UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, DC 20555 - 0001

May 29, 2015

MEMORANDUM TO: ACRS Members

FROM: Peter Wen, Senior Staff Engineer **/RA/**
Technical Support Branch
Advisory Committee on Reactor Safeguards

SUBJECT: CERTIFIED MINUTES OF THE ACRS REGULATOTRY POLICIES AND PRACTICES SUBCOMMITTEE ON MARCH 4, 2015

The minutes of the subject meeting were certified on May 6, 12015, as the official record of the proceedings of that meeting. Copies of the certification letter and minutes are attached.

Attachments: As stated

cc: E. Hackett
M. Banks

UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, DC 20555 - 0001

MEMORANDUM TO: Peter Wen, Senior Staff Engineer
Technical Support Branch
Advisory Committee on Reactor Safeguards

FROM: Harold Ray, Chairman
Regulatory Policies and Practices Subcommittee
Advisory Committee on Reactor Safeguards

SUBJECT: CERTIFICATION OF THE MINUTES OF THE ACRS REGULATORY POLICIES AND PRACTICES SUBCOMMITTEE MEETING ON MARCH 4, 2015

I hereby certify, to the best of my knowledge and belief, that the minutes of the subject meeting are an accurate record of the proceedings for that meeting.

/RA/ **May 6, 2015**

Harold Ray, Chairman
Regulatory Policies and
Practices Subcommittee

Date

Certified on: May 6, 2015
Certified by: Harold Ray

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
MINUTES OF THE REGULATORY POLICY AND PRACTICES SUBCOMMITTEE MEETING
MARCH 4, 2015

The ACRS Regulatory Policy and Practices Subcommittee held a meeting on March 4, 2015 in Room T-2B1, 11545 Rockville Pike, Rockville, Maryland. The meeting convened at 8:32 am and adjourned at 11:29 am.

The entire meeting was open to the public. No written comments or requests for time to make oral statements were received from members of the public related to this meeting.

ATTENDEES

ACRS Members

Harold Ray, Chairman
Peter Riccardella, Member
Michael Corradini, Member
Steve Schultz, Member
Dick Skillman, Member
Dana Powers, Member
Dennis Bley, Member
John Stetkar, Member
Michael Ryan, Member
Ron Ballinger, Member
Charles Brown Jr., Member

Peter Wen, ACRS staff – Designated Federal Official

NRC Staff

Kathryn Brock
Bruce Lin
Ryan Nolan
Greg Casto
Andrew Prinaris
Ata Istar
Jerry Purciarello
Michael Mazaika
Chang-Yang Li
J. Burke
Angelo Stubbs

SUMMARY

The purpose of this meeting was for the Regulatory Policy and Practices Subcommittee to review the proposed Regulatory Guide 1.27, “Ultimate Heat Sink for Nuclear Power Plants,” Rev.3. The Subcommittee heard presentations by, and held discussions with representatives of the U.S. Nuclear Regulatory Commission (NRC or the staff). The meeting transcript is attached and contains an accurate description of each matter discussed during the meeting. The presentation slides and handouts used during the meeting are attached to the transcript.

The following table lists the significant issues that were discussed during the meeting with the corresponding pages in the transcript.

Significant Issues Discussed	Reference Pages in Transcript
Subcommittee Chairman Ray opened the meeting by noting the purpose of the meeting.	4
NRC staff's opening remarks: Kathryn Brock provided a short summary as why this RG needs to be updated.	6
The Staff's Presentation Issues discussed: ✓ Overview of RG 1.27 ✓ Reason for Revision ✓ Summary of Revisions ✓ Technical Revision ✓ Public Comments & NRC Responses ✓ Conclusions Members of Subcommittee brought up the following issues during the staff's presentation:	
• Guidance for passive plants In the "Purpose" Section of the proposed RG, the staff wrote: *"The guidance provided in this RG does not apply to passive plants that utilize a passive containment cooling system (PCCS) as their UHS."* Members asked about: - Whether the passive plants should be included in this RG? (Stetkar and Corradini) - Due to different regulatory cooldown requirements for the passive plants, while some members felt that these differences could be accommodated within a RG applicable to both passive and active designs, others felt that clarity of application requires a narrower scope. The current RG is appropriate to just address the active design plants. (Powers and Ray) - Whether the title of this RG ought to be changed to reflect that this RG is for "Non-Passive Plants" only? (Skillman) - If the staff is going to write one that does apply to reactors that use the PCCS as the UHS, how is the staff addressing UHS review guidance for passive plants? (Ray)	13-21, 33-37, and 121-122
• Definition of "ultimate heat sink" (UHS) The staff's presentation slide# 3 describes the UHS and its three principal safety functions. The term of UHS is not defined in the current Part 50 regulations. Member Skillman inquired about whether it is appropriate to create a definition of "UHS" for this RG application.	23-26

• Consideration for multi-unit accident In the staff's Regulatory Position 1.a., the staff wrote: *"The UHS should be capable of providing sufficient cooling for at least 30 days to: (1)…., and (2) in the event of an accident in one unit, to limit the effects of that accident safely, to permit simultaneous and safe shutdown and cooldown of any remaining units, and to maintain them in a safe-shutdown condition…"* Member Stetkar asked about whether consideration should be extended to multi-unit accident, in light of the lessons learned from Fukushima, where there were more than one unit involved in the accident. The staff replied that this RG is limited to design basis conditions, and they have classified Fukushima accident as a beyond-design basis event. If the plants are designed properly, then an external event, for example, earthquake, should not cause a design basis accident such as, loss of coolant accident (LOCA). The LOCA is a non-mechanistic, with no particular cause, and it happens because of some unknown reason. Following this logical, from a probability standpoint, the external event could cause a multi-unit loss-of-offsite power, but not simultaneous multi-unit LOCA. The staff indicated that a guidance is being developed separately by the JLD staff to address simultaneous multi-unit accident conditions, due to a beyond-design-basis external event.	55-59
• What is considered reasonable with respect to site hazards design? In the staff's Regulatory Position 2.a.(3), the staff wrote: *"The UHS complex, whether supplied by single or multiple water sources, should be capable of withstanding, without loss of the UHS safety functions in the event of reasonably probable combinations of less severe natural phenomena or site-related events."* There are also several other places in the guidance, the background especially, that use terms like "reasonably expected performance" and "reasonably expected to occur." Members questioned the terminology of "reasonably probable" and "reasonably expected." Members also discussed the feasibility of updating this RG from using the deterministic terminology to probabilistic terminology. (Stetkar, Ray, Schultz, Bley, and Brown) The staff indicated that it would consult with the PRA staff to consider alternatives.	82-93

• Consideration to security-related issues In the discussion of the staff's Regulatory Position 2, "Natural Phenomena and Site Hazards Design for the Ultimate Heat Sink," Member Skillman questioned about whether consideration to "security" should be included in the attributes.	94-96

The following are specific comments provided by individual member during the meeting:	
(1) Regarding water-controlling structures not under the jurisdiction of the licensee, the term "prudent" was used to refer to other programs. Members asked why the word "prudent" was chosen. (Ray, Schultz, and Ballinger). The staff replied that they will go back to their hydrology experts to look for words to describe more specifically for the application regarding structures that are not under the jurisdiction of the licensee.	44-48
(2) The third sentence in the staff's Regulatory Position 2. c, says " The maximum accumulated degree-days below freezing recorded in the site region during the winter (or during the worst-case freezing spell in warmer climates) may be a reasonably conservative site characteristic for evaluating this potential." Chairman Ray commented the highlighted wording to be too ambiguous.	61-63
(3) Regarding the staff's Regulatory Position 1. h, Members commented on the code case (N-755-1) used for the high density polyethylene (HDPE) piping: - Why the RG is written in such a negative way? (Stetkar) - The issue is fire-resistant versus non-fire-resistant. The staff could address that in a more general method and avoid getting into the ASME code case. (Riccardella) - The phrase about the code case for HDPE piping may be appropriate. (Powers)	65-69 also 126-127
(4) Regarding the staff's Regulatory Position 1. i, a term of "30-day recovery period" was used. Members commented on the use of this term: -The term of "recovery" has a unique meaning if used in site area emergency or general emergency. (Skillman) -The same term was also used in the staff's Regulatory Position 1. k but with different term (i.e., 30-day period). (Stetkar)	71-72
(5) The second sentence in the staff's Regulatory Position 1. j, says "If the active UHS mechanical component does not automatically start, operator actions are required to support its intended safety function." Members commented on the ambiguity of this statement. (Stetkar, Bley, Brown, Skillman, and Ray)	73-78

(6) The staff's Regulatory Position 1. k lists very specific losses that need be account for. Members commented about whether there are other potential losses not included in the statement. (Bley and Schultz)	78-79
(7) Three specific natural phenomena - SSE, tornadoes, and the probable maximum flood were mentioned in the staff's Regulatory Position 2.b. Member Stetkar commented similarly to Item (6) above that some natural phenomena might inadvertently omit in the list.	98
(8) ASME OM-2012 was referenced in the staff's Regulatory Position 5. c, regarding performance testing of the UHS heat exchangers. Members commented on referencing specific version of ASME standard, which after some time may become inappropriate. (Ballinger, Riccardella, Bley, and Stetkar)	101-103
(9) This proposed RG uses "decay heat" and "residual heat" synonymously. Member Skillman pointed out that when perform shutdown safety analysis, there are differences between these two terms.	122-124

Chairman Ray adjourned the meeting at 11:29 a.m.	

FOLLOW-UP ITEMS	
Issue	**Reference Pages on Transcript**
No follow-up item. All views expressed during the Subcommittee meeting were just by the individual member of the Subcommittee, and do not represent the Full Committee opinions.	

BACKGROUND MATERIALS PROVIDED TO THE SUBCOMMITTEE

1. Transmittal memorandum forwarding draft RG1.127, Rev. 3 to the ACRS
2. Clean copy of RG 1.27, Rev. 3, "Ultimate Heat Sink for Nuclear Power Plants"
3. Regulatory Analysis
4. Redline-strikeout comparison between Revision 2 and the Proposed Revision 3 of RG 1.27
5. Staff's Responses to Public Comment on DG-1275. (An earlier version of the Proposed Revision 3 of RG 1.27 was issued for public comment as DG-1275 in September 2013.)

Official Transcript of Proceedings

NUCLEAR REGULATORY COMMISSION

Title: Advisory Committee on Reactor Safeguards
Regulatory Policy and Practices Subcommittee

Docket Number: (n/a)

Location: Rockville, Maryland

Date: Wednesday, March 4, 2015

Work Order No.: NRC-1424 Pages 1-157

NEAL R. GROSS AND CO., INC.
Court Reporters and Transcribers
1323 Rhode Island Avenue, N.W.
Washington, D.C. 20005
(202) 234-4433

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

+ + + + +

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

+ + + + +

REGULATORY POLICY AND PRACTICES SUBCOMMITTEE

+ + + + +

WEDNESDAY

MARCH 4, 2015

+ + + + +

ROCKVILLE, MARYLAND

+ + + + +

The Subcommittee met at the Nuclear Regulatory Commission, Two White Flint North, Room T2B1, 11545 Rockville Pike, at 8:32 a.m., Harold B. Ray, Chairman, presiding.

COMMITTEE MEMBERS:

HAROLD B. RAY, Chairman

RONALD G. BALLINGER, Member

DENNIS C. BLEY, Member

CHARLES H. BROWN, JR. Member

MICHAEL L. CORRADINI, Member

DANA A. POWERS, Member

PETER RICCARDELLA, Member

COMMITTEE MEMBERS: (cont.)

MICHAEL T. RYAN, Member

STEPHEN P. SCHULTZ, Member

GORDON R. SKILLMAN, Member

JOHN W. STETKAR, Member

DESIGNATED FEDERAL OFFICIAL:

PETER WEN

C O N T E N T S

P R O C E E D I N G S

8:32 a.m.

CHAIRMAN RAY: The meeting will now come to order.

This is a meeting of the Advisory Committee on Reactor Safeguards, Regulatory Policy and Practices Subcommittee.

I am Harold Ray, Chairman of the Subcommittee. ACRS members in attendance are Steve Schultz, Dick Skillman, Dennis Bley, Dana Powers, John Stetkar, Charles Brown, Mike Ryan, Ron Ballinger, and Michael Corradini.

Peter Wen of the ACRS staff is the Designated Federal Official for this meeting.

The purpose of the meeting is to review the proposed Regulatory Guide 1.27, Ultimate Heat Sink for Nuclear Power Plants, Revision 3.

We will hear presentations from the NRC staff. The Subcommittee will gather information, analyze relevant issues and facts, and formulate a proposed position and action as appropriate for deliberation by the Full Committee.

We requested this meeting in recognition of the fundamental and critical role of the ultimate heat sink in providing reasonable assurance of adequate

protection, and the fact that the current Revision 2 is dated January, 1976, almost 40 years ago when it was issued.

We would expect that the experience of four decades might include some important lessons learned regarding the critical role of the ultimate heat sink.

It's important to recognize that the Regulatory Guide applies to design-basis requirements and not to beyond-design-basis requirements, since these are often being discussed here.

A draft Regulatory Guide was issued for public comment, and the resolution of those comments will be part of our review today. The resolution included some interesting regulatory process issues that we'll ask questions about, I am sure.

There is no requirement or current expectation that a presentation will be made to the Full Committee or that the Committee will comment on the Regulatory Guide revision. We will caucus at the end of the half-day meeting as to whether there are any issues which should be presented to the Full Committee.

The rules for participating in today's meeting have been announced as part of the notice of this meeting, previously published in the Federal Register, and the detailed procedures for the conduct and

participation in these meetings were published also in the Federal Register, on November 8, 2013.

The meeting is open to the public, and we have a bridge line open. We have received no written comments or requests for time to make oral statements from members of the public regarding today's meeting.

The 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 meeting room when addressing the Subcommittee. Participants should first identify themselves and speak with sufficient clarity and volume so that they can be readily heard.

We will now participate -- I should say the bridge line will be kept in the listen only mode and opened at the end of the meeting for any comments.

We will now proceed with the meeting, and I call open Ms. Kathryn Brock, Deputy Director of the Research Staff to begin.

MS. BROCK: Hi, thank you very much for having us today.

As you mentioned, this Reg Guide is a long time coming, and it is part of the effort to do an update to all the reg guides that have needed revision over the

years, and I think you'll find that the staff has done a great job over the last few years to bring in those lessons learned on the heat sink into this document.

Thank you very much.

CHAIRMAN RAY: Okay. Turning it over to staff to commence presentation.

MR. LIN: Good morning. I am Bruce Lin, I work at the Office of Research, Division of Engineering.

With me up here is Jerry Purciarello with NRR's Division of Safety Systems.

As Chairman Ray mentioned, this is a pretty old Reg Guide. It was last revised in 1976, so we started to revise this Reg Guide a few years back with staff from NRR, NRO, and Research, and we finished the draft about two years ago, and we subsequently issued it for public comments.

So we are here today just to brief the Subcommittee on the changes that were made to the Reg Guide and our response to the comments.

This is an overview of what we're going to cover today. I'll briefly go over some background and an overview of Reg Guide 1.27 and reasons for the revision and a brief summary of the revisions that were made, and then I'll turn it over to Jerry, who is going to talk about some of the detailed changes that were made

to the Regulatory Guidance, and we're going to discuss the public comments and our response to the comments.

So what is an ultimate heat sink? Well, an ultimate heat sink is the system of structures and components and associated water supply that is credited for functioning as a heat sink to remove the reactor decay heat and essential station heat loads after a normal reactor shutdown or shutdown following a DBA, or design basis accident.

So this includes the necessary water retaining structures and the associated pipings that connect the water source to the essential water intake.

So essentially, the ultimate heat sink performs three principal safety functions: dissipation of the residual heat after reactor shutdown; dissipation of the residual heat after a design-basis incident, such as a loss of cooling incident; and then it also removes the maximum expected decay heat from the spent fuel pool. This is something we added in the current revisions, and I think Jerry is going to talk about it later.

And Reg Guide 1.27 basically describes the methods and procedures that are acceptable to the NRC staff to satisfy the regulations that are applicable to the ultimate heat sinks. This guide applies to active

plants that use water as ultimate heat sinks.

Passive plants have very different design bases for ultimate heat sinks. They -- for example, they -- the passive containment cooling basically serves as the ultimate heat sinks for the passive plants, and a lot of the guidance and requirements in this Reg Guide will not apply to the passive plants.

MEMBER CORRADINI: Yes, and that is now stated?

MR. LIN: It's stated in the Reg Guide that this Reg Guide applies to active plants.

And when we were revising this Reg Guide, NRO was in the process also of updating their guidance for the small modular reactors that would have some guidance on the heat sink requirements for passive plants.

MEMBER CORRADINI: Just one technical question: so in current active plants, if I have a free-standing steel containment, there is no credit given to any sort of heat loss through that?

(No audible response.)

MEMBER CORRADINI: Okay. You said no, right, that's what you said?

MR. PURCIARELLO: Well, I mean, if the licensee made the case for heat loss through the

containment, I mean he could make that case.

MEMBER CORRADINI: Okay, but in the guidance, there is -- the expectation is there -- you assume not.

MR. PURCIARELLO: We have not assumed not, nor for, neither nor. It's just that the licensee would have to make the -- when he does his accident analysis and describes how heat is removed, if he would include the heat lost through containment, then I think his staff would look at that and consider that, but it's not -- I have not seen that personally in any analysis that I looked at.

CHAIRMAN RAY: It is not prohibited by the Reg Guide, it's simply not addressed.

MEMBER CORRADINI: Okay.

CHAIRMAN RAY: And there is no --

MEMBER CORRADINI: So the Reg Guide is silent about it.

MR. LIN: Yes.

MEMBER CORRADINI: Okay.

CHAIRMAN RAY: But the Reg Guide does say in a positive way what was said earlier, that is, that for passive plants a passive containment cooling system may be used as the ultimate heat sink. The guidance provided in this Reg Guide does not apply to passive

plants.

MEMBER CORRADINI: Thank you.

MEMBER STETKAR: Bruce, you mentioned that the NRO is developing, you used the term guidance, for the SMRs. Are they -- are they developing, like this Reg Guide, a general reg guide for --

MR. LIN: No, I --

MEMBER STETKAR: Well how -- okay.

MR. LIN: They basically --

MEMBER STETKAR: Then tell me what they're doing.

MR. LIN: -- updated the Standard Review Plan Section 9.2.5, specific for the mPowers that have the guidance, the requirement for --

MEMBER STETKAR: But that's a design-centered or a plant-specific review --

MR. LIN: Right.

MEMBER STETKAR: -- guidance.

MR. LIN: Right.

MEMBER STETKAR: So how -- how is the staff addressing general review guidance for passive ultimate heat sinks like an ESBWR or like an AP1000 or like any other plant?

MR. LIN: I don't know specifically, but I did look at the AP1000, and if you go to the DCD, they

actually refer to SRP Section 6.2.2 for containment heat removal, because the passive containment coolings basically serve as the ultimate heat sinks.

MEMBER STETKAR: What I am think about is there is a lot of guidance in Reg Guide 1.27 about how one considers meteorological effects, temperatures, historical effects, evaporative losses that happen to be from cooling towers, mass and energy balances, and I don't see a lot of that stuff in Chapter 6 of the Standard Review Plan.

MEMBER CORRADINI: Can I ask John's question a little differently?

