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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

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FUKUSHIMA SUBCOMMITTEE

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THURSDAY

APRIL 21, 2016

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ROCKVILLE, MARYLAND

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The Subcommittee met at the Nuclear Regulatory Commission, Two White Flint North, Room T2B1, 11545 Rockville Pike, at 1:00 p.m., John W. Stetkar, Chairman, presiding.

COMMITTEE MEMBERS:

JOHN W. STETKAR, Chairman

RONALD G. BALLINGER, Member

DENNIS C. BLEY, Member

CHARLES H. BROWN, JR. Member

DANA A. POWERS, Member

HAROLD B. RAY, Member

JOY REMPE, Member

PETER RICCARDELLA, Member

GORDON R. SKILLMAN, Member

DESIGNATED FEDERAL OFFICIAL:

KATHY WEAVER

ACRS CONSULTANT:

STEPHEN SCHULTZ

ALSO PRESENT:

STEWART BAILEY, NRR

ERIC BOWMAN, NRR

GWEN DUBOIS, Physicians for Social Responsibility

BRAD HARVEY, ONR

REGINA MINNISS

WILLIAM RECKLEY, NRR

TIM REED, NRR

MOHAMED SAMS, NRR

JOSEPH SEBROSKY, NRR

*participating via telephone

AGENDA

P R O C E E D I N G S

(1:02 p.m.)

CHAIR STETKAR: The meeting will now come to order. This is a meeting of the Advisory Committee on Reactor Safeguards, Subcommittee on Fukushima. I'm John Stetkar, Chairman of the Subcommittee. Members in attendance today are Pete Riccardella, Harold Rey, Dick Skillman, Dana Powers, Dennis Bley, Ron Ballinger, Charlie Brown, and Joy Rempe. We're also joined by former ACRS Member Steve Schultz, who is our consultant on this matter.

The purpose of this meeting is for the Subcommittee to review and discuss the NRC staff's white paper on NRC staff updated assessment of Fukushima Tier 2 recommendations related to the evaluation of natural hazards other than seismic and flooding.

The Subcommittee will gather information, analyze relevant issues and facts, and formulate proposed positions and actions, as appropriate, for deliberation by the full Committee. This meeting is open to the public. The meeting is being conducted in accordance with provisions of the Federal Advisory Committee Act.

Rules for the conduct of and participation in the meeting have been published in the Federal Register as part of the notice for this meeting.

Ms. Kathy Weaver is the designated federal official for this meeting. A transcript of the meeting is being kept and will be made available, as stated in the Federal Register Notice. Therefore, it is requested that all speakers first identify themselves and speak with sufficient clarity and volume so that they can be readily heard.

And while I remember, I'll remind you to reach into your pockets, or wherever you keep them, and turn off all of your little beepy devices.

(Off record comments)

We have received no written comments or requests for time to make oral statements from members of the public regarding today's meeting. Understand that there may be individuals on the bridge line who are listening in on the proceedings and I'll open the bridge line at the end of the meeting so that those participants can provide their comments if they so wish.

We'll keep the bridge line on mute in

the interim so that it doesn't disturb the proceedings because it makes a lot of noise on our end.

We'll now proceed with the meeting and I call upon Joe -- sure, I made it so far okay, Joe Sebrosky of the NRC staff to open the presentations. Joe?

MR. SEBROSKY: Hi. I'm Joe Sebrosky. I'm a senior project manager in the Japan Lessons Learned Division. I work for Mohamed Shams. Mohamed's going to have some opening remarks.

MR. SHAMS: Thank you, Joe. Thank you, Mr. Chairman and distinguished members. Thanks for the opportunity to talk to you today. As Mr. Stetkar indicated, we're here today to talk to you about the treatment of other natural hazards in the context of Fukushima. We've put together a white paper that proposes our assessment for these hazards and some recommendations that we're making as far as how to go forward with them.

Just by way of background, as you certainly recall, when the agency started its addressing of the Fukushima Lessons Learned, we focused first on the high priority items and we looked for lessons learned from them to implement

into what we designated as the lower priority items.

In the area of natural hazard, the agency focused first on flooding in seismic and we've issued 50.54(f) letters to collect information from licensees, and that activity is underway, and in fact, it's nearing completion in terms of the evaluation of the hazards. There are other activities that will continue on in the future.

So we're actually going to be talking to you tomorrow about some issues related to guidance in terms of assessing the impact of the natural hazard, the flooding and seismic, on the mitigating strategies. But today, we're looking into the other natural hazard, other than flooding and seismic, and basically, we're trying, in our assessment, to answer the question of whether or not should they be treated similar to what we've done for flooding and seismic in the sense that, should we be issuing 50.54 letters for them, you know, in the same manner.

Late last year, we put together a plan on how to address these hazards, that was SECY 150137, presented the plan to the Commission, and

plan included four steps, essentially, identification of the spectrum of hazard, or the population of hazards, to look at, applying some screening criteria to narrow down the field to those that deserve additional looks and, potentially, could deserve additional regulatory actions.

Third step was to do further evaluations to, again, narrow down the field even further, and then the fourth step would be to report to the Commission on the proposals if there's any proposal of regulatory actions.

At this point, we are completed with the first two steps, identification of the hazards and narrowing down, doing the screening, to identify the hazards of any to be moved forward to additional analyses. The white paper that Mr. Stetkar mentioned is really the foundation of a SECY paper that we're writing to send to the Commission by the end of May. That was an interim product that the Commission requested in its SRM for COMSECY 1537.

At a high level, we will be reporting to you today that for most of the hazards and the sites, we do not see the potential for the need for

regulatory actions, however, we've identified snow and high wind as two hazards that we would want to take a further look at, not necessarily to say that it would ultimately --

CHAIR STETKAR: I was going to say, Mohamed, it isn't -- right now, it's just whether or not something gets moved from Task 2, I think it's called, to Task 3, which is further examination.

MR. SHAMS: Correct. Yes.

CHAIR STETKAR: It's not yet made any implications on -- if something's screened out, it's gone, but if something's retained, it yet might not merit regulatory attention, right?

MR. SHAMS: And that's precisely the idea is, we're in a place where we feel that it merits a further look in some sites, and we'll certainly go through that today and identify these thoughts and what we think we will be doing in the next steps.

So we're on track to complete the SECY paper for the Commission by end of May and as we put together our further assessments, we'll prepare another SECY paper by the end of the year forwarding our conclusions and recommendations to

the Commission. With that, we'll walk you through our analyses and conclusions, and look for your insights and feedback on our work.

With that, I'll move to Bill to lead us.

MR. RECKLEY: Okay. I just have a few background slides. Some of it is duplicative of what Mo just went over, but just very quick summary, we did categorize the Post-Fukushima Lessons Learned in three tiers, with Tier 1 being those actions we did without delays, such as issuance of the orders, issuance of the 50.54(f) letters on seismic and flooding hazards.

The Tier 2 and Tier 3 items were deferred based on the availability of staff or the need to get data from the Tier 1 activities, and we have, over the past year or so, been directing attention to those and trying to, where possible, resolve them so that -- and today we're here to talk, as Mo said, about other external hazards, other than seismic and flooding.

This is a slide I think you've also seen before, it's a summary of the Mitigation of Beyond-Design-Basis Events rulemaking, and it's a good summary slide of the actions that were taken

in Tier 1 and how they are being rolled into the Mitigation of Beyond-Design-Basis Events rulemaking, which included, basically, the licensees coming up with an all-hazards response plan, and then that'll be important as we go through today's assessment.

They will specifically, through the rulemaking, address re-evaluated in seismic and flooding hazards, and as Joe will go through, really, today, we're trying to determine, or describe to you, the assessments that we've done of the hazards other than seismic and flooding. But just like seismic and flooding, it's not as if the plants didn't start off already with design and regulatory requirements associated with those hazards.

And so that sometimes gets lost on people that when we say, and Joe will get into some of the ones we screened out, but for example, high temperatures, it's not as if the staff is saying, plants don't need to consider high temperatures. The assessments we're doing now is whether the regulatory requirements and plant design features already in place address that hazards and whether we need to do any more than that.

