let the Instrumentation and Control technical reviewers who wrote that part of the SER get into the details of it, but I can tell you that one of the issues that we consider was the type A, type B, type C variables that you might need to perform manual function or not, and that gets into the proprietary design of the NuScale. So we will talk about that during the closed session, if you don=t mind.

MEMBER SKILLMAN: I=ll wait. Thank you.

CHAIRMAN CORRADINI: Okay. The last one.
Go ahead.

MEMBER BROWN: I guess, and maybe you can address this in the closed session, because I guess one of the things that occurred to me, rightly or

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wrongly, is we've got these VRLA batteries, this is kind of the premise for this whole thing is we're going to go for three days and everybody can go to sleep, rest for a while, go back home and have a couple of beers, come back and say everything is okay, everything's just fine, nobody cares. Okay. And I'm being pejorative intentionally in a way.

But now you get back, the batteries are gone, you no longer have those, and, yet, whatever accident occurred damaged or impaired the non-Class 1E or non-augmented stuff that you need, that you'll subsequently need, and now the ability to bring in other power and hook it up is not able to be done. And so in every circumstance we've noted or had to deal with, electrical power has been critical to ensuring the long-term safety to the public of these plants, and that seems to me to be a linchpin that they're hanging on that, hey, everything will be fine after 72 hours, we'll roll in with our trucks, and there will be enough stuff that's still okay that we can just hook everything up and it will be just fine.

But you can't wait for 72 hours. You're going to have to do it before then. It just seems to me that there's certain levels of certain types of equipments,

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regardless of whether you can survive 72 hours or not, that should be robust enough to allow you to utilize it, apply power when you get back.

So that=s, I just wanted to make that observation.

CHAIRMAN CORRADINI: Okay. Well, I think we need to move on. I want to get to the public comments, and then we have to go, then we need to go into closed session, okay?

So if you can hold on. Would that be all right? Thank you.

Okay. As we open the phone lines for the external people on the phone for public comment, is anybody in the room that wants to make a public comment?

Hearing none, I hear crackling. So if anybody is on the line, can you please acknowledge that you=re there? Okay. Any comments from the members of the public?

MS. FIELDS: Yes, I have a comment.

CHAIRMAN CORRADINI: Okay. Could you please identify yourself and give us your comment, please?

MS. FIELDS: My name is Sarah Fields. I=m

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a member of the public in Moab, Utah. I am definitely not a technical person, but it appears there=s a lot of proprietary information and issues, and these are very significant for health and safety. And I wonder at what point some of this information will be available to the public.

CHAIRMAN CORRADINI: Ms. Fields, so --

MS. FIELDS: Or if there=s going to be so much stuff behind the fence, the public can=t get a handle on what=s going on.

CHAIRMAN CORRADINI: Okay. So let me just respond in a generic way. There is a policy in this regard, so I=ll turn to our Designated Federal Official.

MR. SNODDERLY: Ms. Fields, this is Mike Snodderly. I=ve received your email request concerning the Committee=s transcript on February 7th.

That was declared in our ADAMS system, and it should be up on the website either today or Monday. When it does, I will respond and let you know.

Also, if you listen to the opening statement, and in my email back to you I=ll include that information about how the Committee communicates with the public through our letters. For this

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particular item, we have tentatively scheduled, if the Committee decides to write a letter on this issue, that will be publicly available at our June meeting. And I'll give you that information when it's available for those meetings so that you can listen and participate. Thank you.

MS. FIELDS: Well, I mean, for the NRC, how is the NRC going to be making some of this information when there's a public review --

CHAIRMAN CORRADINI: We'll make sure that's part of our response by email back to you, per Mr. Snodderly, okay?

MS. FIELDS: Okay, thank you.

CHAIRMAN CORRADINI: All right. Other members of the public that have oral comments? Okay. Hearing none, if we could close the line, and I'm going to ask NRC and NuScale to surveil the room and make sure everybody is bonafide that can stay for the closed session. And then we'll ask NuScale Power to come back up.

(Whereupon, the foregoing matter went off the record at 9:25 a.m.)

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ACRS Presentation: Topical Report Overview

Open Session

TR-0815-16497

Safety Classification of Passive Nuclear Power Plant Electrical Systems

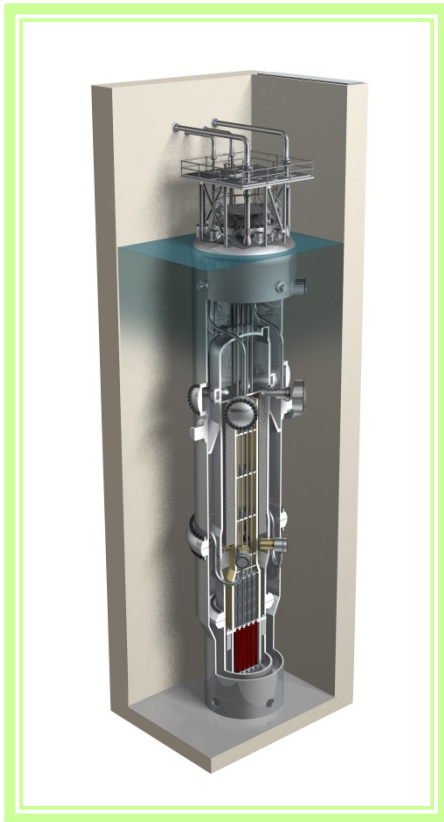
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March 24, 2017



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Abbreviations

- GDC – general design criteria
- IEEE – Institute of Electrical and Electronics Engineers
- RG – regulatory guide

Purpose

- To provide an overview of topical report, Safety Classification of Passive Nuclear Power Plant Electrical Systems (TR-0815-16497)
 - regulatory requirements
 - conditions of applicability