My impression was that with each of the ones that he identified, it's an I'll say case-by-case, but a specific, design-specific -- a design-specific analysis. At least for ESBWR, my memory was that it was looked at that and only that, that there was no general reg guide that addressed it. Is that a fair statement?

MR. PURCIARELLO: I was not involved in the review of the ESBWR, so I can't specifically answer that question --

MEMBER CORRADINI: But --

MR. PURCIARELLO: -- for new reactors or for the AP1000, the other --

MEMBER CORRADINI: So my expectation is

anything new is going to be approached on a case-by-case basis --

MEMBER STETKAR: This --

MEMBER CORRADINI: -- design-by-design.

MEMBER STETKAR: This Reg Guide applies to a wide variety of designs, anywhere from something that looks like Lake Michigan to something that looks like recirculating mechanical draft cooling towers, and yet there's a generic -- a general reg guide that applies across the board to things that the staff should consider and ask applicants whether they've considered during their designs of those very specific systems.

My question is why isn't there comparable guidance for the staff when they review different ways of passively removing heat?

To look at, for example, mass balances would be something, to see whether or not the water is coming back to where you think it's going to come back, to see whether you considered the range of environmental conditions that you've assumed is going to be present for --

MEMBER CORRADINI: Right.

MEMBER STETKAR: -- evaporating from the surface of a large cylindrical structure.

MEMBER CORRADINI: But I guess, just to make sure, but when we looked at AP1000 and ESBWR, they did address it, but they addressed it for that design and only that --

MEMBER STETKAR: Right.

MEMBER CORRADINI: -- design. Okay.

CHAIRMAN RAY: Well --

MEMBER STETKAR: Of course, as do people who have a large natural draft cooling tower or several small porous draft cooling towers or, you know, Lake Michigan, for their particular design.

CHAIRMAN RAY: Well, the nature of regulatory guides, of course, is to provide information that is needed widely to tell lots of people how to comply with regulatory requirements. That need is going to exist. I guess the question at hand would be does that need exist for SMRs at this point in time?

AP1000 is behind us, but sort of, not quite, but the -- the issue of -- the regulated issuance of a regulatory guide would be that this would be beneficial to people who are having to -- having to put together an application that would be reviewed by the staff.

Yes, and you just haven't gotten around to it is I guess the --

MR. PURCIARELLO: I think yes, that is correct. Yes, there is a need, and no, there is no provision for that at the moment.

CHAIRMAN RAY: Yes.

MR. LIN: Not in a reg guide, right. The Standard Review Plan has been updated to provide some guidance for the small modular --

CHAIRMAN RAY: Well, but as John mentioned, it's limited and not comprehensive --

MR. LIN: Right.

CHAIRMAN RAY: -- and it's not as complete as this --

MR. LIN: Right.

CHAIRMAN RAY: -- is, and so on.

So, but your -- I think your input to us at this point is you're not aware of any intention to address proactively this future potential need with a reg guide that talks about passive cooling --

MR. PURCIARELLO: Not to my knowledge.

CHAIRMAN RAY: SMRs.

MR. PURCIARELLO: That's correct, not to my knowledge.

MEMBER CORRADINI: So not to beat it to death, but the staff must have some sort of attributes it looks for even though it's case-by-case. So is that

written down somewhere?

In other words, just to lay it out, so AP1000 is behind us, the ESBWR is behind us, but now you've got mPower, now you're going to have NuScale, you could have Holtec, is there a set of principles that the staff goes through even though they're unique designs? I think that's where John is going.

MR. PURCIARELLO: Yes. Is there anybody in the New Reactors Office that could answer that question?

MS. BROCK: This is Kathryn Brock. I think we'll probably have to take an action to get some answers for you.

CHAIRMAN RAY: Well, some of us have roles to play elsewhere in which people would like to know what the NRC's requirements are, and of course, the NRC's response typically is well show me the design and I'll tell you whether it's adequate or not, so it's a loop that we get into, and some of us are on both sides of that loop, and so it's a natural question: should we attempt to answer, as an agency, people's questions before they present a design?

And in some ways, of course, we can do that. Like John suggested, there is guidance here that would apply, potentially.

But as to writing a reg guide -- we had someone who wanted to speak also.

MR. LI: My name is Chang Li from NRO. From our review experience so far, it's like AP1000, ESBWR, those new reactors, we have design-specific review. We don't have generic rules that we still apply. That's Reg Guide 1.27, the previous revision, those parameters that John was mentioning, it was reviewed, it's according to the previous --

MEMBER STETKAR: Give you one example, and I can't -- I have to be careful because I didn't look up history, but my recollection is that when we looked at ESBWR and AP1000, they used, for example, five years of meteorological data to characterize their range of meteorological parameters.

This Reg Guide says if I have Lake Michigan, I have to use 30 years of meteorological data. So I am questioning this notion of design-specific stuff that tends to be inconsistent with what we're requiring for a general class of plants, that each have their own individual heat sink design, and whether or not the Agency has carefully thought about those types of consistencies.

MEMBER SCHULTZ: And that is just an example.

MEMBER STETKAR: Across -- and that is just an example, I mean, that's one that comes to mind --

MEMBER CORRADINI: But that's an example that caused a lot of discussion at the time.

MEMBER STETKAR: Indeed it did.

MEMBER CORRADINI: And not to say -- not to say five years is any more conservative or less conservative, it's just different.

MEMBER STETKAR: It is just different, and this Reg Guide specifically says 30 years or more of weather data is preferred.

MR. MAZAIKA: This is Mike Mazaika from NRO, I'm a meteorologist.

I guess to clarify, the five years I think that you're referring to has to do with dispersion meteorology as opposed to design-basis climatological conditions, so I think --

MEMBER CORRADINI: Well my memory -- again, we can check --

MEMBER STETKAR: I --

MEMBER CORRADINI: -- but my memory is it was about control room habitability, it was about a number of things.

MEMBER STETKAR: Let me not --

MEMBER CORRADINI: Yes.

MEMBER STETKAR: I tend to bring up specific items, and I said I had to be careful because I didn't go back and study all of the stuff, but it's issues of that notion, of that ilk, that -- that gives me pause to think about should the staff be stepping back and saying what types of issues should be addressed in the design and the review of passive cooling systems? And don't try to do that on a kind of ad hoc, case-by-case basis when you're looking at details of a specific design, in the same way that this Reg Guide doesn't look at the details of a particular type of cooling tower design.

CHAIRMAN RAY: Well, or -- just to repeat it yet again, there are elements here which are not specific to the limited application of this Reg Guide to the water cooling systems that are hypothesized here. There are meteorological conditions, there are many others as well.

And one could try to formulate a way of saying well, these are applicable generally. They are not limited just to the scope that this Reg Guide applies to at present. You could do that, and I think that's the observation that's being made.

Now, whether that would be productive of Agency time or not, that's a different question, but it

would certainly settle issues that sometimes we grapple with, which is do the meteorological conditions that are specific here, do they apply to an SMR, for example, or is there some reason why they don't?

MR. LIN: When we started revising this Reg Guide, we actually had tried to include the passive plants. Part of the reason we didn't was because the passive plants have different safety requirements -- not safety, like, for the 72 hours, you know, they consider it safety-related, but post-72, they have a different category and different design requirements for components that are only needed for the post-72-hours, so for the current Reg Guide, we would basically require that your system and structure have to be designed to GDC too, and for the -- I guess we call it regulatory treatment of non-safety systems have a different set of design requirements, and it was too confusing to merge the two.

And we have a staff from NRO that is actually working on this Reg Guide, and they do one for ultimate heat sink for new plants.

CHAIRMAN RAY: Well that, I think, goes then to answer the question better than anything else you have said so far.

You say there is some initiative to address

this proactively for plants that would be outside the scope of this Reg Guide?

MR. LIN: No --

CHAIRMAN RAY: New plants, you said?

MR. LIN: No, as part of the review, we have a staff from NRO that is also part of this Reg Guide revision time. He works in NRO, and he --

CHAIRMAN RAY: Okay, well listen, let's move on. I think the question has been recognized here --

MR. LIN: Right.

CHAIRMAN RAY: -- we'd appreciate some feedback just so that --

MR. LIN: Yes, we can take an action and --

CHAIRMAN RAY: -- give us a better understanding --

MR. LIN: -- get back to you.

CHAIRMAN RAY: -- because, as I say, it's not that we're unaware of the value that such things would have in plants that aren't yet applicants or new reactor applicants, just to reinforce that oh yes, these same requirements do apply, or something different.

MR. LIN: Right.

CHAIRMAN RAY: Okay. Why don't you proceed?

MR. LIN: Okay.

So I also list some of the related guidance here. Obviously, the Standard Review Plan Section 9.2.5 on ultimate heat sinks is related, and SRP Section 2.3.1 on regional climatology basically is concerned with identifying the meteorological data that would result in a maximum water loss or that can result in maximum intake water temperature to the plant.

Standard Review Plan Section 2.4.11, low water considerations, is concerned with natural events that can limit or reduce the supply of the water.

So we incorporate some of the guidance from the various Standard Review Plans into the current Reg Guide.

This slide just provides a very high-level overview of what's in Reg Guide 1.27. It describes the critical rules and regulations related to ultimate heat sinks, primarily many of the general design criteria, and it contains system design considerations for ultimate heat sinks such as the safety features that the heat sink has to perform, and it provides meteorological conditions to consider in the design of the ultimate heat sinks.

MEMBER SKILLMAN: Let me ask this question. If you go back to your slide 2 -- excuse me,

slide 3, at the top of the page, you give a succinct definition of UHS, and in this particular version, you identify design basis effects.

If you look at the old General Design Criteria 44, the original, 1976, those words are different. If you weave your way through 50.2, 50.4, if you look at the definitions, there is no definition involving a heat sink. If you look at the definition in the revised Standard Review Plan, it's different than that.

So my question is really on your slide 5. Why don't you consider a definition of UHS that is appropriate for the Part 50 plants, all of which are Appendix A 10 CFR 50, plus the comments that my colleagues have made? It seems to me that a very slight adjustment to what you have on that one slide would address what all of us are saying.

And I will tell you, I have worked with this UHS term since 1966. I understand it. But for every plant, as Jerry said, if you're going to say credit heat removal through the supports and restraints of the reactor cooling system, then your UHS might be the river, the pond, the tower, plus metal structures.

And it seems to me that there is a way to address what my colleagues and I are saying by creating

a definition of what you mean by UHS, but I suggest to you there isn't a definition codified anywhere on this very important topic.

If we talked about SSCs, we know what those are. We know what that means. UHS is equally important in the vocabulary of NSSS design.

MR. PURCIARELLO: I agree, and I know that the only time the term "ultimate heat sink" is even mentioned in the regulations is in GDC 44.

MEMBER SKILLMAN: Yes sir.

MR. PURCIARELLO: It's not mentioned anywhere else.

MEMBER SKILLMAN: Right.

MR. PURCIARELLO: And that is such a high-level regulation requirement, we have to develop guidelines that incorporate that, and GDC 44 says that -- GDC 44 is really not even on the ultimate heat sink, it's on the cooling water system --

MEMBER SKILLMAN: It's on the cooling water system, right.

MR. PURCIARELLO: -- so it's on the system that is supposed to transfer this type of heat to an -- and it mentions the term, it doesn't even define it, it just says to an ultimate heat sink. I mean, I think this implies, you know, a sink, you know, something where it

can accept energy, and it just says there is a cooling water system that has to be able to do that, and the cooling water system has to mitigate any accident plus bring the remaining units on the site to an orderly shutdown and cooldown, and it has to do that assuming a loss of off-site power and assuming an additional single failure somewhere, you know, in the plant.

But I -- I agree, there is no -- in the regulations, there is no definition of sink, ultimate heat sink, and I think the question you're asking is why don't we define that further? Well, as far as that being in a regulation is concerned, you know, that would be rulemaking, and that's a little bit beyond what we're trying to do here on a guideline, so that might be a question that would be -- the Commission should be asked, you know, why isn't there a definition for it in a regulation?

But in our -- to answer your question, you said somewhere in the Reg Guide, we have a definition that does not gibe with --

MEMBER SKILLMAN: Yes.

MR. PURCIARELLO: Where in the --

MEMBER SKILLMAN: Take a look at Rev 0, the original.

MR. PURCIARELLO: Rev 0 of the --

MEMBER SKILLMAN: Of General Design Criteria 44.

MR. PURCIARELLO: Oh, I don't -- I don't have that in front of me.

MEMBER SKILLMAN: Appendix A, 10 CFR 50, it's the gold standard.

MR. PURCIARELLO: Yes, is that not -- that's different from the current version of GDC 44?

MEMBER SKILLMAN: Well, it is probably the same version that it talks about, but it's supposed to be the cooling water systems.

MR. PURCIARELLO: Right.

MEMBER SKILLMAN: And it is that criterion that has driven the design of all the plants in the country.

MR. PURCIARELLO: Right.

MEMBER SKILLMAN: In fact, it is alive and well today on the best plants.

MR. PURCIARELLO: Right.

MEMBER SKILLMAN: And so we're talking about, actually, the system that implements that, UHS.

MR. PURCIARELLO: Yes.

MEMBER SKILLMAN: And so the challenge is why isn't there a definition of UHS that addresses the types of questions our comments are providing?

Because -- because in that definition would be the guidance that would, if you will, create a foundation for all of us who are doing this work.

MR. PURCIARELLO: Well, okay, but couldn't we express that definition in a reg guide? I mean --

MEMBER SKILLMAN: Yes.

MR. PURCIARELLO: Okay.

MEMBER SKILLMAN: And this would be the place to do it. That's exactly what I am saying.

MR. PURCIARELLO: But --

MEMBER SKILLMAN: That's exactly what I am saying. This is the place to do it.

MR. PURCIARELLO: And you say that our proposed version does not adequately define an ultimate heat sink?

MEMBER SKILLMAN: I don't think so.

MR. PURCIARELLO: Okay, well, we should take it under consideration then, and we should try to develop a -- a definition.

I mean, it might --

CHAIRMAN RAY: Well, it -- I guess in listening to this, a definition would tend to restrict --

MR. PURCIARELLO: Yes.

CHAIRMAN RAY: -- rather than to better

clarify what is an ultimate heat sink.

The way it -- here, it says, in GDC 44, "to an ultimate heat sink," meaning to me that it is whatever you choose to make it, whatever you choose to argue is the ultimate heat sink in a particular case.

We're simply, in the Reg Guide, addressing the ultimate heat sink as defined particularly by the devices that you're talking about here, a cooling pond, a river, an ocean, a lake, whatnot.

But that doesn't seem to me like that says those are the only heat sinks that exist. In fact, we specifically exclude passive containment cooling as one of the heat sinks that are addressed for the Reg Guide. That shows, well there is a heat sink, but it is not part of this Reg Guide.

And so I am not sure that defining heat sink and saying well it's this and not that advances the objective that we have.

MEMBER SKILLMAN: But Harold, it could be this and that. It doesn't have to be exclusive --

CHAIRMAN RAY: I understand.

MEMBER SKILLMAN: -- it can be written broadly enough that it really identifies what is meant.

CHAIRMAN RAY: Well, I think one could argue, Dick, that the words themselves address what is

meant, and that is the place where the heat ultimately goes, whether it's several places, just through support structures and so on, as well as the cooling water system. That is something that isn't precluded by reference to ultimate heat sink.

The issue of information that is described here in the Reg Guide, and the conditions, let me go back to meteorological again, what time period, what tenure one must use for the data that is being used in the analysis, that is something that has applicability, potentially, independent of what heat sink or what type of reactor design you're using, whether it's active or passive or whatnot, one would think that the meteorological conditions that need to be taken into account are independent of that. Maybe not, but at least that's a starting point.

But I am not sure that is accomplished by saying well, the ultimate heat sink is the following.

MEMBER CORRADINI: I am going to go a different direction, so I don't want to stop --

CHAIRMAN RAY: Oh, that's fine. I just wanted to make that comment after Dick had -- to me, leaving it, it's the ultimate heat sink, whatever it is, is the better way to go --

MEMBER CORRADINI: Right --

CHAIRMAN RAY: -- here.

MEMBER CORRADINI: -- but the reason I guess I am sympathetic to what Dick is asking, which is it kind of goes back to your -- so you said something at the beginning that I am -- my impression, so I am going to say it and you tell me if I've got the wrong impression.

The reason to review -- to upgrade or to update this Guide is simply because it's old, or because there's things missing that the licensees need questions answered?

MR. PURCIARELLO: We had additional regulatory positions that we put in the Reg Guide. We needed to reword the Reg Guide so that it's clarified.

If you noticed, the existing revision has the words "for comment" on it. I don't know 40 years ago how far that went and where it ended and why it did as such, so it being 40 years old, plus we know we've got operating experience, information that we added as a regulatory position --

CHAIRMAN RAY: Slide 8, Mike, shows you a couple of additional regulatory positions that are --

MEMBER CORRADINI: The spent fuel is the only one that I thought was going to be substantially --

CHAIRMAN RAY: Well, there's inspection, maintenance, and testing, water chemistry and micro-bio controls, those are two areas addressed --

MEMBER CORRADINI: Okay, so we're coming to it then.

CHAIRMAN RAY: Yes.

MEMBER CORRADINI: But the reason I am asking the question is, I guess, the reason I am sympathetic to what Dick is asking is that if you're going to go through the effort of updating something, it seems you want to make it somewhat comprehensive, so part of it is what he's asking, part of it is what John is asking relative to saying okay, this is the only thing we're going to consider until now, but we're aware of advanced designs that have a different path to the environment.

I mean, the ultimate heat sink is the environment. I mean, that is what it is.

CHAIRMAN RAY: I think --

MEMBER CORRADINI: Whether it be a water body connected to the air or the air.

But it just seems to me that this seems really specific, given you're going through all this effort, so I am -- that is why I am sympathetic to actually doing it to improve it --

MEMBER SKILLMAN: Yes, I believe what you've written in your slide, first bullet on page 3, gets to the heart of it.

"Credited for functioning," those are the critical words. And that could be meteorological, that could be supports and restraints, that could be a passive system, it is what you have credited for your thermal hydraulic heat balance, for your heat balance.

So it seems to me that you almost have a diamond, and all I am saying is would you give consideration to saying this is the definition of UHS? And you could do that, I think you square with General Design Criteria 44, I think you square with your Standard Review Plan, and I think you really address the concerns that we have for whether it's a small modular reactor or whether it's a passive plant because what's important is what is credited.

MEMBER CORRADINI: And then you could admit that there's gaps to be filled later.

MEMBER SKILLMAN: Yes. But it seems you're just about there, and so I commend you for what you've done, I am not trying to give you raspberries here, but I think the one thing that's missing are -- the several things that are missing are the definitions.

You know, those of us who were NSSS

designers recognize, definitions are important, real important, because they set kind of the markers on the path for how you design one of these machines.

CHAIRMAN RAY: Okay, let's --

MEMBER SKILLMAN: Enough, okay.

CHAIRMAN RAY: -- let's -- we do have to move on, but I do want to note here on the record that the Rev 3 does say the following: "Note: passive light water reactors have significantly different design bases for UHS than traditional plants that use active systems."

Now that implies that therefore, there is a need for something beyond what's presently addressed here to be addressed in the context of these significantly different design bases. Now, we may disagree with that, but at least that is the statement that is made.

And then they elaborate by saying "For passive plants, the passive containment cooling system may be used as the ultimate heat sink." Well, that is just an observation.