So it's not as if we're excluding hazards from the need to be considered, it's whether additional regulatory actions or additional information needs to be sought from licensees to address a particular hazard.

CHAIR STETKAR: Bill, since you brought it up, I might as well get it out now, things like high temperature, which, people did, at one time, address when they originally licensed the plant, and in many cases, used five years' worth of data to justify what high temperatures they used.

It's my understanding that that information is not updated, so that, for example, 30 years later, 50 years later, despite the fact that we may have collected more meteorological data for the site, and I don't want to get into the issue of climate change, that's not something that I'm broaching here, but just the fact that we have a larger database available, so therefore, we might be able to capture extremes in temperature that might not have been examined in the initial licensing, or that things like the amount of heat loads in the plant may have changed such that the demands on ventilation equipment, and whatever assumptions were made regarding exterior

temperatures, might not necessarily be as valid.

How does the current licensing process, the current regulatory process, capture that?

MR. RECKLEY: That's --

CHAIR STETKAR: You know, you said well --

MR. RECKLEY: No, no, I understand.

CHAIR STETKAR: -- it takes care of it, but, you know, why don't people go back --

MR. RECKLEY: Joe, you want to give it a shot and then I'll --

MR. SEBROSKY: Yes, I'll give it a shot and then you can add. So what we say in the paper, and we talk about extreme temperatures, both hot and cold, and if you look at the tech specs that were based on a licensing basis that was put together when they were originally operated the plant, or originally licensed the plant, you have tech specs on ultimate heat sink temperature, you do have tech specs on the containment, you have tech specs on the control room temperatures that get to how well your heat sinks are working.

And what we argue is that licensees, in some cases, have identified that they're constrained. They've seen ultimate heat sink

temperatures increase and they'll come in for a tech spec amendment. So there's tech specs in place that recognize those limits.

There's another argument that we make in the papers, and that gets to operability determinations. If a licensee sees a heat wave coming its way, we've had cases where we've had to issue Notice of Enforcement discretion, and it's based on a licensee doing an assessment and saying, my licensing basis for this plant assumed an air temperature of 100 degrees. I know that I'm going to see 105 degrees tomorrow.

Even though I don't have an explicit tech spec on that air temperature, my operability of key systems, structures, and components is based on design basis calculations that assumed 100 degrees and I'm going to see 105. The licensees, what they do in their process, they'll do an operability determination, and if that operability determination result is, I have to declare a piece of equipment inoperable because I'm exceeding its design basis, they have to enter the appropriate tech spec.

So what we argue is, in the case that you make, if a licensee is outside its design

basis, they have a process in place to evaluate that, and do we need something in addition to that, and licensees recognize that if they become constrained, they may have to come to us for a license amendment to change either the explicit tech spec.

CHAIR STETKAR: What I'm asking though, Joe, is, how do the licensees determine that they are constrained? We've just gone an exercise with AP1000 where they determined, oh, my God, our ventilation stuff for the main control room was underdesigned because we didn't realize that we're going to have all of the loads in there and our capacities are too small; ventilation capacity is too small.

People are replacing analog stuff with digital stuff, people are making changes to power plants, people are changing heat loads, they might have evidence of different meteorological -- different temperature profiles for the site, is it only this kind of episodic thing that forces them?

In other words, you know, they don't have to update their FSAR, they don't have to come in and re-evaluate all of that stuff, do they?

MR. SEBROSKY: So I think what you're

talking about, when you look at Chapter 2 of most plants' safety analysis reports, we consider that in our guidance to be historical information, and that licensees aren't obligated to update that continuously, and that's why you see out of the Fukushima Lessons Learned, you see the activity that we're doing right now, and you also see the activity associated with every ten years, you know, look at whether or not, on a periodic basis, you need to re-evaluate some of those Chapter 2 assumptions.

And what I was trying to convey, and, Bill, correct me if I make any misstatements, there's two backstops on Chapter 2 when it comes to hazards. One is the one that I just talked about, and it's not just for if you see a heat wave coming. Take the scenario that you mentioned where the internal heat loads for which the HVAC system was designed to remove heat, you recognize that you added different components that have produced more heat and you're not going to be able -- the chillers that you have installed aren't going to be able to reject the added heat or you see something else along those lines, you still get back to the operability determination that licensees are

obligated to do if they find problems like that that's subject to inspection.

The backstop to some of the more serious challenges that you would see is, there is a requirement in 10 CFR 50.9 that if a licensee is aware of a safety-significant issue that impacts the ability for the plant to safely operate or shutdown, they're obligated to inform us of that and then it would be up to us to review that and make a determination on whether or not we have to take action.

CHAIR STETKAR: I'll play the Devil's advocate, so everybody's been doing that throughout the life of their facilities, and yet, oh, my God, they weren't doing it for seismic, and, oh, my God, they weren't doing it for external flooding, and, oh, my God, they didn't realize that I'm in a hurricane area and I can have higher winds than hurricanes.

So if they've been doing it for the lift of their facilities and they weren't meeting their initial licensing basis in these areas, why do I have assurance that they will continue to meet, or are meeting, their licensing basis for things like high temperature? Because they

apparently weren't in the other areas and something happened that made us look more carefully at those.

MR. RECKLEY: And it's a complex arrangement that's evolved over many years and as Joe mentioned, what we try to do in the design aspect is to capture what we think are the most important parameters and those become technical specifications. Then there might be a second tier where licensees proceduralize controls, they're not in the tech specs, but they might recognize that a certain parameter is important enough to the operability of a piece of equipment that it becomes proceduralized themselves, and I think going to Mr. Stetkar's point, we wouldn't rule out the possibility there's other parameters, that don't make either one of those, that they might exceed at some point.

And as an additional thing that's in place is operational experience programs, where, if that parameter is exceeded, and the exceedance of that parameter actually caused a problem, then we have, and licensees have, measures to both identify and share that information with other licensees.

So I don't want to imply that this is all a perfect system, but we have tried, through

putting in place these hierarchal controls of parameters, and then other backstops like operational programs, to capture things and address it if there's a problem.

In terms of Fukushima, I'll just add, that there is one last recommendation that we're still evaluating for the re-evaluation of other hazards on a periodic basis, where, we won't just wait for an event to trigger an evaluation, but we will look periodically to see if additional measures or requests for information should be pursued.

CHAIR STETKAR: And that's still out on the table. And I know you can say, I don't know, will that periodic re-evaluation apply to all hazards or only those that are left after the screening process? So for example, you know, high winds or seismic, obviously, flooding.

MR. RECKLEY: I think it'll have a heavy focus on seismic and flooding, but I don't believe it is limited to seismic and flooding.

CHAIR STETKAR: Okay. Well, I hear what you're saying, and, you know, if everybody had been doing what you say they're doing, I suspect we wouldn't be having the discussion about seismic and

flooding, or at least people wouldn't be going through all of the difficult exercises that they're going through because they would have been going through that in the past.

The operational experience is this kind of reactive approach to licensing. You know, until something bad happens, we'll be confident that everybody's doing what they ought to do, and then when something bad happens, like Fukushima, we'll focus on it. And that's the concern, is, Fukushima gave us a wake-up call and the NTTF recommendations kind of said, well, wait a minute, maybe it's a point in time where we ought to take a snapshot of where the U.S. industry is on a broader perspective than just --

MR. RECKLEY: I would say the other thing, operational programs, or operational experience programs, do is, it highlights if we've mischaracterized a parameter that we thought wasn't very important and it turns out to be more important than we thought it was, and that's a key aspect to it.

MR. SHAMS: I had a thought to share with Mr. Stetkar. So looking at the core of why we're doing flooding and seismic, it's rather

because the state of knowledge in this area has evolved, and as such, we're looking at the impact of that evolution on our current knowledge of that hazard compared to what it was that the sites have been licensed to.