Topical Report

- Purpose

Request Nuclear Regulatory Commission (NRC) review and approval of what are termed as “conditions of applicability,” and the methodology and bases used in their development

- Scope

The conditions of applicability and augmented provisions for which NRC review and approval are sought via this topical report are specific to the safety classification of reactor plant electrical systems, as follows:

- off-site and on-site alternating current (AC) electrical power systems
- on-site direct current (DC) electrical power systems

- Not in scope

- instrumentation and control (I&C) equipment and circuits

Regulatory Requirements

- The existing regulatory requirements
 - GDCs—many apply since this concept involves the entire plant design (not just electrical)
 - IEEE Std. 603, IEEE Std. 308 (IEEE Std. 946), RG 1.32, RG 1.81, IEEE Std. 497, RG 1.97
- The plant design must support the concept of no electrical energy to accomplish any safety-related functions
- The plant safety analysis must support the safety classification
- The plant design must support and confirm those functions that use electrical energy to accomplish required functions

Definition of Class 1E

- Regulatory definition of Class 1E
 - *Class 1E*

*The safety classification of the electric equipment and systems that are essential to emergency reactor shutdown, containment isolation, reactor core cooling, and containment and reactor heat removal or that are otherwise essential in preventing significant release of radioactive material to the environment.**

**Class 1E is a functional term. Equipment and systems are to be classified Class 1E only if they fulfill the functions listed in the definition. Identification of systems or equipment as Class 1E based on anything other than their function is an improper use of the term and should be avoided.*

--IEEE Std. 308-2001, as endorsed by RG 1.32, Revision 3

Definition of Safety Function

- Regulatory definition of Safety Function

- *Safety function*

*One of the processes or conditions (e.g., emergency negative reactivity insertion, post-accident heat removal, emergency core cooling, post-accident radioactivity removal, containment isolation) essential to maintain plant parameters within acceptable limits established for a design basis event. ***

***A safety function is achieved by the completion of all required protective actions by the reactor trip system and the engineered safety features, or both, concurrent with the completion of all required protective actions by the auxiliary supporting features.*

--IEEE Std. 308-2001, as endorsed by RG 1.32, Revision 3

Topical Report Summary

- This topical report
 - presents a structured review of the regulatory requirements associated with classification of electrical systems in a nuclear power plant.
 - presents a structured methodology that may be used to determine that Class 1E power is not required.
 - furthers the design of nuclear power plants in a manner that enhances nuclear safety and utilizes lessons learned from the Fukushima event.
- The conditions of applicability are deemed proprietary and will be discussed in further detail in the closed session.



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Presentation to the ACRS Subcommittee

**Staff Review of NuScale Topical Report on
“Safety Classification of Passive Nuclear Power
Plant Electrical Systems”**

Presenter: Omid Tabatabai
Sr. Project Manager, Office of New Reactors

March 24, 2017
(Open Session)

Staff Review Timeline

- NuScale submitted its topical report (TR) in Oct. 2015
- Staff issued request for additional information (RAIs) in Oct. 2016
- NuScale responded to RAIs in Dec. 2016
- NuScale submitted Rev. 1 to the TR in Feb. 2017
- Staff issued its safety evaluation report (SER) in Feb. 2017
- Staff plans to brief advisory committee on reactor safeguards (ACRS) full committee in Jun. 2017
- Staff plans to issue its final SER in Jul. 2017
- Staff plans to publish the “-A” (approved) version of the TR in Sep. 2017

NRC Technical Review Areas/Contributors

- **Reactor Systems:** Tim Drzewiecki, Jeff Schmidt, John Budzynski
- **Instrumentation and Control:** Luis Betancourt, Joe Ashcraft, Dinesh Taneja
- **Containment and Ventilation:** Clint Ashley, Nan Chien, Ann-Marie Grady
- **Plant Systems:** Raul Hernandez
- **Probabilistic Risk Assessment:** Mark Caruso
- **Electrical Engineering:** Bob Fitzpatrick, Sheila Ray, Swagata Som, Fanta Sacko, Vijay Goel
- **Radiation Protection/Accident Consequence:** Michelle Hart, Ron LaVera

Scope of the Staff Review

- Per NuScale request, staff reviewed the TR for “any” passive design - not just for NuScale SMR design
- Staff focused its review on the “conditions of applicability”, as listed in the TR, Table 3-1, and the augmented design, qualification and QA in Table 3-2
- Staff prepared its SER based on the information in the TR, Revision 0
- Information in the TR is mostly proprietary, thus detailed technical discussions deferred to the closed session

Staff Review Approach

- Staff evaluated conditions of applicability against applicable regulations
 - Staff is following Non-LWR Guidance Development as described in DG-1330 and will consider any potential impacts.
- Absent Class 1E ac/dc power system, staff focused on reliability of the onsite dc system; instrumentations for postaccident monitoring; reactor coolant system (RCS) integrity; containment integrity; and spent fuel pool monitoring

Request for Additional Information

- Staff issued six RAIs
 - 4 questions related to reliability, design/maintenance of the batteries, and the QA provisions relative to RG1.155, “Station Blackout”
 - 2 questions related to reactor safety (event non/escalation, maintaining safe shutdown state) absent a Class 1E ac/dc power system
- Staff found NuScale RAI responses acceptable
- Staff requested NuScale to incorporate its RAI responses in the TR (Rev 1.)

Staff SER Conclusions

- NuScale TR is acceptable -- with limitations and additional conditions
- Staff identified 2 confirmatory items (CI) in the SER
 - Note: The Rev 1 to the TR, which was submitted in Feb. 2017, has addressed the two CIs. Staff will update the SER accordingly.

**Questions/comments from members
of the public before the closed
session starts?**