The guidance provided in this Regulatory Guide does not apply to passive plants that utilize a passive containment cooling system as their ultimate heat sink. Now, the ultimate question I think we're

asking is, well, why not? What is it that makes it -- makes this Regulatory Guide not applicable?

And so that ultimately is the question. If you are going to write one that does apply to reactors that use the primary containment as the cooling system -- I mean the primary -- excuse me, the passive containment cooling system as the ultimate heat sink, how would it be different?

MR. PURCIARELLO: It would be different -- let me try to answer that question.

The -- there's different -- there's different regulations in 10 CFR -- 10 CFR 52. There's the 72-hour requirement for being able to remove decay heat, the -- many of the components are not safety related, they're RTNSS.

Just, it's a different regulatory environment, and as far as SMRs are concerned, you know, I have just seen a couple briefs on SMRs, and you know, these plants are -- these reactors are submerged in pools of water, and I would just feel very uncomfortable saying this applies to SMRs because I would have to see the design of the primary system of an SMR before I'd say this is an adequate ultimate heat sink and these are adequate rules --

CHAIRMAN RAY: Yes.

MR. PURCIARELLO: -- for making sure that it's technically sufficient, so --

CHAIRMAN RAY: Okay. So I mean, I think you're explaining why it wouldn't be practical to just assume that this Regulatory Guide could be easily adapted --

MR. PURCIARELLO: Yes.

CHAIRMAN RAY: -- to a passive cooling system.

MR. PURCIARELLO: Right.

CHAIRMAN RAY: Now we may disagree with that, I don't know, but I sensed some disagreement anyway.

John's question I took -- since he is not here I can say this now -- I took as a little different, which was well there's stuff in here that we all would agree does apply, and why can't it be made clear that this is the Agency's position on issues like meteorological tenure and things like that? That is a little different question.

MR. PURCIARELLO: Yes.

CHAIRMAN RAY: Although it is related. Yes.

MR. LI: This is Chang Li from NRO.

One example that I can give is, say, here

is this Reg Guide, I am going to -- I am sorry, it's inherited from the previous revision about the 30-days water requirement, the heat sink requirements, but the design criteria, when it applies to passive plants -- because they are talking about seven days to -- 72 hours to reach safe shutdown conditions, so the ultimate heat sink design criteria is talking about initially 72 days using passive systems, and another from 72 hours to seven days use RTNSS systems and so forth, but it does not require up to 30 days requirement, so it's not -- this Guide cannot apply to the -- those passive plants.

CHAIRMAN RAY: Well yes, and so ultimately the issue is that because passive plants have a much lower probability of core damage, they are in a different world when it comes to how long they have to achieve certain states, end states, and whether things have to be safety-related or not and so on and so forth. All of that arises from a fundamental difference in design, which is that they don't depend on any active components.

If you depend on active components, then you are subject to this. If you don't depend on active components, then you are subject to something that has not been written yet in the totality.

Again, the issue John first raised, well

there are things here that do apply, even, we believe, to a passive plant. That is an observation. The question that comes out of that is: is anybody doing anything that will provide information to those who are involved in the development of passive plants as to what is acceptable to the staff for a passive plant?

MR. PURCIARELLO: We have to get back to you on that --

CHAIRMAN RAY: We understand.

MR. PURCIARELLO: We will check with NRO and see what they are doing as far as developing regulatory guidance for passive plants and SMRs.

CHAIRMAN RAY: Yes, okay. With that having been said again, let's move forward here. We are doing fine on time, but we want to make some progress here.

MR. LIN: I think we already touched on this, but we -- in the revised Reg Guide, we provided additional guidance for inspections, maintenance, and testing of ultimate heat sinks.

CHAIRMAN RAY: Yes, and in that regard, let me now raise a different question, which is -- it was associated with the resolution of public comment.

And in that regard, there was a comment made about the implication that the Maintenance Rule would

apply to things that aren't under the control of the licensee.

MEMBER CORRADINI: So can I ask a question that we're debating?

So was Fukushima a failure of the ultimate heat sink based on your definition or not?

Well, let's take an empirical check. Based on your definition, which we all seem to like, at least for the moment.

MR. PURCIARELLO: The ultimate heat sink -- let me -- let me think about this question.

I know what we're doing -- what we're requiring -- what we are requiring plans to do is to, because of Fukushima, is to put in provisions for beyond design basis events, but I think as I look back on it that probably what happened should have been the design basis events because they should have been designed for that earthquake, they should have had a higher wall to prevent a 40-foot tsunami, so I think --

MEMBER CORRADINI: So can I -- can I say your answer differently, just so I am clear for the record?

What you are saying, if it were in the design basis, yes it was, but since it's outside of the design basis, at least as entering the event --

is that what I hear you saying?

MR. PURCIARELLO: Could you rephrase your question?

MEMBER CORRADINI: Well I was going to say, to me, based on your definition of the ultimate heat sink, because it's not just where the energy goes, it's the system that takes it there, which is the way you've defined it --

MR. PURCIARELLO: Okay.

MEMBER CORRADINI: -- which is perfectly fine.

MR. PURCIARELLO: No, it's not the system that takes it there --

MEMBER CORRADINI: Well, that's what you say. You say "The ultimate heat sink is the system of structures and components and associated water supply credited for functioning of the head sink to absorb the" blah blah blah, that's the system.

MR. PURCIARELLO: Functioning as a heat sink, not as the method to get the heat -- the energy to the heat sink.

MEMBER CORRADINI: So --

MEMBER RICCARDELLA: Oh, so the diesel generators then aren't part of --

MR. PURCIARELLO: The ultimate heat sink?

No.

MEMBER RICCARDELLA: -- this ultimate heat sink --

MR. PURCIARELLO: No.

MEMBER CORRADINI: But the pump to get it there is?

MR. PURCIARELLO: That part, no, that's part of the essential service water system.

MEMBER CORRADINI: Right, so what is the system of structures -- give me an example then of a system of structures and components and associated water supply that's --

MR. PURCIARELLO: Cooling towers, manmade lakes --

MEMBER CORRADINI: So it's just the place where the energy is dumped, it's not how you got it there?

MR. PURCIARELLO: That is correct.

CHAIRMAN RAY: Yes, and the -- and the beyond design basis conditions interfere with that getting it there.

MEMBER CORRADINI: Okay.

CHAIRMAN RAY: Now, can I go back and resume what --

MEMBER CORRADINI: Sorry.

CHAIRMAN RAY: -- I was saying? That is all right.

So --

MR. PURCIARELLO: Can I clarify one thing, though? He mentioned --

CHAIRMAN RAY: Yes.

MR. PURCIARELLO: -- before about transferring heat to metal and such.

I said, you know, we would review it. I know that the heat transfer to metal is taken into account in containment analysis design, the peak pressure and how much heat is being taken out in a certain time. I have never seen it as far as an ultimate heat sink is concerned because part of the requirements that I have seen licensees do is they take the sensible -- in their calculation, they take the sensible heat out of the reactor and the containment, they take the heat energy that's in the metal and in the vessel that is part of the calculation.

I have never seem them -- granted, I have not reviewed a lot of ultimate heat sink -- I mean, design basis action analysis, but I am not aware of any of them ever taking credit for where the heat goes to the supports and the pipe beam, and that's part of the ultimate heat sink, no, I have never seen that, and you

asked me is that possible, and I said off the top of my head, I said well I guess if they -- if they made the case, you know, that they could do that, but that was just my personal opinion at that point, and I am not saying that that's -- that they have ever done that, or even our reactor systems people would accept that.

MEMBER CORRADINI: But just to -- because Harold is going to get after me for asking this, so just to make it final, so that if it was a manmade lake, if it was a cooling tower, wet or dry, if it was a lake that's nearby, that's the ultimate heat sink, it's not the system that takes the energy to that point?

MR. PURCIARELLO: That is correct.

MEMBER CORRADINI: Whether it be service water, component cooling, or some combination.

MR. PURCIARELLO: Right.

MEMBER CORRADINI: So the assumption is that it's always a water body?

MR. PURCIARELLO: Well, I can -- in a wet cooling tower, I mean, the heat does get transferred to the atmosphere, you know, through evaporation --

MEMBER CORRADINI: But just to pick your -- that is fair, but the AP1000, it's a cooling tower sitting on top of the containment.

MR. PURCIARELLO: For all intents and

purposes.

But it's not governed by safety-related systems, it's not active, it's -- it's under a different, different -- it's under --

MEMBER CORRADINI: Natural draft cooling tower is not active.

MR. PURCIARELLO: Well, but Mike, Mike --

MEMBER CORRADINI: You see where I am going with this. There's no natural draft cooling towers that are ultimate heat sinks.

MR. PURCIARELLO: There are --

CHAIRMAN RAY: Let me grant what you say, that it's a cooling tower sitting on top of the reactor: it's passive, though, and what we said earlier was that automatically changes the game in terms of --

MEMBER CORRADINI: No no, I am fine, but I just wanted to make sure I understood it, but I get it, I get it.

CHAIRMAN RAY: Okay. So now let's resume the discussion up there that is focused on the word maintenance in the last bullet.

So we have this guidance which we are now providing that refers to the Maintenance Rule as one means of assessing the adequacy of maintaining the structures that are within the control of the licensee.

In regard to those that are not, we have something I just want to probe a little bit further.

We say, "However, it would be prudent for the licensee, for these other structures not under their control, to ensure other water controlling structures affecting the safety of the site are being monitored under another program."

Why do you choose the word prudent? It seems to me that you could have said that the controls that are being applied by whoever is in charge of these other structures need to be described, for example, so that if -- if somebody is maintaining a water-control structure that falls under this category but they're not the licensee, it's somebody else, it changes hands, they change what they do, they -- it just seemed like the use of the word prudent rather than saying something stronger such as the measures being applied to these other structures need to be described or addressed was an alternative that you didn't choose here.

Why is it worded the way it is, which seems so I guess strange? Yes.

MR. PURCIARELLO: I can answer that and say that let us go back to our -- to our hydrology experts and look for better words to say, instead of using the word prudent which is a -- this is a guideline to

regulations, so to say prudent means, you know, that the reviewer, years from now when he is using this to review a new application, would say well it's prudent that you tell me how this dam or this SSC is going to be controlled, even though it's not under your -- your cognizance, you don't have control of it.

And I agree, that is very loose words. I mean, maybe we should say something like tell us what you are going to require the other governing body to stipulate for this dam that is downstream, it's not under your control, you know, Army Corps of Engineers is controlling it.

You are saying that more specificity should be in the application regarding structures that are not part of -- that you don't -- that the applicant doesn't have control of.

CHAIRMAN RAY: Yes, I think the licensee needs to -- if they are going to rely on something, they need to say on what basis they are relying on it, and the Agency then, if they don't ensure that those measures, whatever they may be, are kept in place and used because they were the -- presumably the basis upon which we agreed to grant the license, if they're not maintained in that way going forward, that at least there's something to point to to say well wait a minute,

the licensing basis says --

MR. PURCIARELLO: Yes.

CHAIRMAN RAY: -- that this thing will be maintained in such-and-so way, and it's no longer being done so because the, you know, the funding for the maintenance program was cut back or whatever the case, it changed hands, the water-control structure went from a federal agency to a county irrigation district, I don't know.

It just seems like this is not a sufficiently definite provision, so --

MR. PURCIARELLO: Why don't we go back and talk to our hydrology people and see if we can come up with some more -- we'll take that as your comment and respond to it.

CHAIRMAN RAY: Well, of course, the Subcommittee doesn't make comments, only individual members do, and I am acting as an individual member here.

We will talk at the end whether or not we need to -- to go and talk to the Full Committee, but that is just one comment from me, and I hear your answer, and that is fine.

MEMBER SCHULTZ: We will come to it again on the slide where the public comment is addressed.

MR. PURCIARELLO: Yes. I don't know if I

can say anything more than I just said though now, now that it's --

MEMBER SCHULTZ: Understood, but the language there is a little even more strong. It says "prudent for the licensee to ensure other water-controlling structures affecting safety are being monitored under another program."

So it does place a high level of attention to the licensee's responsibilities in the way it's phrased in the NRC response.

CHAIRMAN RAY: Yes, I am not -- what I am saying, Steve, is it seems like if this is a regulatory guidance, it ought to cause whatever the measures are in the licensing basis to be described.

MEMBER SCHULTZ: I agree.

MEMBER BALLINGER: So what you're saying is don't even use the word "prudent," just take it out.

CHAIRMAN RAY: Well I would say describe the measures that are being used by this other party, and if they're considered acceptable, then fine, but at least it's in the licensing basis.

And prudence implies, well, I am being prudent as I go forward here, but I am not constrained by what I said would be the case, and that is why I am looking more for constraint on what is done rather than

just you must be prudent and continue to be prudent, and if we think you haven't been prudent 20 years from now, we'll tell you so, or something like that.

MEMBER SCHULTZ: Yes, that is what I am looking for also, a reassurance of consistency.

MR. PURCIARELLO: So if we removed the word "prudence" and left out the discretionary aspect for the applicants, that would be satisfactory to your comment?

CHAIRMAN RAY: Well yes, the more important thing is describe what it is you're relying on.

MEMBER BALLINGER: Yes, prudent is in the eye of the beholder, right?

CHAIRMAN RAY: Yes.

MEMBER SCHULTZ: That is exactly it.

MEMBER BALLINGER: So --

CHAIRMAN RAY: Just say what it is, we'll look at it. If it meets our requirements, fine, that's what you said you would do -- or they would do, and it's up to you to make sure that they continue to do it, and if --

MR. LIN: Yes. Also, in the Reg Guide, we referenced another reg guide, Reg Guide 1.127, Inspection of Water-Control Structures, so it's in -- it is in the regulatory position, we also had that.

CHAIRMAN RAY: Okay.

MEMBER STETKAR: I was going to ask you, in the Reg Guide, this is -- I didn't go back and study many other reg guides, but this one is a bit different than my recollection because there is a long background section that goes through many specific issues, and then there's the regulatory position section that basically regurgitates most of that stuff, which is a little different than what I have seen in the past.

And this particular topic that we've been discussing here appears in the background, this notion of prudency, but it does not appear in the regulatory positions, it is not mentioned in the regulatory position.

Now, if I am a licensee or an applicant or I am an NRC staff reviewer, how do I treat differences between the background section, things that are stated there, and things that are stated in the regulatory positions? What is the Regulatory Guidance? Is it only the -- if it's only the regulatory positions, then this notion of prudency or the need to monitor those other facilities is not mentioned at all in the regulatory positions.

So how -- how do -- how do I reconcile differences between what is in the background

discussion and what is in the regulatory position? And this is just general curiosity. What is the regulatory --

MR. PURCIARELLO: The entire Reg Guide is guidance, I mean, not just the regulatory positions.

MEMBER STETKAR: Okay.

MR. PURCIARELLO: I can tell you, even the explanation up-front on the background and the introduction --

MEMBER STETKAR: Okay.

MR. PURCIARELLO: -- that's all part of --

MEMBER STETKAR: So if I am -- if I am an applicant, the notion that it would be prudent for me to have some --

MR. PURCIARELLO: There are --

MEMBER STETKAR: -- assurance that those other structures are being monitored is part of this Regulatory Guidance, and if I am a staff reviewer, I would be looking for some sort of assurance of that prudency.

(No audible response.)

MEMBER STETKAR: Okay, thank you. Just curious that it was different.

CHAIRMAN RAY: Okay. We'll inch ahead.

MR. LIN: Okay. I think we already talked

about this. The reason for revision, it's obviously -- it's outdated. It was last revised in January 1976, and it has the "for comments" mark on it, so -- and we also need to update the Reg Guide to support reactor applications, to ensure that the guidance in the Reg Guide is consistent with the more recent NRC guidance such as the Standard Review Plan.

We also want to update the Reg Guide to incorporate changes in regulations and lessons learned from operating experience.

MEMBER CORRADINI: Not to pick on you, but the first sub-bullet underneath update, but you're not going to update it for new reactor update, yours is going to say it isn't applicable. Is that updating it? Is "never mind"?

MR. PURCIARELLO: No, no, just passive plants. EPR is an active new reactor, and that would apply, this would apply to EPR.

MEMBER CORRADINI: Okay, you got me.

MR. LIN: And -- and you realize, this Reg Guide is a little -- because we also -- there is a commitment from the staff to the Commission to update the reg guides to go along with SRP updates associated with new reactor applications, and we are committed to update our reg guides on a regular basis.

This is a really high-level summary of the changes that were made to the Reg Guide.

In the introduction, we added -- included all the applicable rules and regulations. We added several other general design criteria that are applicable to ultimate heat sinks.

And the discussion section was expanded to incorporate an updated relevant design consideration for ultimate heat sinks. The comments and a lot of the discussions are repeated in the Regulatory Guidance, so I am not going to go into too much detail on the changes that were made to the discussion section because they got carried onto sections of the Regulatory Guidance.

And basically, in the discussion section, we expanded it, some discussion on challenging analysis, added additional safety features that the UHS must perform, we added some discussions with respect to harmonization with international standards and industry standards.

In the regulatory positions, we made changes to the four existing regulatory positions, primarily to clarify the positions that were confusing, and we added other design considerations, and we added the two new regulatory positions to provide guidance on protections and water control for ultimate heat sinks.

I am going to turn it over to Jerry to discuss the changes that were made to the Regulatory Guidance.

MR. PURCIARELLO: Thanks.

This slide shows an itemization of the topical headings of the regulatory positions for the two Reg Guides in question here.

The first one shows four regulatory positions associated with the 1976, that's the current version of the Reg Guide. And on the column on the right, it shows the proposed regulatory positions for this current 2015 version of the Reg Guide.

As you can see, the first four regulatory positions have the same -- they deal with the same topics. In regulatory positions 1 and 2, we clarified the positions, we improved them, and we added some new guides that I'll get into later on in the next slide.

In regulatory positions 3 and 4, a defense in depth of technical positions. There was no real change in content. We made some minor editorial changes.

And then we added regulatory positions 5 and 6, and I will now go on to explain these more in detail.

Next slide, please, number 9.

Okay. In regulatory position 1(a), we added the term "cooldown." This is not a new requirement. In the first section, in the guidance section, it did mention that the UHS had to be capable of shutdown and cooldown of the remaining units.

We want it to be -- the regulatory position to be consistent with the background information, and this shutdown and cooldown requirement for remaining units after it mitigates the design basis accident in one unit, this is for a multi-unit site, that this is in consistency with GDC 5 --

MEMBER STETKAR: Is it really? Does GDC 5 require cooldown?

MR. PURCIARELLO: It said "An orderly shutdown and cooldown of the non-accident units," yes.

MEMBER STETKAR: Cooldown.

MR. PURCIARELLO: Yes.

MEMBER BLEY: Not the cold shutdown.

MEMBER STETKAR: Not the cold -- okay, not the cold shutdown.

MEMBER BLEY: It comes up in BTP 5-4, which they'll get to in a while here.

MEMBER STETKAR: Is there some thought -- last I knew, in March of 2011, there was multiple accidents at a multiple-unit site that occurred, for all

practical purposes, within a short time of one another. Is there any thought to changing this notion of the fact that at a multi-unit site, by definition, only one of those units can have an accident, and therefore the heat removal requirements shall be determined only by a single unit's accident and the other unaffected units' heat removal?

MR. PURCIARELLO: Well, are you asking the question on a multi-unit site, would you have a loss of coolant if you had an accident on two units at the same time?