It's not necessarily because the sites are not meeting their licensing basis, they are, or they ought to be, and there are regulatory controls to, you know, make that case. And also, to add to what Bill said about, you know, our efforts now on the hazard reconfirmation activity, we also have programs in place like the generic issues program that already had in it, GI-199, related to seismic, prior to Fukushima, and we were looking into, what were the impacts of our, at that time, recent knowledge of seismic and knowing that the Central and Eastern United States had higher -- you know, high frequency input, what that would do to the fleet, so we were under that way, but ultimately, we folded that activity into the Fukushima activity anyway.

So I just wanted to put the point that, there are other components as well that would add to this framework of making sure people have the most recent understanding of the hazard and

applying that into their facilities.

MR. SCHULTZ: Bill, is it clear that the operational history as well as the operability determination sequences, are they going to be tied into this ten-year, or the periodic, review of hazard, specifically, or is it just going to be a periodic thing without much detail?

MR. RECKLEY: Right now, the way that program is leaning is that that'll be an NRC assessment, a periodic NRC assessment, as to whether we need to visit regulatory requirements, not a requirement of licensees to do periodic assessments, so I think the short answer would probably be no to your question.

MR. SCHULTZ: So it's a periodic generic evaluation by the NRC.

MR. RECKLEY: Yes.

MR. SHAMS: To add to that, we're just about actually developing the framework for it, we put together a working group, they're piecing it together, a number of components interacting with other federal agencies at knowledge management, looking at operating experience, all these parts, so we don't really have a clear, crisp picture of how it's going to end up, you know, in its

entirety.

We have the deliverable to the Commission due by the end of the year on this topic, but that's the direction it's leaning.

MR. SCHULTZ: I'm only pushing in that direction because today's examples demonstrate that if you're going to make any progress or many any significance difference, you need to look at it on a plant-specific basis.

MR. SHAMS: Well, certainly, that makes, you know, sense, but I think as Bill indicated, our initial efforts are focused on, do we see the hazard changing in a meaningful way in a broad, just in a broad fashion, and then we can, at that point, decide which way to go as far as site-specific application of that.

MR. RECKLEY: But I think we'll have an example later on of, it's not always black and white what's generic and what's plant specific, and so I think we'll have an example later on that we can talk about.

CHAIR STETKAR: Let's go on. You brought it up, I was going to bring it up later, but go on.

MR. RECKLEY: So just some additional

background, we issued SECY 15-0137 to the Commission in October, had the general plans for closing out, or resolving, the remaining Tier 2 and Tier 3 items. Natural hazards other than seismic and flooding were grouped in the third group of those, which are the activities that we plan to complete in 2016.

The Commission agreed with us on the closure of the Group 1 items. The Group 2 assessment, we were here a month or two ago to talk about the Group 2, which was containments other than Mark I and Mark IIs, hydrogen control and enhanced instrumentation. That SECY paper, SECY 2016-41, 0041, was just issued to the Commission at the end of March to closeout those recommendations.

And we're here today to talk about other natural hazards, in large part because the SRM, the Staff Requirements Memorandum, for SECY 15-00137, included a direction from the Commission to come in with an interim status report by the end of May on how the process is working. Joe's going to go over the process for using, but since we owed the Commission a status report by May, we're here to talk to you about that today.

MEMBER RAY: Bill, I take it for

granted that tsunami is included within either seismic or flooding, or both, and therefore, not within --

MR. RECKLEY: Yes, it's considered within the flooding hazard.

MEMBER RAY: I just wanted to have you affirm to me that you understand tsunami can be caused by things other than seismic.

MR. RECKLEY: Landslides, for example, yes.

MEMBER RAY: Thank you.

MR. RECKLEY: So as Mohamed mentioned, we issued a white paper in order to support public interactions and interactions with the ACRS, that was issued near the end of March, we had a public meeting on April 5th to hear from the public stakeholders, and we're here today to talk to the Subcommittee, and I think we're on the full committee for early May.

And we owe, as I mentioned, a status report by the end of May, and then a second SECY paper to the Commission by the end of the year, with the final assessments on whatever hazards are not screened out through this interim status report in May.

And with that, I'll turn it over to Joe to talk about high temperatures and all of the other --

MR. SEBROSKY: Thanks, Bill. So this slide shows the four-step process that was embedded in SECY 15-0137 that Mohamed talked about in his opening remarks. SECY 15-0137, as Bill indicated, had categorized all the Tier 2 and Tier 3, and there was a spectrum of where we were as far as our evaluations on Tier 2 and Tier 3 activities from we were essentially complete to we just have a process.

And that's where we were. If you look at SECY 15-0137, it's only six pages long and it described the process, and this is the four-step process that it mentions in that SECY paper, so that's why it was grouped in that Group 3 activity.

Mohamed already talked about the first two steps, define the natural hazards, don't limit yourself to just the standard review plan, determined and apply screening criteria to see if you can generically exclude licensees from considering those hazards.

When you get to Step 3, and just talk about this a little bit, Mohamed mentioned the 10

CFR 50.54(f) letters, which is a portion of the regulation that requires licensees to respond to requests for additional information, and that's the approach that we took for seismic and flooding.

And where we're at for snow and also tornados is, we're in Task 3. If we saw something that we thought was an immediate safety concern, we're not going to wait for the evaluation to be completed and we would have made a recommendation to our senior management and to the Commission that we need to take some kind of immediate action because it's a safety significant issue and it meets the backfit criteria.

We're not saying that for either snow or the high wind evaluations, and we're not to the point where we meet the requirements that are on the NRC in 10 CFR 50.54(f) before we can even issue the request for information. And if you look at 10 CFR 50.54(f), it has a requirement for the NRC that we have to justify that there's enough of a safety significant issue that it justifies the cost that's associated with the licensee responding to that request for information.

CHAIR STETKAR: Joe, when I think about generic stuff, what exactly do you mean? It

doesn't necessarily have to affect 99 operating reactors.

MR. SEBROSKY: More than one.

CHAIR STETKAR: More than one.

MR. SEBROSKY: That's the test.

CHAIR STETKAR: So it could affect two and only two.

MR. SEBROSKY: That's the test in our process.

CHAIR STETKAR: Okay. We'll get into that later, obviously, in some of the things, but I just wanted to make sure that we understood that.

MR. SEBROSKY: And we are going to see that when we talk about low water level conditions for HB Robinson. If you look at the fourth step in the process, it is, if, based on the information that you get from the licensees, you can make a determination that it warrants backfit or some kind of immediate action for the NRC to take, and obviously, we haven't gotten to Step 4 for any of the hazards we'll be talking about yet. Next slide.

MEMBER SKILLMAN: Joe, let me ask this, as these plants have operated for years and years, the operators have become very clever in adapting

to whatever the conditions are that the plant is experiencing. Give you two examples, I worked on a number of sites that were basically on a moat, and so loss of access is a real problem, Three Mile and Prairie Island, both of them in river situations, one is the Mississippi, the other is the Susquehanna.

Anything that prevents you from getting to the site has security, has staffing, has EMT, ambulance, supply chain, law enforcement implications. And over the years, the site staffs at both of those sites have found a way to overcome whatever would threaten access, whether it's debris from flooding, whether it's animals, critters --

MEMBER POWERS: Come on, Dick, they're wonderful. Get to your point.

MEMBER SKILLMAN: My point is, is it likely that there have been natural events that have been overcome by the site staff that you haven't looked at? You're not even aware of it because it's been invisible to you.

MR. SEBROSKY: I don't discount that that's a possibility. I used to be an OPs officer. I did that for three and a half years. We have resident inspectors at the site. There's daily

calls between headquarters and the region on any number of activities going on at a site. If it rose to a threshold where it required some kind of regulatory action, I would think we would pick it up through that process.

I understand your point, but I can't think of a scenario that, if it met a safety significant threshold, where it wouldn't be elevated through that process.

MEMBER SKILLMAN: Okay. Fair enough. Thanks, Joe.