MEMBER STETKAR: Not talking about loss of coolant accidents, that I -- I could have an earthquake and a tsunami, for example, that could cause core damage at three units. It might be called Fukushima. It might be a multiple-unit site in the United States that would have another, different type of event occur where I could have within short time of one another multiple units affected.

Do we need to think now in 2015 about that possibility, or do we stick with the definition that according to the lawyers, only one unit can have an accident?

You said you're updating the guidance from lessons learned. One of the lessons learned is that at

a multi-unit site, you can have more than one unit involved in an accident coincidentally.

Go ahead and ask your question.

MR. PURCIARELLO: Yes, I am thinking of it, this has kind of caught me off guard --

CHAIRMAN RAY: While you are thinking about it, I guess John my reaction to that is, is that by definition a beyond-design-basis condition, where you have an external event of some kind that causes an accident at more than unit?

I am thinking about it in terms of a single failure.

MEMBER STETKAR: I don't know.

CHAIRMAN RAY: Okay. That is the --

MEMBER STETKAR: Because I am being careful about what I am calling an accident.

MR. PURCIARELLO: Yes. I think Fukushima --

CHAIRMAN RAY: This is -- go ahead, you first.

MR. PURCIARELLO: I think we have classified Fukushima as a beyond-design-basis --

MEMBER STETKAR: Okay.

MR. PURCIARELLO: -- event because, you know, they had their tsunami wall, which I believe was

only ten feet high, and so they were assuming that they wouldn't get a tsunami any higher than that, and if they got one higher than that, I think it was a beyond-design-basis event.

Theoretically, if the plants are designed seismically, then an earthquake should not even cause a design basis accident. It shouldn't cause a main steam line break, it shouldn't cause a loss of coolant accident.

It could cause a multi-unit loss of offsite power, so that could happen, but that is more considered an anticipated operational occurrence, a loss of offsite power.

But if it's designed correctly, the -- for the most logical or the most probable seismic event or flooding event, the -- the loss of coolant accident is really a non-mechanistic, no particular cause, it just happens because it happens for some unknown reason.

I think the reg guides and the guidance is saying that is not going to happen at two units at the same time from a probability standpoint. I am not sure if that answers your question, but --

MR. CASTO: Yes, this is Greg Casto, and I am not in JLD, but I believe that is being addressed within the JLD framework in looking at -- at the

near-term activities, maybe under the mitigating strategies rulemaking, I think this is a question we probably ought to bring back to you if you're looking at --

MEMBER STETKAR: This is --

MR. CASTO: -- multi-unit --

MEMBER STETKAR: This is design of an ultimate heat sink, though, and I haven't seen anything in the JLD stuff that, unless FLEX is going to fly in big tanker airplanes and dump them into pre-designed, you know, basins or something like that, that is -- I haven't seen anything address that, that looks at the capacity of the ultimate heat sink.

MR. CASTO: Okay.

MEMBER STETKAR: I have looked at, you know, given you're out in the post-72-hours or post-seven-days or whatever, you know, the different phase is, what alternatives do you have? But primarily, from pumping water from an existing body of water into the plant, not --

MR. CASTO: Yes.

MEMBER STETKAR: -- not some of the issues that are being --

MR. CASTO: Okay.

MEMBER STETKAR: -- addressed here.

MR. CASTO: This is a multi-unit accident analysis, is -- is currently under JLD, but --

MEMBER STETKAR: Right.

MR. CASTO: -- we'll bring this question up to --

MEMBER STETKAR: But I think here the key from what I hear you saying may be that you're strictly in this guidance limited to design basis accidents, and in a design basis accident, the maximum heat release would be from something like a steam line break or a LOCA perhaps.

On the other hand, I am a risk assessment guy, and I haven't done the risk assessments about can you get multiple events going on from something -- from some external hazard within the design basis.

MR. PURCIARELLO: This should be design basis because it implements regulations, Commission regulations, and so there are guidelines for implementing those, and the regulations are within the design basis.

And then in regulatory -- going on to regulatory position 1(b), we had a clarification that for cooling towers, that if there was multiple cooling towers, that the design of the cooling towers had to take into effect the effects of recirculation and

interference of one cooling tower with another.

The regulatory position 1(c), we added the -- we clarified the concept that the meteorological conditions for maximum water cooling loss over the 30-day period had to be the worst 30-day combination of controlling meteorological parameters.

In regulatory position 1(d), we clarified it and changed that the meteorological conditions associated with the maximum intake water temperature as opposed to the -- what it previously said was "minimum water cooling," because we're interested in peak temperature because this is the water that comes in and cools safety-related components like diesel generators and such, and you're concerned about peak temperature because it's equipment like diesel generators, you've got to be concerned about peak temperature.

And then in regulatory position 1(e), we clarified the basis for how to select the meteorological data, and we used the term "critical" -- defined the term "critical time," which was really actually defined in the background basis, we redefined what that really means, so we changed that.

Next slide, please.

CHAIRMAN RAY: Before you go on, let me -- I don't know whether this belongs with meteorological

conditions or not, but in talking about natural phenomena and site hazard, you say, "The potential for adverse environmental conditions such as icing should be considered in determining for performance. If applicable, the potential for water freezing in the ultimate heat sink water storage facility should be analyzed. The maximum accumulated degree that is below freezing recorded in the site region during the winter or during the worst case freezing spell in warmer climates may be a reasonably conservative site characteristic for evaluating this potential."

Again, I am drawn to the sort of weak suggestion it may be reasonable. Why was that wording chosen?

MR. PURCIARELLO: Mike, you want to address that?

MR. MAZAIKA: This is Mike Mazaika from NRO. Can you refer me to that specific wording?

CHAIRMAN RAY: Well, it's on page 13 of the printout I have here. It's item 2(c), I guess it is, yes, 2 being Natural Phenomena Site Hazard Designs of the Ultimate Heat Sink, and this is paragraph c.

MR. PURCIARELLO: Regulatory position 2(c).

MEMBER STETKAR: It is actually, I mean,

the index here, slide 12 of your slides.

CHAIRMAN RAY: Okay. I was premature I guess in associating it with meteorology, but anyhow, it just struck me as odd to say it "may be a reasonably conservative site characteristic" without any elaboration.

Maybe it is, maybe it isn't, I don't know, but usually we are more specific, such as by saying it should be used unless there is some good reason shown for using something else, or you know, I just am asking the question of why are we hedging a position as much as that?

MR. MAZAIKA: Part of -- part of that wording talked about resolving redundancies amongst the group that was updating the Reg Guide was based on removing some redundancy in the Standard Review Plan. 2.3.1, the Regional Climatology, addresses freezing conditions, and I believe Section 2.4.7 under Hydrology addresses that as well, so we recognized that it was something that needed to be considered.

As to the specific wording, I can't speak to that right now, but since it was -- since it was addressed in both places of our review guidance, the topic needed to be discussed within this Regulatory Guide.

CHAIRMAN RAY: Well, for what it's worth --

MR. MAZAIKA: Does that answer --

CHAIRMAN RAY: -- this member, anyway, would comment that you ought to reconsider such wording because it I don't think is helpful.

If there is -- if there are different alternatives that should be considered, fine, say what they are, but it implies to me that this is much more of an ad hoc decision than it ought to be.

MR. PURCIARELLO: Okay, slide 10.

And then to regulatory -- going on to slide 10, in regulatory position 1, we added the following design considerations: (h) through (k), (h) dealing with fire protection criteria of construction materials; in regulatory position (i) we added that --

MEMBER STETKAR: Jerry, let me stop you there because -- rather than bouncing all over the place.

(h), if I can find my notes here, is -- it says that I can use fiberglass reinforced thermosetting resin piping as long as it meets other criteria, and then there's a parenthetical note saying at the time this -- of this Reg Guide revision, the NRC staff has not approved American Society of Mechanical Engineers Code Case N-755-1 and the use of high density polyethylene

materials.

This seems to be another instance of staff delays in approving ASME code cases getting folded into regulatory guidance, which then requires applicants later to take exceptions to that regulatory guidance which places a burden on them, places a burden on the staff, and so forth.

So I did a little homework. I don't know when ASME Code Case N-755-1 was submitted. I did find a poster session in the 2011 RIC, that being four years ago, that said that the staff was reviewing it and had not accepted it at that time, so we are at least four years into the staff review process. What is the current status of the staff review of that ASME code case?

MR. LIN: I am not aware of the current status, but I know there is ongoing research in this area, in this particular area, so --

MR. BURKE: This is John Burke, I am Branch Chief in Research.

Bruce is right, that code case is still under review by both Research and NRR, and there is active research in the Office of Research looking at the use of HDPE piping. It is in a different group than the group I am in, but I believe the concern is the welding,

as they call it, the joining the sections together, and then NDE of the material, so that's why that code case has not been approved yet.

MEMBER BALLINGER: But plants have been using that stuff with exceptions for at least ten years.

I mean it is wholesale conversion when they redo their service water systems.

MEMBER RICCARDELLA: Yes, there are several plants that have done this with fitted piping.

MEMBER STETKAR: Right, and it's used other places in the world.

MEMBER RICCARDELLA: In other places in the world as well.

MEMBER CORRADINI: So, I'm sorry, so those are the facts, so what is it that's the --

MEMBER STETKAR: Well my question --

MEMBER CORRADINI: -- what's the --

MEMBER STETKAR: Why does the Reg Guide -- first of all, it's really annoying that it takes the staff many, many, many, many years to review these code cases, I mean, if you're not going to approve it, you ought to just say we're not going to approve it and be done with it, if you're going to approve it, you ought to do it in a timely fashion, but that's a different issue.

Why did we need to write the reg guides this way such that it's written negatively? Basically, now, I could -- can I write a reg guide that says continent on staff approval of this code case, you can use it?

See, that -- that says after the code -- this just says it's not approved.

Exceptions are approved, and exceptions have been approved.

MR. PURCIARELLO: That would seem to be a better way to do it, yes, saying that when approved or it's under -- well, how did you phrase that terminology?

MEMBER STETKAR: Contingent on approval would be -- I don't know how to write it because I don't know how the regulatory guidance is developed this way.

MEMBER POWERS: I've spoken a little bit about the concerns. The applicant can do anything he wants to, but what they write in the Reg Guide is what, if you do this, and we expect you to do it, you can expect approval here.

What we're saying is that right now, you can't ipso facto expect approval on high density -- on piping right now, you're going to have to write a justification on that. I mean, I think that's kind of a factual statement.

MEMBER RICCARDELLA: Well, in terms of

this Reg Guide, I mean, wouldn't it be sufficient just to say buried piping and spray pond piping may be constructed of non-fireproof materials or something of that sort? And that way you get around whether it's fiberglass or HDPE.

I mean, that's the intent of that statement, isn't it, that if it's buried, it doesn't have to be --

MEMBER STETKAR: And that the applicant would --

MEMBER RICCARDELLA: -- fireproof.

MEMBER STETKAR: -- have to justify the material that is being used.

MEMBER BALLINGER: That's a much more definitive thing that --

MEMBER STETKAR: The problem is we get reg guides that are updated once every 25 to 30 to 40 years, and -- and in that Reg Guide, there is a specific material that's approved, a material that is sort of in limbo, and other materials that might come along in the next 25 to 30 years that aren't even listed in here.

MEMBER POWERS: Well, of course they can't be --

MEMBER STETKAR: Well no, they can't, but

my point is why, at this snapshot of time, need -- of necessity, does the Reg Guide have to be very specific about one and only one material, nebulous about another named material, and silent on, you know, the other materials that we don't know about.

MEMBER POWERS: Well, we know absolutely why it has to be silent on the materials we don't know about.

MEMBER STETKAR: Exactly, but --

MEMBER POWERS: Okay. If it is -- I mean, it seems to me it's saying if you're coming in here with a fire-resistant material, I am going to approve this, okay?

Now, if you come in with something else, that heretofore I haven't examined, don't expect to be approved without a justification.

I mean, that strikes me as what the Reg Guide -- the Reg Guide is doing what it is supposed to. It is saying do this and you have every reason to expect to get approved. Do something different and I am going to ask for justification. Now, that justification may vary depending on the status of approval of --

MEMBER STETKAR: Right.

MEMBER POWERS: -- code cases. The justification may be a one-liner in the case of approved

code cases --

MEMBER STETKAR: Yes.

MEMBER POWERS: -- and may be a minor topic for a treatise on the case of unapproved code cases, but I mean otherwise, the Reg Guide seems like it's doing what it's supposed to.

MEMBER BALLINGER: But it doesn't exactly say that.

MR. BURKE: This is John Burke again.

MEMBER POWERS: But it doesn't have to say that. I mean, it seems to -- I really don't understand what you're objecting to.

MEMBER BALLINGER: Well, using the words "should" and "prudent" and those kinds of things.

MEMBER POWERS: I mean, I don't see what is wrong with that.

CHAIRMAN RAY: We had a comment from the audience here.

MR. BURKE: Just to remind you, the -- not on the HDPE, but on the fiberglass pipe, that is in the current Reg Guide also, and there is a separate reg guide on the use of fiberglass pipe that we continue to accept. It's just -- the only change in here is that the -- the phrase about the code case for the high density polyethylene pipe.

CHAIRMAN RAY: Any further discussion, John, you --

MEMBER STETKAR: No.

CHAIRMAN RAY: All right. Given the pause, we're going to, rather than resume and then stop again shortly, we'll take a 15 minute break until 10 minutes after 10:00.

(Whereupon, the meeting went off the record at 9:52 a.m. and resumed at 10:10 a.m.)

CHAIRMAN RAY: We are back on the record, and we are resuming the discussion where we left off at the break, so please proceed.

MR. PURCIARELLO: Okay. We are on slide 10 discussing regulatory position 1(i). In 1(i), we added the guideline that the Applicant should include the thermal load from the spent fuel pool in addition to the accident and non-accident units.

MEMBER SKILLMAN: Jerry, let me -- let me move in here just for a second.

Looking at your draft guide, you have introduced under (c)(1)(a) the fission cooling for 30 days, on your staff guidance (c)(1)(a), you have introduced 30 days. That is fine, I've got no problem with that, sounds like a good place to start.

But then you add on (i), (i) as in indigo,

small (i), heat loads that are important in safety or must be cooled during the 30 day recovery period by the UHS should be included in determining the UHS thermal performance, such as the heat loads from the spent fuel pool and operating pumps.

You have introduced a term "recovery period." Where did you define that? That is the first place that word is used. I think it really is what you're referring to in (c)(1)(a) --

MR. PURCIARELLO: Correct, that is the intent.

MEMBER SKILLMAN: But I would suggest to you that at least in the sampling of one, I know where the -- it took over a year to back out of the recovery period, and that was at TMI-2.

So recovery period means something, and I think what you really mean is the design basis duration or the licensing basis period or the required duration -- recovery period seems to mean something.

MR. PURCIARELLO: Well, we use -- I think maybe the --

MEMBER SKILLMAN: Or delete "recovery."

MR. PURCIARELLO: -- or as we defined it in 1(a), we call it the sufficient cooling for 30 days, or at least 30 days --

MEMBER SKILLMAN: Then repeat those words.

MR. PURCIARELLO: -- you can call it the 30 day sufficient cooling period.

MEMBER SKILLMAN: That would be fine.

MR. PURCIARELLO: Right, I could see -- if that clarified the case, I don't see any problem with it.

MEMBER SKILLMAN: Yes, well recovery has a unique meaning if you're in site area emergency or general emergency, because to get out of a general, you have to have a recovery plan.

MR. PURCIARELLO: Okay.

MEMBER SKILLMAN: So recovery can't -- it has a --

MR. PURCIARELLO: I agree.

MEMBER SKILLMAN: -- it has an item.

MEMBER STETKAR: Jerry, obviously I -- you know, I stumbled over that too, and if you look at (k), you just call it the 30 day period down in (k).

You know, people know what you're talking about with the 30 day period.

MR. PURCIARELLO: Yes.

MEMBER STETKAR: So just say 30 day period, and that even -- it's what you call it in (k), it's what you call it elsewhere --

MEMBER SKILLMAN: It is what you put in 1(a).

MR. PURCIARELLO: Okay. Any other comments on that issue?

MEMBER SKILLMAN: Thank you, no.

MR. PURCIARELLO: Okay, we will proceed on to regulatory position 1(j). There we stated that the UHS active mechanical components should automatically activate --

MEMBER STETKAR: Jerry, you -- that is the first sentence in (j). The second sentence in (j) says "If the active UHS mechanical component does not automatically start, operator actions are required to support its intended safety function."

And I got confused by the second sentence. There, do you mean if it has an automatic start feature and that automatic start feature doesn't work, then the operators need to start it manually, or do you mean if the thing was never provided with an automatic start feature, then operators will need to start it manually? Those are two different things.

MR. PURCIARELLO: The latter.

MEMBER STETKAR: The latter, okay. Well, let me tell you that the sentence could be interpreted either way.

If the latter applies, even in some cases the former, just saying that operator actions are required in many cases doesn't give me much guidance. It doesn't say, well, if you're going to require operator actions, do we expect the applicant to demonstrate the feasibility and reliability of those actions, and their methods to do that?

MR. PURCIARELLO: There's human factor criteria, and I would interpret this to -- I would interpret this to mean that if you don't have -- if your active components are components that you need to actuate to mitigate the design basis exit, if it's not automatically featured, then operator action would be required that would call the attention to the human factors review, saying -- and we have human factor guides, like there can be no operator reaction within the first -- this is just a guideline -- in like the first ten minutes of the casualty.

A case in point would be some of the Westinghouse plants, when it goes on -- when a plant goes on recirculation, sometimes it happens automatically when the RWST level reaches a certain level, and in some plants, the older plants, it requires operator action to actually make that switch over. You know, that's been -- both cases have been approved by the staff --

MEMBER BLEY: Jerry, can I interrupt you and your response here?

What it reads like is what your response to comments looked like, and it looked like this started out as just being automatic, and some folks objected, and you said oh, well, we're going to keep it automatic because that is what we want, but if it doesn't start, you should do it by operator action.

Now, most other reg guides that come to this point of saying you can have operator actions tell us some of the stuff you were just telling us, or at least it refers you to the right place to see how to justify your operator actions.

This looks like it was a response to a comment, you stuck in a sentence, and you should have stuck in more than a sentence.

Think about that.

MEMBER BROWN: I would have -- I would have actually made one other thought process. Instead of saying "operator actions are required," I would have phrased it that the ability to manually start these components should be provided, and then refer to the -- whatever else, you know, the stuff you're talking about.

But saying they're required, you just really want to make sure you can start them, that

somebody can go push a button, and then you've got other requirements that says they've got to be able to do it within a timely manner and refer them to that.

MEMBER BLEY: That's a way they could edit it.

MEMBER BROWN: Yes, I don't like this "operator actions are required," because to me, it's -- it ends up as a confusion.

I -- just saying that they should be able to be manually operated is -- and then refer to your human actions, human factors, to get them in the right -- that was my point.

MEMBER SKILLMAN: Sorry to -- and another way to address that is that the emergency operating procedures, or the operating procedures, should be followed, because those are the ones that will guide you into those actions.

MEMBER BROWN: Yes, but you have got to make sure that -- that that pump or that valve or those things can actually, somebody can go out and punch a button --

MEMBER SKILLMAN: Got to be --

MEMBER BROWN: -- I presume that is --

MEMBER SKILLMAN: They have got to be capable of responding.

MEMBER BROWN: That is why I thought that ought to be more explicitly stated.

MEMBER BLEY: And that's the way most --

MEMBER BROWN: Yes, exactly --

MEMBER BLEY: -- do it, yes. At least the ones I have looked at.

MEMBER STETKAR: I will make a note, there's a NUREG-1852 that provides guidance, where it's written in the context of fire actions, but it's -- it's applied generally to demonstrate the feasibility of operator actions.

MR. PURCIARELLO: How about if we say the words "If active UHS mechanical components are not designed to automatically start, operator actions in the course of human factor standards are required to support -- " --

MEMBER BLEY: If that's what you mean, your response to the comments said we want it to be automatic, so I don't know if you meant what you said in the response --

MR. PURCIARELLO: Well we want --

MEMBER BLEY: -- so this is -- this would be okay with me, but I -- you know, that's -- we're just individuals here.

MR. PURCIARELLO: We want it to be

automatic, but you know, it's --

CHAIRMAN RAY: Well it's ambiguous as a stance, so it's up to you devise -- it's ambiguous in the sense that I think was stated, which is it sounds like maybe the operator action is due to a failure to automatically start --

MR. PURCIARELLO: Yes, it does sound that way, yes.

Okay, going on to position 1(k), we added the UHS inventory, the 30-day inventory, should take into account if it's a pond or a lake or a cooling tower, it should take into account evaporated losses, tower drip losses, and boundary leakage.

We specifically added boundary leakage later on in the process because there was a licensee that came in that had a 20 percent reduction in their UHS, and they said well you didn't say we had to account for boundary leakage, you didn't say it was valve leakage, you didn't say we had to account for that, so even though we didn't accept that --

MEMBER BLEY: Could we have missed something here? Shouldn't you say all sources of -- all losses, I think?

You've been very specific here, and maybe we forgot something, and then they would say well you

didn't tell us we had to look for -- you have to look for all the ways this water might go away is what you're really saying, right?

MEMBER SCHULTZ: All losses such as -- including in that phrase --

MEMBER BLEY: Just said --

MEMBER SCHULTZ: -- leakage because it was forgotten.

MR. PURCIARELLO: Okay, all losses --

MEMBER BLEY: This might be a complete set, but it might not be.

MR. PURCIARELLO: Okay, we can rephrase that to take in the cases we haven't considered.

Okay, slide 11.

This is on regulatory position 2. We -- this is on the capability to withstand natural phenomena and site hazards. In position a(1), we describe the terminology GDC 2 just to be explicit that that's the natural phenomena that we're referring to. It is really no change in the position.

In regulatory position a(4), we expounded upon manmade failures to include reservoirs, dams, and any type of water-retaining structure, both upstream and downstream of the site, including the potential for any blockage that that may cause, that that's a -- the

position previously just said "other manmade failures."

And regulatory position a(5) is a new position, and it talks about any changes in the notion that lake level caused by climatological conditions that result from human or natural causes -- this is sort of a way of referring to, in a way, possible global warming, when it talks about human or natural causes, and we just felt that it had to take that into account.

MEMBER BROWN: How do you expect them to do that? They're supposed to project out 30 years when nobody else knows what they're doing right now.

MR. PURCIARELLO: Well, we made a statement about --

MEMBER BROWN: The life of the license or whatever it is?

MR. PURCIARELLO: We made a statement in regulatory position (c)(1)(e) that current literature on possible changes in climatological conditions in the site region should also be reviewed to be confident that the methods used to predict weather extremes are reasonable, so we are asking them to review current literature, which we don't know what it is going to be like five, ten years from now. I mean it's --

MEMBER BROWN: I mean it just seemed kind of vague for the licensees. I am just thinking of the

licensees, how in the world do you comply with that? That was my thought.

CHAIRMAN RAY: Well, the -- I guess, Charlie --

MEMBER BROWN: Oh, well you've got more experience with that, I just --

CHAIRMAN RAY: I would respond that they would just do their best. The point is, do you include recognition of climate change or do you exclude it? And this is just an effort to include it.

MR. PURCIARELLO: Right, exactly. It says it needs to be included, but we don't know what that is going to be in the future.

MEMBER BROWN: Okay.

CHAIRMAN RAY: You can say we're addressing it by saying we don't believe there is such a thing, therefore we haven't included it, so --

MEMBER BROWN: Well no, I am not implying one way or --

(Laughter.)

MEMBER STETKAR: For the record, this is a Subcommittee meeting, and we speak as individuals.

MEMBER BROWN: I was not trying to make a claim one way or the other, I just was thinking about it's kind of a -- you know, everybody is arguing about

it, and it varies from place to place, so -- so anyway, that is fine, go ahead.

MEMBER STETKAR: Jerry, before you go to the next slide, you did not include (a)(2) and (a)(3), which I had a couple of questions about those.

(a)(2) says that you need to account for the site-related events that "historically have occurred or that may reasonably be expected to occur during the plant lifetime," and (a)(3) says you need to account for "reasonably probable combinations of less severe natural phenomena or site-related events."

And there are also several other places in the guidance, the background especially, that use these terms like "reasonably expected performance," "reasonably expected to occur." What is "reasonably expected to occur during the plant lifetime"? Is it a 90 percent change that something might occur? Is it a 10 percent chance? Is it a 1 percent chance? Is it a 10^{-5} chance? Is it -- what is "reasonably expected"?

MR. PURCIARELLO: Well, I think case in point, let's say like there's a refinery across the river from a plant, what's the chances of having a fire and explosion there? Well, I mean, you know, I don't know, but that would have to be discussed at the time of licensing, you know, if that's reasonable or not.

It's -- can it happen? Well, you know, that would have to be discussed then. I agree, it's -- it's very subjective, it's not precise, but I don't know how to make it precise. You know, it's telling the applicants that they have to look at what's around them and to make a reasonable assessment of what might happen based on what's there, and then discuss it with the staff in their application, and then it would have to be resolved at that point.

MEMBER STETKAR: How does the staff know what is reasonable?

MR. PURCIARELLO: Well, it's a judgment call.

MEMBER STETKAR: Okay. I note that 10^{-7} per year exceedance frequency for high winds is considered reasonably small, 10^{-6} isn't, 10^{-4} exceedance frequency for a design-basis earthquake is considered reasonably small. That's a factor of a thousand difference in someone's interpretation of what might be reasonable. How do we resolve this, this vague notion that keeps permeating this stuff about "reasonable probability" and "reasonably expected" and just leaving it up to your judgment versus my judgment and two other individuals' judgment for a different site at a different time?

MR. PURCIARELLO: Maybe we should talk to our PRA people and see how they would reword this, if it needs to be reworded.

MEMBER STETKAR: Okay, because --

MR. PURCIARELLO: We can do that, we can talk to our PRA people and say this is what we -- this is what we've said, is this statement reasonable? Well, we wouldn't say that, but --

(Laughter.)

MEMBER STETKAR: But you see, there's part of this -- we have regulatory guidance that has been developed over a long period of time stretching back into the -- in this case, the 70s, and there is terminology that has been used, and there's a developing set of notions that are just being perpetuated in many cases, and it does result in things like well, we have to design against a 10^{-7} three-second maximum gust wind speed, but we only have to design against a 10^{-4} design-basis earthquake, or maybe 10^{-5}, we're not quite sure, somewhere in that decade where that design-basis earthquake is. And both of those apparently are considered reasonably probable events because we're requiring people to design against them.

CHAIRMAN RAY: John, are we at a point where we're asking the question should this Reg Guide

be transitioned other, deterministic terminology --

MEMBER STETKAR: Not necessarily, I am just challenging the staff that we ought to try to get away from this vague concept that's left up to the judgment of the individuals of what is reasonably probable.

CHAIRMAN RAY: Yes --

MEMBER STETKAR: I am not necessarily advocating a specific number.

CHAIRMAN RAY: The thing that I applied to it in my review was, well, this is still in the deterministic world where we don't attempt to get beyond --

MR. PURCIARELLO: We can take out the word "reasonably" and just say "probably combinations."

MEMBER STETKAR: 10^{-30} is probable, there's a probability. Meteorite strikes are -- I can calculate the frequency of meteorite strikes.

MEMBER SCHULTZ: "Reasonable" is good, but there needs to be something attached to it so that any individual will see it the same way as another.

MEMBER STETKAR: Some individuals would argue --

MEMBER BLEY: And we've done that.

MEMBER STETKAR: That -- and we've done it

in the past -- some individuals would argue that no, 10^{-7} design-basis wind speed is a reasonably probable event, and you need to consider it.

MR. PURCIARELLO: Couldn't that discussion happen at the time of application? If we wrote it like this, and that discussion you're talking about, that could happen at the time of application?

MEMBER BLEY: Well the problem that happens then is every application comes up with a different judgment about that, and --

CHAIRMAN RAY: Well --

MEMBER BLEY: -- and we're regulating people differently.

CHAIRMAN RAY: We are, in accordance with Commission policy, seeking to move out of the world that I thought this Reg Guide was still in, which is the deterministic world in which we use this kind of terminology for design-basis earthquakes, not for safe-shutdown earthquakes anymore.

But so in the area of seismology, we've moved into probabilistic terminology and meteorological conditions associated with design, wind speeds and so on.

I just assumed you hadn't done that here, but if the point is -- it seems to me like there ought

to be a consistent policy if we're updating reg guides to make that transition where it's practical to do, and I guess then the question should be left to you, well, was that deliberately not done here for some reason?

MR. PURCIARELLO: Well I mean we're talking about site-related events which are not -- which can be unique to each site. I mean, we can't say we're talking about an earthquake or anything. We're talking about a refinery, we're talking about a dam breaking, we're talking about, you know, something that is unique to that position.

MEMBER STETKAR: That's true. It's absolutely true. I don't think anybody is arguing with that.

But in some sense, if I go back to my original question, what is, in the Staff's judgment, a reasonably probable event? Is it something that has got a 90 percent chance of occurring during the lifetime of the plant, the expected lifetime of the plant? Is it 10 percent? Is it 1 percent? Is it 1/100th of 1 percent?

You know, what -- what is that notion of reasonably probable? And I am -- and there, you know, whether I am looking at a refinery explosion or whether I am looking at an earthquake or whether I'm looking at,

you know, some other phenomenon, manmade or natural, that at least gives me some sense of what you mean by "reasonably expected to occur."

MEMBER BLEY: We had concepts like that years ago, and you talked about transients and some abnormal operating occurrences and accidents, and they had to do with whether you expect to see them routinely or maybe once in the life of the plant, or you don't expect to see it. Something at least puts some bounds on what we're talking about, and that is kind of where we're pushing, so --

MR. PURCIARELLO: Yes. Maybe we can look for other guidance on --

MEMBER BLEY: And if we're talking about something here that takes out the ultimate heat sink, then that is a pretty important thing, so it ought to be --

MR. PURCIARELLO: Yes.

MEMBER BLEY: -- not very likely at all.

MEMBER STETKAR: Not very likely to occur during the life of the plant, but even then, that's not -- I don't know what "not very likely" because some people's --

MR. PURCIARELLO: Maybe our -- this is just a maybe -- maybe our PRA people have some data on -- they

have a document that lists probabilities of certain events happening, and then we can just refer them to that document. I am not sure how to handle, I am not sure --

MEMBER STETKAR: You don't want to do that because every site and every hazard is different, especially if you're talking about manmade hazards that could affect pipelines that are delivering water or what have you.

MR. PURCIARELLO: Do you have a suggestion how we should reword this?

MEMBER STETKAR: I -- I have suggestions, but --

MR. PURCIARELLO: We'll take your suggestions.

MEMBER STETKAR: Hmm?

MR. PURCIARELLO: We'll take your suggestions.

MEMBER STETKAR: I -- we ought not to be writing your guidance, and again, this is just individual members of the Subcommittee, so there's a real danger of individuals on a Subcommittee proposing verbiage.

CHAIRMAN RAY: Well again, I think this is more of a -- a policy question than it is a pointing at

some particular use of the term "reasonably probable."

Are we -- because that is the deterministic terminology we've used in the past, right? Okay.

MEMBER STETKAR: Well, but even in the deterministic world, there are certain screens that are applied.

CHAIRMAN RAY: I --

MEMBER STETKAR: There is a screen that is applied that says for high winds, I can screen out things if -- if the frequency is less than 10^{-7} per year. That is in the reg guide.

MEMBER BROWN: Even on a deterministic basis of terminology?

MEMBER STETKAR: That is part of -- it is part of the term.

MEMBER BROWN: Okay.

MEMBER STETKAR: I don't need to consider something that is -- I don't need to consider the once-in-500-billion-year something extrapolated, so even in the deterministic world, there are elements of screening frequencies introduced in the guidance. They are not introduced -- in my opinion they're not introduced consistently, which is why I always come up with winds and the seismic events, but those notions do appear even in the deterministic world.

MEMBER BROWN: So it's not above them taking the approach of looking for that screening type level effect --

MEMBER STETKAR: It --

MEMBER BROWN: -- and put it into the Reg Guide for consideration.

MEMBER STETKAR: That's right --

MEMBER BROWN: I am just --

MEMBER STETKAR: -- except all I am warning is that you have to be careful about not using specific -- you know, saying well if you have a refinery located within, you know, two kilometers of the plant, the frequency of that refinery exploding needs to be less than x, and if you have something else, that isn't the notion I am after here.

The notion is what, for this particular function, do we consider a de minimis risk? So it's that below that, it's not considered reasonably probable, and I don't need to consider it.

MR. PURCIARELLO: You think we should put a number in there? Am I understanding --

MEMBER STETKAR: That is -- you know, that is up to you guys.

MR. PURCIARELLO: I mean, are you hinting at putting a number in there? Is that kind of what

you're --

MEMBER STETKAR: That's -- I --

CHAIRMAN RAY: Well, it couldn't be a number that you just picked just to satisfy the need for a number. I mean, it's got to -- to me, at least, it's got to reflect some consistent policy approach to, in this case, external hazards.

And you're saying if -- if they're less than the -- they're less severe natural phenomena, then we've got to consider combinations of them.

I mean, these -- this is more of a policy decision than it is let's just pick a number and move on.

MEMBER STETKAR: I'll give you an example.

In the natural hazards area, you say that the structures need to be designed against wind loading or something like that. There's guidance on wind loading that says I don't need to worry about things that has an exceedance frequency less than 10^{-7} per year.

So in principle, you know, you say well I need to design my structures for the ultimate heat sink against that type of wind load, and yet in these other areas, I am left to negotiate over what is reasonably expected to occur.

So there -- you know, what I am saying is

there are implications in other parts of the guidance here that do tie into numbers if you look at other regulatory guidance that are out there for those phenomena, whether I am talking about seismic events or whether I am talking about high winds and tornadoes or things like that. We don't have numbers like that for flooding yet.

MEMBER SCHULTZ: Since we are asking the staff to determine an approach here, taking what you have written and talking with the PRA team would be a good place to start, to see how that might be appropriately redesigned in terms of --

MEMBER STETKAR: I know that the PRA folks are looking at -- they have told us, anyway, that they are looking at the overall Regulatory Guidance and screening criteria from a risk assessment perspective of what are reasonable screening criteria for external hazards.

I have been told they're doing that. I don't know where they are in that process. Because they are aware of these discrepancies in terms of even in the PRA world of things that say well this is -- is an approved screening number.

So I know that they're thinking about it. I don't know where they are.

MR. LIN: Okay, because we'll -- next, we'll talk to the PRA.

MEMBER SKILLMAN: Before you move out of RP 2, I'd like to ask a question, please.

MR. PURCIARELLO: Sure.

MEMBER SKILLMAN: This natural phenomenon and size hazards design for the UHS, where have you given consideration to security?

MR. PURCIARELLO: We haven't in this Reg Guide. I mean, we -- the front part, we talk about GDC 2, 4, 44, 45, and 46. That is the regulations that this is giving guidance for. There is no guidance here in regards to security.

MEMBER SKILLMAN: Should there be?

MR. PURCIARELLO: Well there should be somewhere, I mean, some points that should be in this Reg Guide are not --

MEMBER BROWN: Is the ultimate heat sink within -- well, I guess if it's a lake, it's not within the plant boundaries, you've got to fight going out to it, so --

MEMBER SKILLMAN: It isn't just the lake, it's getting --

MEMBER BROWN: No, I am just -- I am just trying to understand or question about how you apply

this. I guess for, you know, towers and/or mechanical draft, whatever it is, or the big reservoir that would be -- that you build like, depending on which plant it is, you'd have it -- it would be within the protected physical, which is covered by

MEMBER BLEY: It can be either one, yes.

MEMBER BROWN: So it could be outside? Okay, that's the reason I thought of it. I don't know how to address that, just that you've got to do it somehow.

MEMBER SKILLMAN: It seems to me that there are -- it might be beneficial to simply be clear that security-related issues are covered elsewhere.

MR. PURCIARELLO: Greg, would you say something?

MR. CASTO: I didn't really want to.

(Laughter.)

MR. CASTO: Again, just by --

CHAIRMAN RAY: Your name?

MR. CASTO: Greg Casto.

CHAIRMAN RAY: And --

MR. CASTO: Oh, I am sorry, Balance of Plant, DSS.

CHAIRMAN RAY: Thank you.

MR. CASTO: Thanks, sorry.

I am on a working group right now with NSIR, and not specific to ultimate heat sink, but one of the areas we're looking at are what are the established requirements and systems covered for definition of vital equipment and designation of vital areas?

So this would be one example that would be included under that, and there are -- there's security-based regulations, guidance, and documents that define that and -- and discuss that criteria and how to determine it.

So I think this is captured elsewhere, but, you know, I'll listen to your comments, and if we've got questions we need to get back to you, then we can do that.

MEMBER SKILLMAN: Thank you for that explanation.

My comment would be that this member would suggest that there be a line that says security is covered elsewhere, and here's where it's covered, and I would leave it at that.

CHAIRMAN RAY: Okay.

Okay. As a check, we've got an hour and twenty minutes to finish all of the things we need to do, so please proceed.

MR. PURCIARELLO: Okay, slide 12.

These regulatory positions 2(c), (d), and

(e) are all new guidelines that weren't in the previous Rev that are in there now, and in regulatory position 2(c), we mention that the applicant should take into account the possibility of icing, which includes freezing of any storage facility like the bottom of a wet cooling tower or, you know, there's things like frazil ice that's happened at some sites, and that's taken into account -- that should be taken into account by the licensee or the applicant.

Then in regulatory position 2(d), we -- we're telling the licensees to take into account the dynamic effects associated with GDC 4, which are things like energy line breaks, pipe whip, anything that may possibly damage the ultimate heat sink, that has to be taken into account in accordance with GDC 4.

And then regulatory position 2(e) tells the applicants to take into consideration operating experience including things such as the clogging of the suction bays by any type of silt or aquatic, fish, biological growth. There's cases where flooding has caused -- it has washed up the debris from the banks into the ultimate heat sink and caused the loss of service water, loss of ultimate heat sink, so we're telling the applicants to take the operating experience of the last four years into account.

Next slide.

MEMBER STETKAR: Jerry, before you leave this, (b), this is -- Dr. Bley mentioned this earlier in terms of adding specificity that may indeed inadvertently omit things. In (c)(2)(b), it says "UHS features constructed specifically for normal operation and shutdown of nuclear power units that do not provide a post-accident safety function and are not required to be designed to withstand the SSE, tornadoes, or the probable maximum flood," and it goes on.