MR. SEBROSKY: Slide 7 is the preliminary results of Step 1 of the assessment. So what you see in the white paper in Appendix A is a listing of the sources that we used to collect the hazards. And as I indicated earlier, it wasn't limited to just the standard review plan. There were other sources, EPRI documents, that we looked at, and also international documents that we looked at to make sure we were taking a good hard look, and it gets back to Mr. Stetkar's point, you've been operating for 40 years, but how do you have assurance?

If you look at how this issue was identified, it was a combination of the ACRS

identifying it to us and also in an appropriations language from Congress. Take a good hard look at the natural hazards and see if there's anything that causes you pause.

So Appendix A describes the sources that we looked at, it provides a high-level discussion of why we excluded man-made hazards from further consideration, including consulting with OGC, getting back to Congressional appropriations language, what it meant, and did they intend for us to look at both natural and man-made.

Based on feedback from our Congressional Affairs Office, the intent was natural hazards, but to be -- to make sure we weren't missing something, we put the man-made hazards into our generic issue process and made sure we weren't missing something there. That's discussed in Appendix A.

The natural hazards that we came up with are listed in Appendix A. We don't give you a source if it's coming from the SRP, so the names may be slightly different from what you would see in the standard review plan, and we grouped them based on the hazard.

This table on Slide 7 provides you a

high level on what natural hazards we excluded as part of Step 1 and what you see here is some asterisks material. You see a single asterisk around external flooding and seismic activity, that goes to the 50.54(f) letters that Mohamed mentioned earlier that we've issued, and because that's being reviewed as part of the Tier 1 activity, we closed it for the purposes of this paper.

For the most part, what you find in Appendix A are high-level discussions of why we excluded the hazards that aren't asterisk. There's two exceptions that we're going to talk about the forthcoming slide, and that's volcanic activity and geomagnetic storms. We have additional discussion on those two activities that I'll talk about on the next slide.

CHAIR STETKAR: You know I'm a detail guy. You're not going to get away from this one that quick. When I went through Appendix A, and I'll only talk about ones that aren't on the following slide so that we can get through all of this, I had some questions about the basis for excluding things, so I'll bring up some examples.

You excluded things like avalanches and landslides, and for avalanches, it says, "The

hazard is highly unlikely to cause coincident loss of all trains of safety-related SSCs and extended loss of AC power."

When you did the screening, and as I read through the stuff, I noticed a preponderance of focus on does it cause an extended loss of AC power and loss of the ultimate heat sink or loss of access to the ultimate heat sink. That's a very contrived notion.

So for example, suppose I could disable my ultimate heat sink, and only my ultimate heat sink, forever. And you address that under low water level and things like that. Suppose I could have a landslide or an avalanche that comes down the slope next to my plant and fills up my basin with, oh, mud, and rocks, and gook, and trees, and stuff like that.

Maybe it takes out offsite power, I don't know, it depends on where my switchyard is. So what criteria -- did you look at only things that could only do both of those damages, in other words, extended loss of AC power and loss of the ultimate heat sink? Because I see a lot of the decisions cast in that notion, this one in particular.

MR. SEBROSKY: That's a good comment. When we looked at the activities, in particular, we were interested in activities that could lead to extended loss of AC power and loss of the ultimate heat sink because --

CHAIR STETKAR: What about only loss of the ultimate heat sink? Most of my questions on things that got screened out are going to focus on things that take away the ultimate heat sink irretrievably, or make it so bad that the plant can get into trouble, regardless of the fact that everything has electric power to it. Did you look at that? Did you think about that?

MR. SEBROSKY: We did, and I'll talk about that when we talk about the seiche writeup.

CHAIR STETKAR: Right.

MR. SEBROSKY: But I understand the comment and my response is, I'll have to get back to you on that, but the focus --

CHAIR STETKAR: The ones that I saw, just to keep us on track here, I brought up the issue, think about in the terms of avalanche and landslide, because that's the mountain coming down to get you. Think of it in terms of the issues of the upper right-hand corner of this slide, biologic

events, suppose that I make my ultimate heat sink look like Jell-O because it's full of dead aquatic stuff or dead terrestrial stuff that looks like leaves.

I know of one site in not this country that had an actual problem with their cooling water intake filling up at a certain time of year under certain storm conditions with something that looked an awful lot like a mat of leaves, and it was the whole, basically, river looked that way. Didn't affect electric power, but certainly could affect their heat removal, so think about that, please.

MR. SHAMS: I know Joe promised to respond back, but I would just offer a thought that in the design of mitigating strategies, we've ultimately designed for a more limiting situation, which is the loss of both the ultimate heat sink and the extended loss of AC power, so if we lose one, not the other, I would see that as a less limiting circumstance.

CHAIR STETKAR: No, you haven't, and I'll bring this up on the record. You have designed mitigating strategies under the explicit assumption that the bucket of water remains intact. It is designed around the fact that putting water

from the bucket into the plant is not available. And I will point you to endless numbers of references in NEI 12-06 that says a fundamental assumption is that water is in place in my ultimate heat sink and is available to be used for cooling. I just can't get it from that point to the cooling loads in the plant.

So you have not designed mitigating strategies for cases that destroy the ultimate heat sink's bucket of water as a capable source of removing water. And what can do that? You can fill it full of gook. You can turn it into something that looks like Jell-O. You can fill it with so much fine sand and stuff that gets through all of your intake screens and gets into your plant and plugs all of your heat exchangers in your plant or scours them, depending on the design of your intake.

Okay. The mitigating strategies have not designed against that. They assume that the water is available.

MR. RECKLEY: As Joe mentioned, we'll look into maybe clarifying, but I think it is important to distinguish between a couple things, and it's not all inclusive, because some of the

examples, like a landslide, can be fairly quick. U.S. plants have experienced bio-fouling and the clogging of intake structures. I mean, we have experienced that.

But you have to distinguish between those things, I think, that can credibly challenge the operability of safety systems, for which you can respond and it doesn't cause an immediate challenge to the plant in terms of leading to a sever accident without other failures occurring, and those things that might, as the tsunami did at Fukushima, or some other event, the external event itself challenges the plant and takes out your safety system.

So I think we can sharpen our discussion a little bit to address your point, but, as Joe mentioned, it's a good point and good --

CHAIR STETKAR: No, I bring it up more, I'm a detailed guy, you know that, I bring it with specific examples to illustrate the point that the screening process, the thought process, should not necessarily have been limited to only loss of AC power and loss of a heat sink, because some of these things could, in principle, threaten loss of the heat sink alone.

And there may be justifiable reasons for screening them out, but I didn't see that justification in Appendix A, in that table in Appendix A, because it tended to focus on the low likelihood that it could cause both effects.

I've got a couple more, I don't have a lot of these, so that was the big picture. In fact, this other one is like that. You screened out, this was just a curiosity, waterspouts because you say that, well, "Based on a review of operational experience, databases, and engineering judgement, these hazards are considered highly unlikely to cause coincident loss of all trains of safety-related SSCs and extended loss of AC power."

Same thought process that I just brought up generically, and yet, you know, those darn tornados are really important. Last time I checked, the only difference between a tornado and a waterspout was, a waterspout was over water and a tornado was over land, and indeed, they've migrated between each place, so I don't understand why just a necessity, waterspouts are screened out and tornados are really important.

I view them as the same meteorological. If I have evidence of a site along a coastal

location that has had 37 waterspouts in the last 100 years, and just none of them happened to touch down and hit land, I don't know that I'd feel real comfortable about that site from having high rotational winds.

MR. RECKLEY: We'll take a look at that.

CHAIR STETKAR: I mean, it strikes me as you could --

MEMBER POWERS: I interpreted it as it doesn't really affect things until it becomes a tornado.

CHAIR STETKAR: Okay. Except that my argument is, can you screen out a site that's had 37 waterspouts visible from it and just because none of them happened to happen on land, then it's not a problem, because I can say, well, I've never had a tornado near my site.

MEMBER POWERS: But I don't think they do that.

CHAIR STETKAR: Okay. I don't know what they do. It strikes me as high rotational winds. Anyway, that was more of a curiosity.

MR. SEBROSKY: Well, we'll take a look at that.

CHAIR STETKAR: Take a look at that.