What you did between the previous version and the current draft is to add tornadoes. Well, that's good, except for the fact that I know there are sites in the United States where the wind loading is driven by hurricanes. So does that mean that I don't need to consider hurricanes?

This is an example of where you try to add specificity, if you're not careful, you can inadvertently exclude things, and as an applicant, say well, okay, I considered tornadoes, they're not a big deal at my site. I didn't have to consider hurricanes. They didn't tell me I had to consider hurricanes.

Now just, you know, just adding hurricanes, does that solve the problem? Well, maybe. But sometimes adding a lot of specificity inadvertently

omits things.

MEMBER SKILLMAN: John, we reviewed the draft guide. It was intended to include high winds, straight winds, tornadoes, hurricanes. So perhaps that would be --

MEMBER STETKAR: The wind -- the wind guide does --

MEMBER SKILLMAN: The wind guide.

MEMBER STETKAR: -- that is right. But this one B- it pulls out -- you know, and they added tornadoes specifically because they weren't -- the previous version just said safe shutdown, earthquake, or the probable maximum flood, whatever that probable maximum flood is.

MEMBER BALLINGER: But does the -- even, the rationale for doing that, does probable maximum flood cover hurricanes in effect?

MEMBER STETKAR: No. Hurricanes have water related to them, and they have wind related to them --

MEMBER BALLINGER: Okay, okay.

MEMBER STETKAR: -- and the wind loading at some sites, most notably along the Gulf Coast in the southeastern U.S., is determined by straight-line hurricane winds, not by tornadoes.

Just think about it. It's just a comment, but it's something I stumbled across because we've been following this. There are differences in the way people treat hurricanes and tornadoes that we've been commenting on for a couple of years now, and they seem to be coming together.

MR. PURCIARELLO: Actually, if we took out all those terms, SSE, tornadoes, and probable maximum flood, and just said events associated with GDC 2, then that would be everything.

MEMBER STETKAR: That might be a way of doing it, but again, I don't think it's appropriate for --

MR. PURCIARELLO: I think that would be --

MEMBER STETKAR: -- individuals in a Subcommittee meeting to necessarily propose language.

MR. PURCIARELLO: Okay, thank you.

Page 13. Page 13, like I said before, reg positions 3 and 4 were just minor clarifications, we really didn't change the regulatory positions, so I am going on to regulatory position 5.

This is a new -- a new regulatory position. We added words about that we needed routine inspection and a maintenance program for the UHS, all the SSC associated with it for detection of corrosion, erosion,

and other problems that happen over time in the use.

And in regulatory position 5(b), we added that the pre-service inspection and these period test programs should also include the heat exchangers that are connected to the UHS.

In regulatory position 5(c), we said that these heat exchangers should be -- the testing of it should be performed in accordance with that manual listed there, OM-2012, the Operation and Maintenance Manual.

And in (d), we said -- this is what we discussed a little bit earlier about these -- about dams that are within the -- that are within the jurisdiction of the applicant or licensee should be in the Maintenance Rule, and we added that, and for components or for SSC that's not within the -- not within the jurisdiction, I believe we are going to come up with a more specific statement on that -- so that's how we're going to handle that.

CHAIRMAN RAY: Yes, I mean the one about if it's not within your jurisdiction is a comment that we -- that several of us have made, anyway.

MR. PURCIARELLO: Right.

MEMBER BALLINGER: With respect to item (c), since we only revise these things about every 40

years, in this case, using the word ASME OM-2012 might, after 20 years, be not appropriate. So can -- can we think about using terms like "appropriate ASME procedures" or "related to Operation and Maintenance" or something like that? Because otherwise --

MEMBER BLEY: They promised that this won't --

MEMBER BALLINGER: There's a bunch of stuff there that --

MEMBER BLEY: -- that this won't -- that it won't go this way in the future, right? These are going to be reviewed --

MR. LIN: Well, there's a Reg Guide Program that --

MEMBER BLEY: Some current version or something like that, but --

MEMBER STETKAR: Let's let Bruce get that on the record clearly.

MR. LIN: Right. There's a Reg Guide Program that we're committed to at least review the reg guides every five years, whether we determine whether it needs to be revised or feels good as is, and then we have -- it would be in the record, every five years, we review all the reg guides.

So if we issue this in 2015, then in 2020,

we will revisit this Reg Guide and determine we need to revise it or the Reg Guide is good as is.

MEMBER RICCARDELLA: Why don't you say "the latest approved version of ASME" --

MR. LIN: Yes, we can do that.

MEMBER RICCARDELLA: "2012" --

MEMBER BALLINGER: Something like that, yes. Because there's an ANSI guide on flooding which is referred to in all of the flooding stuff, dam failures and stuff, which doesn't exist anymore, you can't find it.

MR. PURCIARELLO: Maybe we should say the "latest approved" because the latest may come out and may not be approved yet --

MEMBER BLEY: I think the "approved" language does it. I mean, there are other standards that no longer exist that are still part of the regulation here, and they still have to use them.

MR. PURCIARELLO: Slide 14, please.

And we added regulatory position 6 on water chemistry and microbiological control, these are new positions.

We stated that the quality of water in cooling towers, ponds, and heat exchangers should be considered in the design of the UHS, and that there

should be a chemical provision, or the limit of microbiological growth or macrobiological growth, and corrosion, any type of age-related scaling associated with the UHS.

And then we -- if there's any infrequently used loops, that they should be flushed and tested periodically.

Okay --

MEMBER BLEY: I just have a curiosity question.

MR. PURCIARELLO: Yes.

MEMBER BLEY: Do you know what they're using these days? You used to use chromium, but you can't use that anymore.

MEMBER BALLINGER: You would get arrested for that.

MEMBER BLEY: Right.

MR. PURCIARELLO: You mean for corrosion control, or --

MEMBER BLEY: Yes. Biofouling, that sort of stuff.

PARTICIPANT: Hypochlorite.

MEMBER BLEY: Hypochlorite?

PARTICIPANT: Some modification.

MEMBER BALLINGER: Or ozone, hydrogen

peroxide, something that --

MEMBER SKILLMAN: Yes, it is chlorite or peroxide, that's environmentally acceptable.

MR. PURCIARELLO: Next slide, please.

We're on slide 15 right now, and this -- the draft Reg Guide was issued in 2013. We received public comments from NEI, the general public, and some anonymous comments.

We addressed all the comments. Most of them were minor. Any significant comments, I will just talk about now in the next slide.

Slide 16. This statement came from NEI, and they said that our discussion of the UHS was too prescriptive, that we're talking about beyond-design-basis considerations, we're talking about Fukushima-related issues.

And our response, we agreed in part and disagreed in part. We -- basically, we're not talking about anything about beyond-design-basis events, we're leaving that to the Fukushima Task Force, but we did take out any type of statement associated with the -- I think we were using the term "global warming" then, or possibly change, so we took that out, and we added these -- we toned down that language and put down these two statements you see in red here that into account

possible climatological conditions resulting from human or natural causes, that they should look at current literature associated with that in the future.

Next slide, please. This is the one on the Maintenance Rule, and I think we've talked about this before, about -- about structures within the jurisdiction of the licensee and structures not within the jurisdiction of the licensee, and this has already been addressed, we've talked about this one before.

Next slide, please. This slide came in -- this comment came in talking about the possibility of a sea level rise due to storm surge and possible clogging debris and saying that the sea level may rise two meters by 2080, that must be considered.

And we agreed in part with this comment. We actually included the language about sea level changes in this Reg Guide even before this comment, and that comment is in there already, and we added that reg position 5 under 2(a) saying that potential changes in ocean, river, or lake levels as a result of severe natural events or possible changes in climatological conditions in the site region resulting from human or natural causes, that takes into account the possible global warming issue, that may be reasonably expected to occur during the plant lifetime.

Next slide, please. This comment on page 19 referred to the fact that we -- or referred to the statement that we should include that in the -- for the UHSes that require transient analysis, after the worst critical time period, that we should include an additional 24 hours after that, and we disagreed with that. We didn't relax any considerations. We redefined the term "critical heat load," or, I mean, I am sorry, "critical time period," and we -- including the additional 24-hour worst period, those are only examples used in the existing Reg Guide. They used the term as an example "five days after the accident," "one day after the accident," "thirty days after" -- that was meant to be an example.

We changed the language such that the critical time period should be calculated for each design of the ultimate heat sink, whether it's two hours, like in a cooling tower design, or a day, like in a cooling lake design, that they had to figure out what that critical time period is. There's two critical time periods, one associated with the peak temperature of the water going into the plant to cool components, and the other critical time period associated with loss of evaporation, the loss of water due to evaporation, and will you have enough for 30 days?

And this doesn't -- for lakes and oceans, large lakes and oceans and rivers, it's a -- it's a moot point because it doesn't -- you're not worried about evaporation, you're not worried about a critical time period because water is not recirculating back into the plant, being changed by the plant during the first few hours of the accident, so --

MEMBER BROWN: Is drought thought about in terms of the manmade lakes?

I only made that a question because I know in some of my travels, you see some of these manmade lakes that have turned into recreational facilities, and now they're -- the water levels over a five-year period are now 20 or 25 feet or more lower than they were before, and I didn't -- I guess I didn't understand whether this -- I understand the natural stuff, but the manmade ones are somewhat more susceptible.

MR. PURCIARELLO: Yes. Well, like I think LaSalle for example, there is a manmade lake there and a submerged UHS, and they pump water in from a river that's nearby to fill the lake if the lake level goes down.

MEMBER BROWN: Okay, so there is some consideration -- there's something already in place -- but that just means they have taken that into

consideration. But is there a requirement? I mean, is there a position relative to that for these types of sources?

Whether somebody actually did something, because it was a possibility doesn't mean it's necessarily highlighted for consideration in the future.

MR. PURCIARELLO: That gets into the weather and hydrology area, and there certainly is a hydrology analysis done in chapter 2 of the FSAR, and I can't speak to that as far as -- drought is taken into consideration, I know they take that into account, but I don't feel I can answer your question in more detail than that.

MEMBER STETKAR: If you search the document, it is mentioned in the background, it is --

MR. LIN: Yes, in the Standard Review Plan --

MEMBER STETKAR: "Because of the importance of the UHS, the safety of these functions should be ensured during the following design-basis events postulated for the site: for example, a safe-shutdown earthquake, design-basis tornado, hurricane, flood, or drought." So it is -- there is no further guidance on treatment. Yes, that is on page 5

of the document.

MEMBER BROWN: Okay. I obviously missed it.

MEMBER STETKAR: There is no further discussion about, you know, how you do --

MEMBER BROWN: No, I just --

MEMBER STETKAR: -- it does at least highlight --

MEMBER BROWN: -- as long as the term is provided in there, that is fine. I just wanted to make sure we covered the unusual situation, because the manmade stuff tends to get hit harder by that than some of the other sources. At least that's my thought process anyway.

MR. PURCIARELLO: Can we go to slide 20?

This was a comment dealing with the -- the cooling margin that's supposed to be designed into the ultimate heat sink, and this comment stated that the way the guidance was worded, that we allowed for significant delays in cooling of a non-accident unit to gain transient analysis margin.

And we partially agreed with that comment. We added the requirement for the -- I should say the guideline that they should take into account spent fuel pool heat, but looking at other guidance that we had,

in GDC 5 and Branch Technical Position 5-4, that the non-accident units were required to be cooled down in an orderly way, the branch technical position on the RHR system says that the -- again, we get into the term "reasonable," I am not sure that is going to be acceptable here, but it says "Within a reasonable period of time following shutdown assuming the most limiting single failure."

This particular commenter was saying that the non-accident unit should be brought to cooldown -- that the design of the UHS should be allowing the non-accident units to be brought to cooldown immediately and not have any margin about holding any of the non-accident units in, let's say, a hot standby state, and allowing the capacity to happen as decay heat went down for the non-accident units.

And so we partially agreed with this comment, but we didn't get more prescriptive than in our requirement for -- other than what is already in GDC 2 and Branch Technical Position 5.4. Any comments on that?

CHAIRMAN RAY: Now we have recently looked at Watts Bar II, for example, which shares a system and may even have to return Mode 4 to Mode 3 in order to --

MR. PURCIARELLO: Yes, we are not going to

allow that by the way, but that's okay.

CHAIRMAN RAY: Okay. I mean, that is the case there. So I think we had that in mind as we read through this.

MEMBER BLEY: Just a -- two curiosities for me here.

BTP 5-4 is -- I was going to ask you, as you make these revisions, I thought we were rolling the BTPs into the more formal guidance, but I see that BTP 5-4 is actually part of the SRP, so it is formal. Do you know where the requirement to go to cold shutdown came from? I think it's just an expedience thing. It is certainly not GDC 5.

MR. PURCIARELLO: Well I think GDC 5 does say go to cold --

MEMBER BLEY: No, it says "cooldown," and it doesn't force you to cold shutdown, and in fact that's come up in some of the newer -- in the passive plants, which don't go to cold shutdown.

CHAIRMAN RAY: But when that debate occurred, Dennis, my recollection was that it had to do with we're not going to require -- it was some position the Commission had taken.

MEMBER BLEY: Well, it was linked to a position the Commission had taken, but it was also in

the -- in BTP 5-4.

MR. PURCIARELLO: Well I think the question is what is safe shutdown? You know, do you have to be cooled down, or it can be on standby?

MEMBER STETKAR: I believe the Commission has determined that safe and stable shutdown does not require cold shutdown.

MEMBER BLEY: Yes, they have.

MR. PURCIARELLO: Yes, we have several different guidances on that, and a plant can stay in hot standby and still remove decay heat, although they run out of fresh water, and, you know, they need fresh water to pump into their steam generators, and when they run out of fresh water, then they have to pump seawater in or UHS water and service water, so I mean, it's an economical thing there, destroying the plant.

MEMBER BLEY: TMI ran on the hoggers for a year and a half or two years, and it stayed nice and cool down for the whole time.

MR. PURCIARELLO: I am sorry, TMI ran on what?

MEMBER BLEY: On the hoggers, they just sucked the vacuum on the -- on the main condenser and that kept them 180 degrees or something like that for a couple of years.

Anyway, you don't have to push this any further --

MR. PURCIARELLO: Well, the hoggers were maintained acting in the condenser, and you still had to have water going through the condenser, I would think, all the steam from your steam generator in the condenser, you still have to have some cooling water.

But any further questions on this issue, comments?

(No audible response.)

MR. PURCIARELLO: Okay, last slide.

CHAIRMAN RAY: Before you move on, because you didn't discuss one item of curiosity more than anything else, at least in my case.

There was this debate about indispensable consideration versus essential consideration to apply the forward fit concept to the application of this reg guide. Can you elaborate some more?

I mean, some of us aren't that familiar with forward fit. We understand backfit reasonably well, but tell us about this.

MR. PURCIARELLO: I think all the reg guides have language on forward fit, and it's standard boilerplate language.

CHAIRMAN RAY: Well, it references this

2010 General Counsel, and it's characterized as a concept, "the forward fit concept to new or different positions contained in Revision 3."

And I take it it's not on the top of your list of -- of issues.

MR. PURCIARELLO: Under implementation --

CHAIRMAN RAY: What?

MR. PURCIARELLO: -- under implementation -- I mean, I am not sure I understand your question. I mean --

CHAIRMAN RAY: The question is tell us some more about forward fit as a concept because according to what we read here, if it was something that was detailed in a 2010 General Counsel letter and, like I said, we don't normally talk about forward fit as a concept, maybe one of my colleagues here can say that they're familiar with it, but --

MEMBER BLEY: Information for us, it's something we don't know.

CHAIRMAN RAY: We've got time here, and I wanted to ask you about it.

MR. PURCIARELLO: Yes. Forward fit as I understand it now, I am not sure if this is answering your question, it may be saying something you already know. Forward fit is when a new regulation comes out,

and then you have a reg guide possibly associated with that regulation, and then -- then you would require existing licensees then to implement that reg guide because it's on a new regulation.

But if we write -- there is no new regulation associated with this particular Reg Guide. I mean, GDC 2, 4, 44, 45, and 46 do not change if we as a guideline -- if we as an Agency come up with a new guideline on how we're interpreting those regulations, we can't forward fit that into an existing licensee because we're not -- we're not changing any regulation.

We can't change a new -- we can't forward fit a new -- we can't backfit, I should say, a new interpretation of a regulation onto a licensee, but if it's a new regulation, then they -- all licensees have to comply with new regulations. If Fukushima should become a new regulation, then we have to forward fit, and they would be required to be forward fit.

CHAIRMAN RAY: Well this goes to the issue of -- let me just read from the response to the comment which was NEI 10.

And first, the response says "Specifically, NEI stated that the essential consideration criteria should limit application of the forward fit concept to new or different positions

contained in Revision 3 that are indispensable in order for the NRC staff to approve the voluntary license request at hand."

So we're talking about a license request of some kind from a licensee. And the issue surrounded, it says "The staff concluded that an indispensable consideration was an unnecessarily higher standard than an essential consideration, and NEI failed to show why the less stringent test would be insufficiently protected. The higher standard would unduly limit the NRC's capability to make regulatory decisions that are defensible and have public confidence."

So the upshot is we're talking about an applicant coming in wanting to amend their license, the issue of should requirements in this Revision 3 apply, given that they're making this application, and the standard is well if the -- if the positions in reference 3 are indispensable in order for the NRC to approve the license request as opposed to being merely essential, indispensable versus essential.

And if it's -- we concluded that if it -- it just had to meet the essential test, and then the requirement could be applied to the application, the response to the application, as opposed to being indispensable, which is a higher standard according to

what we've said here.

So I -- I perceive that the forward fit concept as it's characterized is you are -- if you want to amend your license, you are subject to the then-applicable requirements in the area, and the only issue is are those newer requirements indispensable or essential? That is what I read out of this.

MR. PURCIARELLO: I think -- now I understand your question.

CHAIRMAN RAY: Yes.

MR. PURCIARELLO: And you're asking what is the difference between those two definitions of those two words?

CHAIRMAN RAY: Well, I am -- I am also asking -- I am just not familiar with the term "forward fit concept," but I am asking do I have it right? And I guess you are acknowledging that I do understand what --

MR. PURCIARELLO: Forward fit is when you're working and -- yes, you are forward fitting a new interpretation of a regulation or a regulation itself, and the two terminologies that you use, how do you distinguish between the two, I don't know.

CHAIRMAN RAY: Okay. All right. But anyway, it has to do with some action taken by the

licensee to amend their license, and is this new requirement essential or indispensable is the difference that was being debated here.

MR. LIN: I see the response to this comment actually came from the General Counsel --

CHAIRMAN RAY: No doubt, I can figure that out too.

MR. LIN: Okay.

CHAIRMAN RAY: But I thought maybe you guys had some insight to it.

MR. LIN: I just wanted to --

CHAIRMAN RAY: Yes. No, I -- I understood that was the case. All right. Enough of that. Go ahead.

MR. PURCIARELLO: We are down to the last slide.

So in conclusion, we've revised Reg Guide 1.27 to address the current regulations and the lessons learned in the last 40 years, last 39 years, and Reg Guide 1.27 provides the necessary guidance such that applicants, licensees, will -- will design their plans in accordance with NRC rules and regulations.

We received public comments and we addressed those comments, and up until this meeting, I thought we were ready for publication. Maybe not quite

yet.