MR. SEBROSKY: I mean, when we looked at it, I think there was also a thought that waterspouts weren't as energetic as tornados, and I don't know that that's --

CHAIR STETKAR: I wouldn't go there. I'd say it's unlikely that your switchyard is floating out there on the water, but in terms of evidence of vulnerability to high, you know, severe rotational winds.

MEMBER POWERS: When I looked at your list of things that you don't consider, I said, gee, they kind of systematically don't consider things that put a lot of dust into the plant, you know, volcanoes, I mean, the problem we had at Hanford was it plugged up all of our air intakes. And dust storms put dust into things and lots of things, forest fires put smoke, which is dust and drag.

One of the persistent concerns we've had as we move to digital electronics is these dust, and especially the smoke, are corrosive. And that it gets into it, it doesn't cause anything immediate, but six months later all your electrical contacts are corroded out. Does that cross

anybody's mind on these kind of considerations?

MR. SEBROSKY: So that's another good question, and I don't have an answer for you. One of the things we did, though, for all these hazards is, we have a gentleman in our group that came from Events Assessment, and for all these hazards, we scoured the different reports that we have access to.

MEMBER POWERS: Yes, I have --

MR. SEBROSKY: And if we saw an issue that we thought based on the results of that review, we would pick it up. So there was a hard look at our database, our operational experience database, that is quite extensive to look at these kinds of hazards to see if there's an opportunity for us to look at it again with open eyes.

MEMBER POWERS: I don't have --

MR. SEBROSKY: I don't have an answer for that.

MEMBER POWERS: I don't have in mind a particular incident at a nuclear power plant where smoke and dust have corroded contacts. We have encountered it in other digital systems where fire smoke has proved acidic enough to corrode contacts, and I am familiar with some laboratory experiments

that showed, yes, fairly, that that sort of thing does cause corrosion of contact, and it just becomes an issue as we move more and more to these electrical systems that are more delicate.

MR. RECKLEY: And normally, the way that would get picked up, and certainly if it's -- would be that upon the failure of a component because of that mechanism, a licensee would assess it and look at the extended condition that what other equipment might have been affected by that condition, and that works up until the point that you don't assume everything fails at the same time.

MEMBER POWERS: Yes, and I agree with you that you would, undoubtedly, this would not be catastrophically everything at once or is it highly probable that the one critical device failed. That might be a plausible argument, because certainly, these things are slow.

MR. SEBROSKY: Just one other note, the operational experience database that we look at isn't limited to the 100 operating plants in the United States. It's international too.

MEMBER POWERS: Sure.

MR. SEBROSKY: So we did, for all these hazards, look at that database to see if there was

something in it that warranted further review. Next slide. So Slide 8, this is the discussion about the volcanic activity. It is more detailed than some of the other evaluations that we did. And what we reference is a response to a recent 10 CFR 2.206 petition that was based -- the premise of the petition was a supervolcano under Yellowstone, and what are we doing for plants that could be affected by the rupture of that supervolcano.

And the detailed evaluation is actually within the response to that 2.206 petition. We just summarize it in Appendix A and it argues that our conclusion was that the volcanic ash at the time, or volcanic activity, would be limited to Trojan, which has since been shutdown, and the Columbia sites, and that the other sites are too far away to consider the threat.

The Columbia updated Final Safety Analysis Report does, with specificity, look at volcanic activity and mitigating strategies also looked at volcanic activity. And when you look at the mitigation strategy response, there's three phases of the mitigating strategies, as you're aware.

Phase 1 is the use of installed

equipment, Phase 2 is the use of onsite equipment, and Phase 3 is resources coming from offsite. The Phase 2 equipment is housed in a structure that was designed to withstand volcanic ash. That's our basis for saying why we think we're okay at Step 1 on volcanic activity.

CHAIR STETKAR: It's housed in a structure that's designed to withstand volcanic ash, on the other hand, breathing volcanic ash while it's trying to operate is a different issue. Volcanic ash isn't something that just spews up in the air, it falls on the ground, then you're done with it in a couple of hours.

So have they evaluated the operability -- and we shouldn't dwell on this because it's only Columbia and, you know, it's outside the purview, can you screen this out from your generic issue? In my opinion, yes. I think you made an argument that it might be a single-site issue in the United States, but we're arguing that, you know, the --

MEMBER POWERS: Columbia did their analysis. They had the benefit of the Hanford experience and I think they took a pretty reasonable cognizance, not only of the enduring nature, the resuspension, but also its cutting

capabilities.

CHAIR STETKAR: Yes, we shouldn't waste time on Columbia. When I read through the stuff in Appendix A that does talk about Columbia, I'll just, for the record, note that they apparently assumed that it would only cause a two-hour loss of offsite power, which, okay, you could assume whatever you want to assume, but --

MEMBER POWERS: I think we were out for three days up at Hanford.

CHAIR STETKAR: Yes, I was going to say, if that's what they -- but again, it's a single -- the staff has to deal with that single site. And whatever they assumed, and whatever the basis, and whatever credit they take for mitigating strategies, you know, that's not what we're talking about today because it's only a single site.

MR. SEBROSKY: I understand the point, but from our perspective, if we even -- that's part of the process, that if we identify even a single site, that we need additional information, that that would be part of the white paper. So as part of Step 1, we're saying all 100 operating units are okay, including Columbia, so we'll take a look at that.

CHAIR STETKAR: Oh, okay. I didn't understand that. I thought something got passed to Task 3 if and only if there were two or more.

MR. SEBROSKY: No. That's the basis for it not being a generic issue. What we're proposing, and if it's not clear, I apologize --

CHAIR STETKAR: Yes, that is --

MR. SEBROSKY: -- Step 1 and Step 2, we're saying for all hazards, other than snow and high winds, all 100 plants are okay and there's not one plant that we need to show 50.54(f) under.

CHAIR STETKAR: Oh, I didn't get that impression. I thought it was strictly, do we pass it through to Task 3 as a potential generic issue, meaning two or more --

MR. SEBROSKY: An outcome of this could be one 50.54(f) letter for one hazard to one plant. And that's what we think is within the scope of this.

CHAIR STETKAR: So that's why dwelt on Columbia.

MR. SEBROSKY: That's why we dwelt on Columbia and that's why we dwell on HB Robinson.

CHAIR STETKAR: Well, that explains -- yes, because I had a question of why are you going

into those single-unit --

MR. SEBROSKY: We take advantage of generic. If we can resolve an issue generically for all 100 sites, or 100 operating units, we take advantage of that, and if the generic activity culls it down to one plant, then we have to look at that one plant.

MR. SHAMS: And if we're not satisfied with the justification, it would had to have been moved to Step 3.

MR. SEBROSKY: When you talk about Columbia and the volcanic ash, and I understand you may be referencing what's in their updated Final Safety Analysis Report as far as what they assume for the activity, in generally, when it comes to the NEI 12-06 equipment, the guidance that we use and the guidance that we inspect against, and I still have to get you an answer on Columbia, but the guidance that we use and the guidance that we inspect against, if it's a volcano, if it's an avalanche, if it's a landslide, I'll give you an example, in Diablo Canyon, landslide, they have to have a process in place to get the Phase 3 equipment onsite assuming that landslide, and how are you doing it?

And they have bulldozers and helicopters, right? So if you get to the volcanic activity, again, I'd have to take a look at it, and what we did or didn't do when it comes to implementing all three phases of that in a volcano, but there is an expectation, a clear expectation, that they would be able to mitigate that beyond design basis of that in all three phases given the condition.

CHAIR STETKAR: That may come back, though, to that -- you know, my rant about the bucket of water, that it's clear that the NEI 12-06 assumes that the water reservoir is available and it's suitable for whatever cooling purpose is needed, meaning, it's clean enough and all that kind of stuff.

There may be an implicit, I haven't read it anywhere, assumption that the air quality is sufficient so that I can run my portable gas turbines, or portable diesel generators, or whatever I'm hooking up, you know, within my Phase 2 or Phase 3 response strategy. That isn't stated explicitly in NEI 12-06. I haven't seen the air quality.

MR. SEBROSKY: No, it's an implicit

assumption, given the hazard, that you'll be able to -- and I go back to Diablo Canyon and also with avalanches, that if you lose access to the site because of an avalanche, then the mitigating strategies --

CHAIR STETKAR: And that's clear.

MR. SEBROSKY: So we'll take a look.

MEMBER POWERS: Yes, the air quality problem during the Mount St. Helens was just disastrous. I mean, we just couldn't -- I mean, you couldn't drive cars.

CHAIR STETKAR: Anyway, so just to be clear, I didn't think any unit that could be affected by any of these things, if you determined it could be, then it would have been tasked to Task 3.

MR. SEBROSKY: The fundamental premise is that if we could resolve the issue for all 100 operating plants in Step 1 or Step 2 --

CHAIR STETKAR: It was done.

MR. SEBROSKY: -- it was done. And that's what we're saying.

CHAIR STETKAR: And if you could not resolve for one and only one, it would pass to Task 3.

MR. SEBROSKY: That one plant would pass to the Task 3. And certainly, when we talk about snow loads, we're not worried about the plants in Florida with snow loads, so that's an example of where it would be a more focused review, and the same thing with HB Robinson. That's why we dwell so much on that because of the downstream dam fire.

CHAIR STETKAR: We'll get to the dam thing later.

MEMBER POWERS: Well, on the other hand, a Florida plant did have a big snow load, you'd worry about it.

CHAIR STETKAR: They make an argument that anything south of the 35th parallel, you don't need to worry about snow. I live south of the 35h parallel and we had some damn heavy ice storms and snow storms.

MR. SEBROSKY: Well, that's for purposes of the NEI 12-06, but we don't make that argument for snow loads. What we argue is -- and we'll talk about this.

CHAIR STETKAR: And it doesn't make any difference because there's enough plants north of the 35th parallel that you've retained it for --

we'll eventually visit Task 3.

MR. SEBROSKY: Yes, and it gets to structural margin. So Slide 9 is the geomagnetic storms and this is a different proposal, where, Columbia, we're saying we believe we have enough information to resolve Columbia, the argument for geomagnetic storms is it's being evaluated under a Tier 1 activity, and because it's captured under the Tier 1 activity, we can close it in this Tier 2 activity.

And our argument is laid out in this slide, but under -- as part of the Tier 1 activity, the mitigation and beyond-design-basis event rulemaking, with specificity, mentions a petition for rulemaking associated with geomagnetic storms. We did, as part of that proposed rule, receive comments on geomagnetic storms that we're looking at right now and we're assessing as part of that process.

And the punchline on all this is, because it's being reviewed as part of that process and there is a process for informing the Commission of the results of the staff's review, that we can close the activity as a Tier 2 activity.

CHAIR STETKAR: Is that -- there were

two of these things, we'll get to seiche later, but seiche and geomagnetic storms are treated, conceptually, the same way in the white paper that, because something else is dealing with them, we can checkoff the box that they're closed under this thing.

MR. SEBROSKY: Yes, we can talk about seiches, and there is a change --

CHAIR STETKAR: We will eventually, but conceptually, both of those, right, are dealt with the same way. They're being dealt with under some other issue so we can checkoff the box for this particular activity that, we're done with them.

MR. SEBROSKY: Yes, and we may --

CHAIR STETKAR: But hand it off to other people. My question is, these thing have to be resolved by the end of this year. When do those other things need to be resolved? Are we just simply passing it to something that's going to go on ad nauseam for decades or centuries and say, well, we're done with it --

MR. SEBROSKY: So one of the concerns that we had was to make sure that we weren't missing an immediate safety concern. And there is an argument in the paper that takes advantage of

staff's past work on geomagnetic storms and indicates that, as documented in the staff responses to Congress, we don't see an immediate safety concern right now, but we're still studying the issue.

So I can't give you a timeline for when it's going to be resolved in the rule, or if it's going to be completely resolved in the rule, because some of this activity is outside the purview of the Nuclear Regulatory Commission and gets to the stability of the grid and the work that FERC has the lead on, and there is a White House initiative to look at geomagnetic storms that we're involved with.

So it would be disingenuous for me to suggest I know how it's going to end up in the MBDBE rule, and also, how it'll eventually be resolved as part of that White House initiative. What we try to argue in the paper is, we're telling the Commission we don't see an immediate safety concern that kicks us right into issuing a 50.54(f) letter or doing a backfit.

CHAIR STETKAR: But at this point of the game, from your --

MR. SEBROSKY: That's why we say we can

kick it to the Tier 1 process.

CHAIR STETKAR: Yes, but I'll bring you back, and I'm trying not to be too dramatic on this, you're going to tell the Commission you're finished with it from your perspective, so it's not an issue for the MBDBE rulemaking --

MR. SEBROSKY: I didn't say that.

CHAIR STETKAR: Well, but if it was --

MR. SEBROSKY: It's not for this Tier 2.

CHAIR STETKAR: The accounting on this stuff is starting to boggle me, so let me just get back to, if it's passed on to Task 3, from the purposes of this white paper, it's still in play in terms of, perhaps, issuing generic letters or being included as a requirement in the rule, right? Okay.

MR. SEBROSKY: Yes.

CHAIR STETKAR: If it's not passed on to Task 3, from the purposes of this particular exercise, it's off the table, is that correct?

MR. SEBROSKY: No.

CHAIR STETKAR: No. Okay. Why is it not off the table then?

MR. RECKLEY: Well, if in the

disposition of the issue under the MBDBE rulemaking, for example, there became -- and Tim's going to rescue us here, but if the staff was unable to say whether -- if we needed information from licensees in order to address a question about whether it should be in the rulemaking, we would, through that process, undertake the same thing we would here, right?

We're just trying to say it's already in a Fukushima-related item, keeping it open here wouldn't help in its resolution. It's already been undertaken through the rulemaking. Tim, do you have a --

MR. REED: Can you guys hear me?

MR. RECKLEY: Yes.

MR. REED: This is Tim Reed. I'm the project manager for the Mitigation of Beyond-Design-Basis Events rulemaking, and what the two of them mentioned earlier is correct. We have several efforts going on right now. Obviously, FERC, they're the transmission system reliability people, they regulate that, they are, in fact, they have a proposed rule out, they're trying to adjust the requirements for geomagnetic storms for that, so we have to wait to see what that ends up being,

because that'll address this issue to some extent.

There's a White House initiative, of course, we have to be cognizant of that, and of course, what we're putting in place for the Beyond-Design-Basis events rulemaking is, in part, at least a good start, to address this thing too.

So what we're looking at here is that there's a petition for rulemaking 1596, which we have accepted, okay? Now, what that means is, we've accepted this PRM, we are going to consider it under rulemaking, but what we have to do is see where end up with our rule, where FERC ends up, where the White House ends up, what delta exists, if any, if that's substantive enough, and then all the comments, we've gotten, frankly, some really good comments on our rule for this issue, geomagnetic storms, we would consider those as part of the PRM to see what, if any, additional requirements would occur.

So to get back to what you guys are saying, it's definitely in a process. It's going to be, you know, completely considered under the PRM rulemaking process, so I think that's just a little bit more detail than what you guys were saying, so hopefully that clears it up.

Again, this is what I think we're going to be doing. I got to be careful. This is the way the rule's going right now. I'm not the Commission, the last time I checked, so I guess they can change what I do.

MEMBER POWERS: Well, I think what you leave open is John's question that by being considerate of other activities for White House, who knows what all, does that mean this goes on for heroic periods of time or is there a point where you say, look, I can't wait for these people because they have to consider a lot of other things besides nuclear power plants and their impact on those, and whatnot.

I mean, do you have a watchdog timer on this?

MR. REED: Again, I think that gets back to, you know, I don't have -- Dr. Powers, I do have to wait for our federal partners to at least -- you know, you understand that.

MEMBER POWERS: I mean, there's the question, you say you have to wait. No, you don't.