CHAIRMAN RAY: Okay. Now we will go to any public comments in a moment, but first, let me ask if the members have any questions, further questions for the staff.

MEMBER BALLINGER: I have one sort of maybe naive question, and that is the most recent COL that was approved, has somebody taken this Reg Guide and then go to that most recently approved license and say is what we say here consistent with what the licensee or the applicant has given us?

CHAIRMAN RAY: The only one would be --

MEMBER SKILLMAN: The EPR.

MEMBER BALLINGER: EPR?

MEMBER STETKAR: No. The most recently approved COL was ABWR --

MEMBER SKILLMAN: Oh no no no, I am not suggesting EPR was approved.

MEMBER STETKAR: Oh.

MEMBER SKILLMAN: This would apply to an EPR is all I am saying.

MEMBER STETKAR: This would apply for EPR, that is right.

MEMBER SKILLMAN: Yes.

MEMBER STETKAR: ABWR.

MEMBER BALLINGER: It is kind of a gut check.

MEMBER CORRADINI: No, ABWR wouldn't apply. ABWR has got a passive containment design that wouldn't apply.

MEMBER SKILLMAN: Exactly.

MEMBER STETKAR: The only thing that's not in ESBWR is the pumps inside, and that's ABWR, ABWR.

MEMBER CORRADINI: I understand.

CHAIRMAN RAY: Ron, do you want to question further?

MEMBER BALLINGER: No.

MEMBER SKILLMAN: I've got one or two comments if I could, Mr. Chairman.

It seems to me that because of the very clear distinction you're making that this is not applicable to the passive plants, its title ought to say "For Non-Passive Plants." It seems to me that that ought to be part of this document. The title ought to clarify exactly what this applies to.

CHAIRMAN RAY: Well it is in the second paragraph.

MEMBER SKILLMAN: It's in the second paragraph. But the title -- I guess I've worked with reg guides for so many years, there are reg guides and

then there are reg guides. There are some that are junior varsity reg guides, and then there are some that really define the essential characteristics of the facility.

And this is one that I would say is a cardinal regulatory guide. And so if the thought is this is only applicable to the active plants, then its title should communicate that, and if there will be a new one in the future for passive plants, then it should have its own title.

Let me make one or two more comments.

In the background, which is on page 3, this is (b), and it's the second major paragraph, you identify that the function of the UHS is to absorb reactor decay heat and essential station heat loads.

Then, in the next paragraph, instead of using the term "reactor decay heat," you use the term "dissipation of residual heat."

MR. PURCIARELLO: Can you point, where is that again?

MEMBER SKILLMAN: Yes, I am on your page 3 of the Draft 3 --

MR. PURCIARELLO: Okay.

MEMBER SKILLMAN: -- and I would like to contrast the term "reactor decay heat" with your use of

the term "residual heat."

MR. PURCIARELLO: We should be consistent.

MEMBER SKILLMAN: It should be consistent, and "residual heat" is probably the correct term because the residual heat is probably the sum of the time point heat generation rate plus the sensible heat.

And you touched on this a while ago, and I will tell you, your shutdown analysis, say for a six-hour shutdown, is the sum of the decay heat generation rate plus the heat in the water, the heat in the tubes, the heat in the steam generators, the heat in the reactor coolant pumps, the heat in the steel, you know, all of that has to square in your heat balance. And for the 24-hour shutdown, it's got to do the same.

So in that context, the residual heat is really the sum of the sensible in all the metal plus the inventory of decay heat that has been generated at that point and to the point when you end the period.

So the terms, at least this member would suggest, are very important.

MR. PURCIARELLO: Okay, so we should use the -- be consistent and use the word "residual."

Again, is that -- that is in the second paragraph from the bottom?

MEMBER SKILLMAN: Yes. It is on Rev 3,

page 3, and it's the -- the pair of paragraphs that's following background, the first paragraph after background, the second paragraph after background.

MR. PURCIARELLO: Okay.

MEMBER SKILLMAN: And I'll be happy to give you my mark-up notes if that will --

MR. LIN: I have it.

MEMBER SKILLMAN: Okay.

I have one other question. On your page 5, you're giving examples of UHSes that the staff has found acceptable, and at the bottom of that list, you identify a cooling lake with a submerged pond.

A cooling lake with a submerged pond. So if my colleagues and I considered that, should we see this, if you will, as a reservoir, and embedded deep within that reservoir, a second reservoir?

MR. PURCIARELLO: Yes, well LaSalle has that. What they have is, you know, they have a cooling lake for their condensers, and that's a manmade lake, and it's only about five feet -- it isn't deep, five feet deep.

And then on the bottom of that, more close to the plant, it gets excavated even further, goes into the intake of the plant. That's a safety-related structure, so now if the lake should go away based on

an earthquake and the dikes break and the lake drains out into the field, that reservoir is left, and that is enough to -- it is supposed to be enough to mitigate and accident and bring the other unit to a cold shutdown condition.

MEMBER SKILLMAN: Well, I appreciate that explanation. That is what I thought you meant, and that's why I asked the question about security, and that's really all I want to say.

MR. PURCIARELLO: So you think that statement should be changed to --

MEMBER SKILLMAN: Nope.

MR. PURCIARELLO: Okay.

MEMBER SKILLMAN: Thank you.

CHAIRMAN RAY: Any other questions for the staff?

(No audible response.)

CHAIRMAN RAY: Peter, would you make sure the phone line is open please? Any questions from the audience?

Phone line is open, we understand. Is there anyone on the lines? If so, please acknowledge.

MR. LEWIS: Marvin Lewis.

CHAIRMAN RAY: Hi Marvin, good to hear from you, thank you. Is there anyone who wishes to make any

comment?

(No audible response.)

CHAIRMAN RAY: Hearing none, then we will go to the final part of our meeting, which is a discussion among the members.

And we'll -- I'll introduce it before asking for input by saying I think the main thing, at least to my mind, to understand, is whether there is any need for us to have a presentation at Full Committee, the purpose for which in my view would be if we thought there was some likelihood that the Committee would wish to write a letter on this. Otherwise, there is good attendance here at the Subcommittee, and I'm skeptical than we would need otherwise to take it to Full Committee.

So, but whatever comments you wish to make, but I would like you to address that question as well. And I will start with Pete.

MEMBER RICCARDELLA: I -- it doesn't seem to me that we need a Full Committee meeting on this subject, but --

CHAIRMAN RAY: Speak up please, Pete.

MEMBER RICCARDELLA: It doesn't seem to me that we need a Full Committee meeting on the subject, but just sort of an editorial comment on your slide

number 10, we've discussed this already, I just want to -- I think on the item (h), it doesn't show there, but you mentioned that the document includes some reference to Code Case 755 not being approved, on HDE piping. I think it would be a mistake to memorialize that issue with Code Case 755 in a document that is liable to be applicable for the next 30 or 40 years if history is any indication.

I think -- and it has nothing to do with the issue. The issue is fire-resistant versus non-fire-resistant. So I think you can do -- address that in a more general method that wouldn't get into that Code Case.

CHAIRMAN RAY: Okay. Anything else?

(No audible response.)

CHAIRMAN RAY: I'll note, of course, that the staff's intent is to update reg guides every five years going forward.

Mike.

MEMBER CORRADINI: I don't think there is a need for a letter. Given that everybody except for a couple of us are here, they have gotten all our informal comments, so assuming they understand them, I think this is good enough.

CHAIRMAN RAY: Thank you.

Steve?

MEMBER SCHULTZ: I agree with what has been stated. I think the presenters have been receptive to the comments of the Subcommittee, and I think that should be sufficient to allow them to move forward.

CHAIRMAN RAY: Dick?

MEMBER SKILLMAN: I don't think a letter is required. And I commend you, this is a good solid update of a very critical Regulatory Guide.

I still believe as an individual member that it would not be difficult to make this applicable to passive plants with the right text, maybe another sub-portion that says here is how this is applied, functionally, to the passive plants.

I agree with my colleague Harold Ray. If it is identified as functional, then there may be a basis to do that.

But I commend you on a really good job. Thanks.

CHAIRMAN RAY: Thank you, Dick.

Dana?

MEMBER POWERS: I -- I think the staff has done a good job on this Reg Guide.

However, I think that because we have invested time in the Subcommittee meeting, and that we

have made comments on this, that are obligated to bring this to the Committee and have a letter on it.

CHAIRMAN RAY: Anything else?

MEMBER POWERS: That is it.

CHAIRMAN RAY: Okay.

Dennis?

MEMBER BLEY: I think I agree with Dana. I don't think we have anything major to say, but we've had a long discussion, and then lots of things were raised, so it's probably worth it.

And I appreciate the presentations and discussions. Thank you.

CHAIRMAN RAY: John?

MEMBER STETKAR: Yes, I have been torn about the notion of Full Committee, and I -- I tend to be persuaded that we do speak as a Full Committee, we don't speak as individual members in the Subcommittee meeting, and that if -- we have made numerous comments. Individually, they might seem small, but part of what we do as a Full Committee is sort through what we think might be important enough for consideration by the staff, and in that sense, I think it probably would be worthwhile to bring it to the Full Committee.

CHAIRMAN RAY: Okay.

Mike?

MEMBER RYAN: I come down on the side of a short briefing, concise letter would be helpful for the record going forward. You know, you never know when that might come in handy or how that might evolve over time. I think it's good to capture the quality of the conversation at this point.

Thank you.

CHAIRMAN RAY: Ron?

MEMBER BALLINGER: I think I agree with everybody, the presentation was great as far as it goes.

But I also really agree with Dick that there may be a golden opportunity here to short-circuit the production of another reg guide, if you will, and expand this to include passive plants.

So that is one person -- so --

MEMBER POWERS: Well, I know we're valuing the time in discussion, but I think I agree with the staff that compartmentalizing the reg guides as much as possible is a net virtue, that it's better to have more reg guides than to have one that is all-encompassing.

With the attendant capacity you can use to misinterpret, to confound, I don't think I would go to great lengths to make reg guides very generic. I would prefer to keep them as focused as humanly possible so that you just don't run into so many difficulties.

I look at this reg guide, I don't look at this other reg guide.

MEMBER BALLINGER: I'll yield to Dick's expertise in that at least I am hearing that in his opinion, it's not a big deal to --

MEMBER POWERS: I don't care what kind of a deal it is. I would keep them -- I would have a reg guide for active plants and one for passive plants, one for BWRs, one for PWRs.

I would focus them down as much as I could just because 90 percent of our difficulties seem to be when things are taken from column A and column B inappropriately, or when there has been a misinterpretation of language that's inapplicable in an area --

CHAIRMAN RAY: And as somebody who was licensed plants before, I agree with Dana, more specific, and also I believe there is a big difference between passive and active plants for reasons that we won't go into now. It is a profound and big difference, and trying to write anything that applies to both of them is a challenge that we have the consequences, I think, Dana is speaking to.

Anything else on it?

MEMBER BALLINGER: I think we should write

a letter.

CHAIRMAN RAY: Okay.

Charlie?

MEMBER BROWN: Number one, I learned something in the slide in the presentation even on down to electrical gas, so it was an interesting meeting to attend for somebody like me who is not familiar with the plants.

Relative to the active versus passive, I totally agree with Dana. I don't -- I think you ought to separate these out.

I read the Reg Guide, and like 80 percent of it wouldn't -- that is a speculative number, but a lot of it would not even apply to the passive plants and could lead to confusion, and so I think a separate guide would be best.

Relative to a letter, it's a mixed bag. I mean, I -- it's probably not a bad idea because there are a number of new positions that have been established. It might be a decent idea to do a letter. You have to write it, so -- draft it.

If we make it five to five, then you can vote.

MEMBER POWERS: I think this is an example of the regulatory process, and it's well done, activity

-- and it all will allow the Committee to exercise its philosophical muscles, and --

MEMBER BLEY: And the discussion of the last five minutes argues for having a Committee position rather than 12 positions.

CHAIRMAN RAY: That's why we have this part of the Subcommittee process, to find out how everybody feels.

Anything else, Charlie?

MEMBER BROWN: Nope. You get to vote too, so --

CHAIRMAN RAY: Well, I do, but I think it's clear that we will ask you to come back to a Full Committee at a date that is yet to be decided.

There will be a meeting a noon today to review what's called Planning and Procedures, and there will be perhaps some information out of that.

Perhaps when you do come back, when you're asked to return, you'll have some other information that you've indicated you'll be looking for responses to comments that you've heard today from members, and then whether we write a letter or we don't write a letter, that will be a decision that will be made at the Full Committee meeting.

MEMBER STETKAR: One thing that might help

us, you know, you've heard our input this morning, obviously you need to go back and caucus and think about your plans going forward, I think it would help us, if you decide that you should make changes, and if those changes require you to go out for new public comments, that would probably influence the timing of when we came to the Full Committee again.

If you think you can make -- if you think you need to make changes and that you can do that without going for public comments, that is a different influence on our time, so we'll probably be in contact with you, you know, over the next week or so to -- to get some feedback on that perspective.

CHAIRMAN RAY: Anything else?

(No audible response.)

CHAIRMAN RAY: We're off the record and adjourned.

(Whereupon, the meeting went off the record at 11:29 a.m.)

1

2

Regulatory Guide 1.27 Ultimate Heat Sink for Nuclear Power Plants

Bruce Lin
RES/DE/CIB

Jerry Purciarello
NRR/DSS/SBPB

ACRS Subcommittee Briefing
March 4 2015

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

Agenda

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

- Overview of RG 1.27
- Reasons for Revision
- Summary of Revisions
- Technical Revision
- Public Comments & NRC Responses
- Conclusions

Overview of RG 1.27

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

- The ultimate heat sink (UHS) is the system of structures and components and associated water supply credited for functioning as a heat sink to absorb reactor decay heat and essential station heat loads after a normal reactor shutdown or a shutdown following a design basis accident (DBA) or transient
- The UHS performs three principal safety functions:
  - Dissipation of residual heat after reactor shutdown
  - Dissipation of residual heat after a DBA such as a loss-of-coolant accident
  - Dissipation of maximum expected decay heat from the spent fuel pool

Overview of RG 1.27

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

- RG 1.27 describes methods and procedures acceptable to NRC staff to satisfy rules and regulations that are applicable to the ultimate heat sink (UHS) features of plant systems
- This guide applies to active plants that use water as the ultimate heat sink
- Related Guidance:
  - Standard Review Plan (SRP) Section 9.2.5 Ultimate Heat Sink
  - SRP Section 2.3.1 Regional Climatology
  - SRP Section 2.4.11 Low Water Considerations

Overview of the RG 1.27

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

- Describes applicable rules and regulations related to UHS
- Contains systems design considerations for UHS
- Provides meteorological conditions considered in the design of UHS
- Contains natural phenomena and site hazards design for the UHS
- Provides guidance for inspection, maintenance and system performance testing

Reasons for Revision

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

- Outdated
  - Last revision: January 1976
- Need to update RG 1.27
  - New reactor applications
  - Revisions in regulations
  - Lessons learned from operating experience
- NRC Staff Commitment to Commissioners in 2006 (ML060760667)
  - Update RGs where appropriate to go along with the SRP update associated with new reactor applications
  - Commitment to update RGs on a regular basis

Summary of Revisions

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

- The introduction section was revised to include applicable rules and regulations
- The discussion section was revised to incorporate/update relevant design considerations for UHS
- Changes to the 4 existing regulatory positions and added two new regulatory positions

Summary of Revisions

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

Regulatory Position (1976)	Regulatory Position (2015)
1. System design and meteorological conditions	1. System design and meteorological conditions
2. Natural Phenomena-hazards	2. Natural Phenomena-hazards
3. Defense-in-depth	3. Defense-in-depth
4. Technical Specifications	4. Technical Specifications
	5. Inspection, maintenance, & testing
	6. Water Chemistry and Micro-bio controls

Technical Revision

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

Regulatory Position (RP)1 – System Design Considerations for the UHS

- a, clarified that the UHS should provide sufficient cooling to permit safe shutdown and cooldown of remaining units
- b, added clarifications regarding transient analysis for UHS cooling towers performance and potential effects of recirculation and interference
- c, the meteorological conditions resulting in maximum cooling water loss should be the worst 30-day combination of controlling parameters
- d, the meteorological conditions resulting in the maximum intake water temperature to the plant from the UHS should be the worst combination of controlling parameters (daily variations for the critical time period)
- e, clarified the bases and procedures used to select and develop critical meteorological data

Technical Revision

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

RP1 – System Design Considerations for the UHS

- Added the following system design considerations:
  - h, construction materials should be fire resistant (buried piping and spray pond piping may be constructed of fiberglass-reinforced thermosetting resin)
  - i, heat loads that are important to safety or must be cooled during the 30-day recovery period by the UHS should be included in determining the UHS thermal performance (spent fuel pool)
  - j, UHS active mechanical components should automatically start and open/close as appropriate to support DBA heat loads
  - k, UHS inventory to support the 30 day period for UHSs where the water supply may be limited, (e.g., ponds, lakes, cooling towers) should account for evaporation losses, tower drift losses and boundary leakage

Technical Revision

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

RP 2 – Natural Phenomena and Site Hazards

- a(1) clarified that the most severe natural phenomena expected at the site in accordance with GDC 2

- a(4) failure of reservoirs, dams, and other manmade water retaining structures both upstream and downstream of the site including the potential for resultant debris to block water flow

- a(5) potential changes in ocean, river, or lake levels as a result of severe natural events, or possible changes in climatological conditions in the site region resulting from human or natural causes

Technical Revision

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

RP 2 – Natural Phenomena and Site Hazards

- Added the following site hazard design considerations:
  - c, the potential for adverse environmental conditions, such as icing, should be considered in determining UHS performance (includes freezing of UHS water storage facility)
  - d, the UHS complex should be designed to accommodate the effects of missiles effects of pipe whip, jets, energy line breaks, and dynamic effects (i.e., water hammer) during normal plant operation as well as upset or accident conditions in accordance with GDC 4
  - e, operating experience from other similarly designed and sited power plants should be used as appropriate. For example, potential clogging of suction flow paths from silt, aquatic fauna such as fish, and biological growth such as seaweed (see IN 2004-07)

Technical Revision

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

RP 5 –Inspection, Maintenance, and Performance Testing (new)

- a, a routine inspection and maintenance program should be established for the UHS system piping, structures, and components (detection of corrosion, erosion, protective coating failure, silting, and bio-fouling)

- b, both the initial pre-service test program and the periodic test program should encompass safety-related heat exchangers that are connected to the UHS

- c, performance testing of the UHS heat exchangers should be performed in accordance with ASME OM-2012, “Operation and Maintenance of Nuclear Power Plants”

- d, dam or other water-controlling structure and connecting piping systems within the jurisdiction of the licensee should be included in the Structures Monitoring Program in accordance with RG 1.160, the Maintenance Rule and RG 1.127, “Inspection of Water-Control Structures Associated with Nuclear Power Plants”

Technical Revision

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

RP 6 –Water Chemistry and Microbiological Control (new)

- a, the quality of the water used in cooling towers, spray ponds, and heat exchangers should be considered in the design and operation of the UHS because it can greatly affect the thermal performance of the UHS. Chemicals or other preventive measures may be needed to treat microbiological growth, macrobiological growth, corrosion, suspended solids fouling and scaling in nuclear power plant water systems that are part of the UHS.