MR. REED: Well, actually, I'll correct that, actually Joe mentioned, if we solve an issue right now, I mean, if we solve an issue right now,

we would take action and we are monitoring that right now. I mean, so I guess that's probably the better way of saying it.

MEMBER POWERS: Okay. Well, I guess I really am dead serious. Is there a watchdog timer on this?

CHAIR STETKAR: Generic issue 199 was crawling along at its snail's pace with everybody doing all of the research and trying to figure out how to plan to figure out how to maybe figure out how to do it for years and the bad news is, Fukushima happened, you know, which, oh, my God, this is really important.

Well, the point that I'm trying to make, and that Dana's trying to make, is that, if -- we don't want to have that experience. We don't want to have the Japanese experience of studying the fine structure of precise notions of models for tsunamis. We don't want to have something that goes on in the research community for decades if indeed it might be an issue, if there might be protections that the plants can put into place, or if we, indeed, can draw a conclusive enough argument that it really isn't an issue.

And my notion, keeping it alive in this

framework at least pushes an end of 2016 forcing function to that decision.

MR. RECKLEY: Keeping it open in two staff activities versus one staff activity, to be honest, is not going to speed things up, but going to your basic point though, and this is brought out by various studies, including the National Academy of Science, where you try to balance the continual evaluation of new data and study, and do due diligence of issues, and taking timely regulatory action, and avoiding what some might say happened at Fukushima where you can get into a paralysis-by-analysis mode, or maybe what your point was for GI 199, that we might have been in, although, I would argue a little bit we weren't there, but I can understand the point.

And we're trying to do that balance, and I think that's what Joe and Tim have both said, is that, we're comfortable in the initial assessment through both mitigating strategies and other understandings that this isn't an immediate safety issue, and it can be resolved in, what some might say, the longer term through the rulemaking process.

CHAIR STETKAR: Okay. Thanks.

MEMBER RAY: Well, wait a minute. Can I ask a question?

CHAIR STETKAR: Yes, you may.

MEMBER RAY: What Bill last said, he said, I can't repeat it exactly, Bill, but you used the phrase through the mitigating strategies. And I guess, in listening to this for the last God knows how long here, I was trying to ascertain to what extent we were deferring resolving something because we thought we had a mitigating strategy in the event that the resolution came, as John said, after the event, as it did in Fukushima.

And, you know, I understand that having mitigating strategies in place may give us more time to decide is this a problem or not, which I think is, basically, what you were saying, but am I misunderstanding what you were saying?

MR. RECKLEY: No, I think that's fine. The fact that we have put mitigating strategies in place provides that much more confidence.

MEMBER RAY: Okay. Now, you understand from our standpoint though, my standpoint, excuse me, that that's reasonable to a point, but beyond a point, it simple is an excuse for not resolving something that should be resolved.

CHAIR STETKAR: Those mitigating strategies rely on the stuff inside of the plant still working.

MR. SHAMS: Phase 1. That's correct.

CHAIR STETKAR: No, no, Phase 3 relies on the stuff inside. You have to have electrical and electronics stuff inside the plant that still works.

MR. SHAMS: What I meant is, yes, the Phase 1 equipment that you connect to through Phase 2 as well, and Phase 3, yes.

CHAIR STETKAR: So, you know, I'm not an expert on geomagnetic storms, so I don't know what it can do to sensitive electronic stuff or how long those effects can persist inside the plant.

MEMBER RAY: You're questioning whether the mitigating strategies are, in reality, a reason to extend resolving the thing.

CHAIR STETKAR: Exactly, because I don't know enough about the problem.

MEMBER RAY: I understand.

CHAIR STETKAR: That's what I thought the whole issue of kicking this to Task 3 to take a harder technical look at it.

MEMBER RAY: I was just commenting on

what Bill had said because he connected mitigating strategies with the time to resolve these things, and I think that that's something that, at least in my view, is understandable to a point, but it goes too far too often.

MR. SEBROSKY: So the last bullet on Slide 9, we did have an April 5th Category 3 public meeting on the white paper and we did not receive any substantive comments on this portion of the paper as a result of that, so it's just a report out since this meeting is so close to the April 5th meeting, what we heard, and there are some assessments where we do have substantive comments that we're trying to react to in the version that will go forward to the Commission.

CHAIR STETKAR: Joe, just for -- I might as well bring this up now, we are planning to address this as a full committee in our May meeting, roughly two weeks from now. Is the version of the white paper that we received for this Subcommittee meeting what the full committee is going to have for its deliberations or will there be a change?

You just mentioned that as a result of the public meeting you were --

MR. SEBROSKY: I understand, and we talk about that, and I think -- do you want to --

CHAIR STETKAR: We can wait until the end of the -- or we can address it now.

MR. SEBROSKY: I think we should probably --

MR. SHAMS: We're prepared to give you an updated white paper or we can give you the draft SECY paper, because it is in concurrence, which would, essentially, constitute --

CHAIR STETKAR: That would be good.

MR. SHAMS: We can do that.

CHAIR STETKAR: Okay. The sooner the better.

MR. SEBROSKY: We would have to make that publicly available. Well --

CHAIR STETKAR: Yes, I mean, it's --

MR. SEBROSKY: And I think we need to -- so there's a couple caveats, right? It would be draft and it's not approved -- it doesn't have management and OGC approval, just like the white paper.

CHAIR STETKAR: But if it's substantively improved from the draft white paper, I think that our committee members, and perhaps the

staff, might benefit from our seeing that.

MR. SHAMS: Well, there's certain areas that it certainly had more information in it. You had talked about Robinson and the seiche area, so those are areas, and we contemplated giving you just these sections because they're the ones that actually had substantive change, if you would, so that was a third option that we thought of.

So why don't we take that and think about, you know --

CHAIR STETKAR: It's probably better to have a complete document just so that we can refer to something, you know, that the ACRS' review is linked to a specific document rather than one document with bits and pieces possibly changed.

MR. SHAMS: It makes sense and let's work that out --

CHAIR STETKAR: Let's do that. Talk to Kathy for the --

MR. SHAMS: Thank you.

CHAIR STETKAR: I don't want to put too much of a rush on you, but it is, you know, roughly two weeks from now.

MR. SCHULTZ: Joe, is there more information in this document related to the

volcanic evaluation for Columbia?

MR. SEBROSKY: Yes. The substantive comments --

MR. SCHULTZ: Here it says, you know, the staff has done a detailed evaluation which is summarized in the following paragraph, but it doesn't really hit on the issues that we discussed today in terms of whether the equipment -- for example, it depends upon an evaluation related to the equipment protection and indicates that the structure will handle the ash loading, weight loading, but doesn't talk about whether the equipment will operate in the environmental condition of the volcanic ash.

MR. SEBROSKY: So there's things between now and beginning of May that we would be able to do as far as giving you an update to the paper. Between now and the full committee meeting, I think the only thing, reasonably, that we can do is let the full committee report back to you on some of the concerns that we heard and what we intend to do.

What we can give you between now and the full committee is the additional information that we've put together, the additional arguments

that we've put together, based on the comments that we got as a result of the issuance of that paper. We can do that, and then we can report back to you on where we -- what adjustments, if any, we're considering as a result of comments that we receive today.

MR. SCHULTZ: Thank you.

MR. SEBROSKY: The next slide. So this is a summary slide. What's in our paper is, there are four groups of hazards that were not disposition as part Step 1, and that's wind and missile loads from tornados and hurricanes, snow and ice loads for roof designs, drought and other low-water conditions, and extreme temperatures. These are the four sets that moved on to Step 2 of the process in the white paper. Next slide.

So what Step 2 of the process starts out as in the white paper is, we recognized very early on that we needed to do a more detailed evaluation when it came to wind and missile loads, and also snow loads, and we moved that to Step 3 of the process, so Step 3 of the process of the proposal is we would report to the Commission what the issue is, summarize it at a high level, why we moved it to Step 3, and what we're thinking as far

as being able to address those issues in a timely fashion.