- b, redundant and infrequently used cooling loops should be flushed and flow tested periodically at the maximum design flow to ensure that they are not fouled or clogged

Addressing Public Comments

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

- The draft RG (DG-1275) was published for public comment September 2013
- Comments received from:
  - NEI (10), General Public (1) & Anonymous (2)
- All comments addressed - Majority of comments led to several minor clarifications to draft RG
- Significant comments (those that led to revisions) summarized on following slides with NRC responses

Public Comments & NRC Response

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

Public Comment	NRC Response
Background discussion regarding design considerations for UHS is too prescriptive, with some elements that may not have an established or NRC endorsed mechanism to evaluate, and new design inputs that may belong to 'beyond design basis' considerations, a process still in regulatory development. For example, "consider the effects of climate changes that might occur over the design life of the facility", etc. What would be the criteria & methodology to quantify? Moreover, the Fukushima Flooding Task Force is working with NRC on various guidance on dam failures, etc. and language here is duplicative of other guidance.	The staff partially disagreed with this comment. In Rev 3 of draft RG 1.27, the staff added discussions on system design considerations for the UHS, clarified the meteorological conditions to be considered and considerations for natural phenomena and site hazards. The staff disagreed that these discussions represent beyond design basis scenarios. Regarding the example cited, the intent of this statement was to ensure that long-term possible environmental changes are considered in the design of the UHS. Staff has revised the sentence to read: "For natural sources, historical experience indicates that river blockage (e.g., ice dams or flood debris) or diversion may be possible, as well as potential changes in ocean, river, or lake levels as a result of severe natural events, or possible changes in climatological conditions in the site region resulting from human or natural causes." The staff also added the following in Regulatory position C.1.e: "Current literature on possible changes in the climatological conditions in the site region should also be reviewed to be confident that the methods used to predict weather extremes are reasonable."

Public Comments & NRC Response

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

Public Comment	NRC Response
The guidance for scoping of SSC's in the Maintenance Rule is in NUMARC 93-01 Rev. 4a, and endorsed by R.G. 1.160. Further, in many cases, the water controlling structures are not in the jurisdiction of the licensee, but other entities. Reference to the Maintenance Rule should be removed, as it is an arbitrary inclusion as written.	The staff partially agreed with this comment that not all water control structures affecting a plant site would be within the jurisdiction of the licensee/applicant. The discussion of the Maintenance Rule has been revised to clarify that only those structures within the jurisdiction of the licensee should be monitored in accordance with the Maintenance Rule and RG 1.160. However, it would be prudent for the licensee to ensure other water controlling structures affecting the safety of the site are being monitored under another program such as the US Army Corps of Engineers National Dam Inspection Program.

Public Comments & NRC Response

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

Public Comment	NRC Response
Missing from this is any consideration of how sea level rise may impact the reliability of the UHS during the license period. Pond banks that were initially safe may be washed away by enhanced storm surge for example leaving no cooling water supply. Cooling water that was initially fresh may become brackish and damage equipment not designed for the changed water chemistry leading to failure of critical cooling systems. Changed tidal flow patterns may lead to accumulation of clogging debris where the original design prevented this. If the effects of subsidence on ground water are to be considered, then surely the effects of sea level rise up to at least 2 meters by 2080 must be considered as well.	The staff agreed in part with this comment. The staff agreed that these are important considerations for the design of the UHS systems. In fact, the potential change in sea level was included in the discussion section of proposed Revision 3 to RG 1.27, which states: "For natural sources, historical experience indicates that river blockage (e.g., ice dams or flood debris) or diversion may be possible, as well as changes in ocean or lake levels as a result of severe natural events". The staff has added a new regulatory position under section C.2.a to further address this comment: "(5) potential changes in ocean, river, or lake levels as a result of severe natural events, or possible changes in climatological conditions in the site region resulting from human or natural causes, that may reasonably be expected to occur during the plant lifetime."

Public Comments & NRC Response

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

Public Comment	NRC Response
Concern: Revision 2 of the RG 1.27, required transient analysis to include the worst 24-hours following the initial critical time period. This analysis period should remain part of the design basis analysis because peak heat loads from a realistic or conservative analysis may occur several hours after the start of the initial accident. Suggested Revision: Following the site specific UHS critical time period the worst 24-hour period should be maintained as a requirement for transient analysis for peak cooling water temperature.	The proposed revision did not relax considerations for the transient analysis. Instead, the proposed revision specified that the meteorological conditions resulting in the maximum intake water temperature to the plant should be the worst combination of controlling parameters for the critical time period(s) unique to the specific design of the UHS. Depending on the UHS design, the critical time period (i.e., the time interval after a DBA to when the intake water to the plant from the UHS reaches its maximum value) varies. In practice, the 24-hour, post-accident time period has, in many cases, been looked upon as a default time period. Now rather, the proposed revision clarifies that the responsibility for defining and justifying the time period(s) critical to the UHS design lies with the applicant or licensee.

Public Comments & NRC Response

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

Public Comment	NRC Response
Concern: The existing guidance allows flexible to defer cooling of the spent fuel pools to gain transient analysis margin. Requirements discussing cooling of spent fuel pools should be clarified. Also, the existing guidance allows for significant delays in cooling the non-accident unit to gain transient analysis margin. Emergency procedures direct operates to cool the units to ensure safety margin. Limiting the cooling capability for the UHS structure is inappropriate for a shared safety system (e.g. a cooling pond). Reducing UHS cooling capacity in this manner restricts operational flexibility and reduces plant safety margin. Suggested Resolution: The guidance should prescriptively discuss cooling requirements and the treatment of the associated heat loads in transient analysis to ensure that safety margin is adequately maintained.	The staff partially agreed with the comment. An additional safety function was added to the Background information to further clarifies spent fuel pool cooling: "The UHS performs three principle safety functions: (1)……. and (3) dissipation of maximum expected decay heat from the spent fuel pool to ensure the pool temperature remains within the design bounds for the structure," This addition concurs with the SRP 9.1.3, "Spent Fuel Pool Cooling and Cleanup System." No specified time was included for cooling the non accident unit because neither GDC 5 nor BTP 5-4 specify a cooldown time. GDC 5 specifies an orderly shutdown and cooldown of the accident unit and BTP 5-4, "Design Requirements of the Residual Heat Removal System," Section B 1.D, specifies the RHR system must be capable of bringing the reactor to a cold shutdown condition, with only offsite or onsite power available, within a reasonable period of time following shutdown, assuming the most limiting single failure.

Conclusions

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

- RG 1.27 has been revised to address current regulations and lessons learned from operating experience since the guide was last revised in 1976
- Revised RG 1.27 provides necessary guidance for nuclear power plant licensees and applicants to use to establish UHS features of plant systems required by NRC rules and regulations
- Public comments received and addressed
- RG 1.27 ready for final publication

Regulatory Guide 1.27 Ultimate Heat Sink for Nuclear Power Plants

Bruce Lin
RES/DE/CIB

Jerry Purciarello
NRR/DSS/SBPB

ACRS Subcommittee Briefing
March 4 2015

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

Agenda

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

- Overview of RG 1.27
- Reasons for Revision
- Summary of Revisions
- Technical Revision
- Public Comments & NRC Responses
- Conclusions

Overview of RG 1.27

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

- The ultimate heat sink (UHS) is the system of structures and components and associated water supply credited for functioning as a heat sink to absorb reactor decay heat and essential station heat loads after a normal reactor shutdown or a shutdown following a design basis accident (DBA) or transient
- The UHS performs three principal safety functions:
  - Dissipation of residual heat after reactor shutdown
  - Dissipation of residual heat after a DBA such as a loss-of-coolant accident
  - Dissipation of maximum expected decay heat from the spent fuel pool

Overview of RG 1.27

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

- RG 1.27 describes methods and procedures acceptable to NRC staff to satisfy rules and regulations that are applicable to the ultimate heat sink (UHS) features of plant systems
- This guide applies to active plants that use water as the ultimate heat sink
- Related Guidance:
  - Standard Review Plan (SRP) Section 9.2.5 Ultimate Heat Sink
  - SRP Section 2.3.1 Regional Climatology
  - SRP Section 2.4.11 Low Water Considerations

Overview of the RG 1.27

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

- Describes applicable rules and regulations related to UHS
- Contains systems design considerations for UHS
- Provides meteorological conditions considered in the design of UHS
- Contains natural phenomena and site hazards design for the UHS
- Provides guidance for inspection, maintenance and system performance testing

Reasons for Revision

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

- Outdated
  - Last revision: January 1976
- Need to update RG 1.27
  - New reactor applications
  - Revisions in regulations
  - Lessons learned from operating experience
- NRC Staff Commitment to Commissioners in 2006 (ML060760667)
  - Update RGs where appropriate to go along with the SRP update associated with new reactor applications
  - Commitment to update RGs on a regular basis

Summary of Revisions

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

- The introduction section was revised to include applicable rules and regulations
- The discussion section was revised to incorporate/update relevant design considerations for UHS
- Changes to the 4 existing regulatory positions and added two new regulatory positions

Summary of Revisions

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

Regulatory Position (1976)	Regulatory Position (2015)
1. System design and meteorological conditions	1. System design and meteorological conditions
2. Natural Phenomena-hazards	2. Natural Phenomena-hazards
3. Defense-in-depth	3. Defense-in-depth
4. Technical Specifications	4. Technical Specifications
	5. Inspection, maintenance, & testing
	6. Water Chemistry and Micro-bio controls

Technical Revision

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

Regulatory Position (RP)1 – System Design Considerations for the UHS

- a, clarified that the UHS should provide sufficient cooling to permit safe shutdown and cooldown of remaining units
- b, added clarifications regarding transient analysis for UHS cooling towers performance and potential effects of recirculation and interference
- c, the meteorological conditions resulting in maximum cooling water loss should be the worst 30-day combination of controlling parameters
- d, the meteorological conditions resulting in the maximum intake water temperature to the plant from the UHS should be the worst combination of controlling parameters (daily variations for the critical time period)
- e, clarified the bases and procedures used to select and develop critical meteorological data

Technical Revision

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

RP1 – System Design Considerations for the UHS

- Added the following system design considerations:
  - h, construction materials should be fire resistant (buried piping and spray pond piping may be constructed of fiberglass-reinforced thermosetting resin)
  - i, heat loads that are important to safety or must be cooled during the 30-day recovery period by the UHS should be included in determining the UHS thermal performance (spent fuel pool)
  - j, UHS active mechanical components should automatically start and open/close as appropriate to support DBA heat loads
  - k, UHS inventory to support the 30 day period for UHSs where the water supply may be limited, (e.g., ponds, lakes, cooling towers) should account for evaporation losses, tower drift losses and boundary leakage

Technical Revision

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

RP 2 – Natural Phenomena and Site Hazards

- a(1) clarified that the most severe natural phenomena expected at the site in accordance with GDC 2

- a(4) failure of reservoirs, dams, and other manmade water retaining structures both upstream and downstream of the site including the potential for resultant debris to block water flow

- a(5) potential changes in ocean, river, or lake levels as a result of severe natural events, or possible changes in climatological conditions in the site region resulting from human or natural causes

Technical Revision

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

RP 2 – Natural Phenomena and Site Hazards

- Added the following site hazard design considerations:
  - c, the potential for adverse environmental conditions, such as icing, should be considered in determining UHS performance (includes freezing of UHS water storage facility)
  - d, the UHS complex should be designed to accommodate the effects of missiles effects of pipe whip, jets, energy line breaks, and dynamic effects (i.e., water hammer) during normal plant operation as well as upset or accident conditions in accordance with GDC 4
  - e, operating experience from other similarly designed and sited power plants should be used as appropriate. For example, potential clogging of suction flow paths from silt, aquatic fauna such as fish, and biological growth such as seaweed (see IN 2004-07)

Technical Revision

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

RP 5 –Inspection, Maintenance, and Performance Testing (new)

- a, a routine inspection and maintenance program should be established for the UHS system piping, structures, and components (detection of corrosion, erosion, protective coating failure, silting, and bio-fouling)

- b, both the initial pre-service test program and the periodic test program should encompass safety-related heat exchangers that are connected to the UHS

- c, performance testing of the UHS heat exchangers should be performed in accordance with ASME OM-2012, “Operation and Maintenance of Nuclear Power Plants”

- d, dam or other water-controlling structure and connecting piping systems within the jurisdiction of the licensee should be included in the Structures Monitoring Program in accordance with RG 1.160, the Maintenance Rule and RG 1.127, “Inspection of Water-Control Structures Associated with Nuclear Power Plants”

Technical Revision

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

RP 6 –Water Chemistry and Microbiological Control (new)

- a, the quality of the water used in cooling towers, spray ponds, and heat exchangers should be considered in the design and operation of the UHS because it can greatly affect the thermal performance of the UHS. Chemicals or other preventive measures may be needed to treat microbiological growth, macrobiological growth, corrosion, suspended solids fouling and scaling in nuclear power plant water systems that are part of the UHS.

- b, redundant and infrequently used cooling loops should be flushed and flow tested periodically at the maximum design flow to ensure that they are not fouled or clogged

Addressing Public Comments

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

- The draft RG (DG-1275) was published for public comment September 2013
- Comments received from:
  - NEI (10), General Public (1) & Anonymous (2)
- All comments addressed - Majority of comments led to several minor clarifications to draft RG
- Significant comments (those that led to revisions) summarized on following slides with NRC responses

Public Comments & NRC Response

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

Public Comment	NRC Response
Background discussion regarding design considerations for UHS is too prescriptive, with some elements that may not have an established or NRC endorsed mechanism to evaluate, and new design inputs that may belong to 'beyond design basis' considerations, a process still in regulatory development. For example, "consider the effects of climate changes that might occur over the design life of the facility", etc. What would be the criteria & methodology to quantify? Moreover, the Fukushima Flooding Task Force is working with NRC on various guidance on dam failures, etc. and language here is duplicative of other guidance.	The staff partially disagreed with this comment. In Rev 3 of draft RG 1.27, the staff added discussions on system design considerations for the UHS, clarified the meteorological conditions to be considered and considerations for natural phenomena and site hazards. The staff disagreed that these discussions represent beyond design basis scenarios. Regarding the example cited, the intent of this statement was to ensure that long-term possible environmental changes are considered in the design of the UHS. Staff has revised the sentence to read: "For natural sources, historical experience indicates that river blockage (e.g., ice dams or flood debris) or diversion may be possible, as well as potential changes in ocean, river, or lake levels as a result of severe natural events, or possible changes in climatological conditions in the site region resulting from human or natural causes." The staff also added the following in Regulatory position C.1.e: "Current literature on possible changes in the climatological conditions in the site region should also be reviewed to be confident that the methods used to predict weather extremes are reasonable."

Public Comments & NRC Response

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

Public Comment	NRC Response
The guidance for scoping of SSC's in the Maintenance Rule is in NUMARC 93-01 Rev. 4a, and endorsed by R.G. 1.160. Further, in many cases, the water controlling structures are not in the jurisdiction of the licensee, but other entities. Reference to the Maintenance Rule should be removed, as it is an arbitrary inclusion as written.	The staff partially agreed with this comment that not all water control structures affecting a plant site would be within the jurisdiction of the licensee/applicant. The discussion of the Maintenance Rule has been revised to clarify that only those structures within the jurisdiction of the licensee should be monitored in accordance with the Maintenance Rule and RG 1.160. However, it would be prudent for the licensee to ensure other water controlling structures affecting the safety of the site are being monitored under another program such as the US Army Corps of Engineers National Dam Inspection Program.

Public Comments & NRC Response

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

Public Comment	NRC Response
Missing from this is any consideration of how sea level rise may impact the reliability of the UHS during the license period. Pond banks that were initially safe may be washed away by enhanced storm surge for example leaving no cooling water supply. Cooling water that was initially fresh may become brackish and damage equipment not designed for the changed water chemistry leading to failure of critical cooling systems. Changed tidal flow patterns may lead to accumulation of clogging debris where the original design prevented this. If the effects of subsidence on ground water are to be considered, then surely the effects of sea level rise up to at least 2 meters by 2080 must be considered as well.	The staff agreed in part with this comment. The staff agreed that these are important considerations for the design of the UHS systems. In fact, the potential change in sea level was included in the discussion section of proposed Revision 3 to RG 1.27, which states: "For natural sources, historical experience indicates that river blockage (e.g., ice dams or flood debris) or diversion may be possible, as well as changes in ocean or lake levels as a result of severe natural events". The staff has added a new regulatory position under section C.2.a to further address this comment: "(5) potential changes in ocean, river, or lake levels as a result of severe natural events, or possible changes in climatological conditions in the site region resulting from human or natural causes, that may reasonably be expected to occur during the plant lifetime."

Public Comments & NRC Response

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

Public Comment	NRC Response
Concern: Revision 2 of the RG 1.27, required transient analysis to include the worst 24-hours following the initial critical time period. This analysis period should remain part of the design basis analysis because peak heat loads from a realistic or conservative analysis may occur several hours after the start of the initial accident. Suggested Revision: Following the site specific UHS critical time period the worst 24-hour period should be maintained as a requirement for transient analysis for peak cooling water temperature.	The proposed revision did not relax considerations for the transient analysis. Instead, the proposed revision specified that the meteorological conditions resulting in the maximum intake water temperature to the plant should be the worst combination of controlling parameters for the critical time period(s) unique to the specific design of the UHS. Depending on the UHS design, the critical time period (i.e., the time interval after a DBA to when the intake water to the plant from the UHS reaches its maximum value) varies. In practice, the 24-hour, post-accident time period has, in many cases, been looked upon as a default time period. Now rather, the proposed revision clarifies that the responsibility for defining and justifying the time period(s) critical to the UHS design lies with the applicant or licensee.

Public Comments & NRC Response

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

Public Comment	NRC Response
Concern: The existing guidance allows flexible to defer cooling of the spent fuel pools to gain transient analysis margin. Requirements discussing cooling of spent fuel pools should be clarified. Also, the existing guidance allows for significant delays in cooling the non-accident unit to gain transient analysis margin. Emergency procedures direct operates to cool the units to ensure safety margin. Limiting the cooling capability for the UHS structure is inappropriate for a shared safety system (e.g. a cooling pond). Reducing UHS cooling capacity in this manner restricts operational flexibility and reduces plant safety margin. Suggested Resolution: The guidance should prescriptively discuss cooling requirements and the treatment of the associated heat loads in transient analysis to ensure that safety margin is adequately maintained.	The staff partially agreed with the comment. An additional safety function was added to the Background information to further clarifies spent fuel pool cooling: "The UHS performs three principle safety functions: (1)……. and (3) dissipation of maximum expected decay heat from the spent fuel pool to ensure the pool temperature remains within the design bounds for the structure," This addition concurs with the SRP 9.1.3, "Spent Fuel Pool Cooling and Cleanup System." No specified time was included for cooling the non accident unit because neither GDC 5 nor BTP 5-4 specify a cooldown time. GDC 5 specifies an orderly shutdown and cooldown of the accident unit and BTP 5-4, "Design Requirements of the Residual Heat Removal System," Section B 1.D, specifies the RHR system must be capable of bringing the reactor to a cold shutdown condition, with only offsite or onsite power available, within a reasonable period of time following shutdown, assuming the most limiting single failure.

Conclusions

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

- RG 1.27 has been revised to address current regulations and lessons learned from operating experience since the guide was last revised in 1976
- Revised RG 1.27 provides necessary guidance for nuclear power plant licensees and applicants to use to establish UHS features of plant systems required by NRC rules and regulations
- Public comments received and addressed
- RG 1.27 ready for final publication