What we say in Step 2 is, we believe we have enough information to resolve drought and other low-water conditions, and extreme temperatures as part of Step 2, and that's what the next slide talks about.

When you look at the low-water conditions, the three low-water conditions that we evaluated were drought, low-water conditions due to downstream dam failure, and this is a very unique scenario that we'll get into in detail, and then also low-water conditions due to a seiche.

One of the things that Mr. Stetkar talked about was being in two processes at the same time. Our management challenged us that if we saw an issue that we believe we could close, that we would close it as part of this activity. Both the low-water conditions due to a downstream dam failure and the low-water conditions due to a seiche were identified by NRC staff as pre-generic issues.

What we allude to, and we reference both of these in the document, where we think we're going as far as the SECY is, we are going to, the

thought right now is, attempt to close both those issues with this SECY paper. And if we can demonstrate that we can close the issue in the SECY paper, the generic issue process would reference the SECY paper as the disposition of the issue. That's kind of where we're at.

The criteria that we applied for the low-water conditions are conservatism of design, operational limits in place, and the warning time. If you go to Slide 13.

CHAIR STETKAR: Joe, before -- I've got some questions about downstream dams, and dams in general, and a couple questions on seiche, but just because of the way your slides were organized, it may be better to take a break now before we get into the dams because you got three or four slides on dams, and I've got a couple of questions, and I don't know if any other members do, so what I propose is we take our break now and then come back and kind of get into the meat of these topics.

So let's do that. Let's recess until 2:45.

(Whereupon, the foregoing matter went off the record at 2:29 p.m. and went back on the record at 2:45 p.m.)

CHAIR STETKAR: We are back in session.

Time to talk about low-water level.

MR. SEBROSKY: This is Joe Sebrosky again, we're on Slide 13, and there's only one bullet on this slide for drought. There's just a one-paragraph disposition for this in Step 2 that there's a sufficient warning time to allow licensees to take appropriate action. The low-water conditions due to downstream dam failure, there's an extensive discussion on low-water conditions due to downstream dam failure and seiches. There's a summary in the main enclosure, but the more detailed assessment is in Appendix B of the white paper.

And what we note is that this issue was identified as a pre-generic issue, the issue was closed out for all but one plant in a March 11, 2016 letter, and the basis for closing the issue for all the plants, with the exception of Robinson, was, the plants with non-seismically qualified downstream dams have developed mitigating strategies to cope with it, risk assessments were performed for plants with seismically qualified downstream dams, and we'll talk about the process in the next slide on how this was identified as a pre-generic issue.

And the concern was, the reason it was identified as a pre-generic issue is to make sure that something wasn't falling through the cracks during our assessment of the 50.54(f) flood hazard re-evaluations.

There were risk assessments performed with seismically qualified downstream dams and all the sites screened out with the exception of Robinson. And again, we'll talk about that in a second when we get to the next slide.

So the conclusion is generic regulatory action to address downstream dam failures are not warranted and what we provided in the assessment was a detailed evaluation of Robinson since it wasn't evaluated as part of the March 11th closeout, and we talk about the capability of the deep well pumps. And what we are adding, a discussion about the reactor coolant pump seals. They have newly installed passive seals that limit the reactor coolant pump leakage.

You see a discussion in the paper right now about the capability to provide a source of water to the steam generators. We don't have a discussion of what the primary plant is doing and we intend -- this is part of stakeholder comments

that we are trying to make that discussion more robust and what we think we can provide you some time next week.

If you go to the next slide. The last bullet on here, when I say further evaluation as part of the NTTF 2.1 activities, there's a -- well, just keep that thought for a second as we walk through this slide, and this process that's outlined in the March 11th, I'll try to see if I can highlight the important parts, you start out with a generic issue and if it goes to the bottom, it needs to be evaluated. If it screens out up top here, then it's out of the process.

So you see new nuclear power plants and other regulated facilities screening out at this step, operating nuclear power plants screening in. This step here, you look at operating nuclear power plants with downstream dams. If it doesn't rely on a downstream dam, then it screens out up here. If it does have a downstream dam for its ultimate heat sink, it does down.

So the next step is random events screen in. The reason that is there is there's a fundamental presumption, and this gets back to the issue on why it was looked at as a generic issue,

as part of the mitigating strategies order, if a dam was considered seismically robust, you didn't have to assume that it failed.

So the mitigating strategies was designed such that you could rely on that source of water and that was the challenge. The challenge was, what happens if that downstream dam that's seismically robust fails due to a random sunny day failure, which we are not looking at as part of mitigating strategies. You just assume the dam doesn't fail.

That is what the generic issue looked at and there were 13 sites, 21 units, that fell within the scope of this generic issue, that whether or not you have a seismically robust dam, fundamentally assume from mitigating strategies perspective that you could rely on it, it would impound the water.

What happens if it failed due to a sunny day failure or a piping event? Do you have an issue? That is what the March 11, 2016 letter looked at for those 13 sites, 21 units. And when you look at the next steps in this process, where it talks about the screening risk analysis doesn't demonstrate low risk, it screens in, and risk

assessment doesn't demonstrate low risk, it screens in, and not more than one operating nuclear power plant screens out.

So based on the assessments that were done, again, if you look at the March 11, 2016 letter, there's a public portion of it, and there's two documents that are non-public that are a detailed PRA, it concludes, they conclude, that based on the risk assessments that were done for all of those sites, 21 units, 13 sites, that all but one of them, they could demonstrate it was low risk.

The majority of the risk analysis boiled down to an impoundment within an impoundment, that although they relied on a safety-related ultimate heat sink dam being robust, if that dam failed because of piping failure, there was another impoundment behind that, and in some cases, submerged that you can't see, that would retain enough water to remove decay heat.

When you look at the detailed risk assessment, that's the kind of information that they looked at and based their risk analysis on. That is not true at Robinson. Robinson does not have a backup impoundment, but they were able to

say 20 of the 21 units screen out, with the exception of Robinson. Robinson needs to be looked at more closely.

If you go back to the previous slide, one of the things I just wanted to talk about real quick, the further evaluation as part of NTTF 2.1 activities, there's a statement in the white paper where the seismic hazard at Robinson, the re-evaluated seismic hazard at Robinson, changed, and there's a non-trivial change in seismic hazard.

What the concern is for that activity is to ensure that the NTTF 2.1 activity, which is the 50.54(f) letter on seismic, is going to look at the dam as it relates to that new seismic capacity, is that going to be evaluated. So there's a portion of Robinson downstream dam failure that is going to be looked at as part of the seismic PRA under the 50.54(f) process.

Because that portion's being looked at, we're saying that's being resolved as part of the Tier 1 activity, and we're closing it in Tier 2 because of that, just that portion. That's what that last bullet means. If you go to the next slide.

So this slide was meant to capture some

of the information that we believe, based on stakeholder comments, that we need to add to the white paper, or the SECY paper, and as we discussed earlier, we have updated the draft assessment in this area based on these bullets, and that's what we have to get with our management, we have to get with Mo afterwards and figure out, some time next week, giving you an updated version. I think that's our commitment.

So this is a laundry list of what we're doing. There is a high-level discussion of the deep well pumps that's already in that appendix. There's four of them. We're adding more of a discussion of the capabilities of those pumps. The "D" deep well pump is a well-sized pump. It can pump out 1320 gallons per minute, so it's non-trivial flow, and it can supply -- it's hard-piped to the service water system. It can feed the installed emergency diesel generators to cool it, and it can also supply some of the heat loads on the service water system.

When I can say wells can support FLEX long-term cooling, the "D" deep well pump has the capability of being supplied by either safety-related bus. The three other pumps, the A, B, and

C deep well pumps, come off non-safety-related buses, but the FLEX diesel generator can be used to power those three pumps, and they can provide water to the aux feedwater system.

The "D" deep well pump has multiple connections to the service water system and it can also, through a FLEX hose, supply, or resupply, AFW water supply tanks. So we also intend to add a discussion on the reactor coolant system inventory control.

If you look at what's in Appendix B right now, it concentrates more on demonstrating the capability of the deep well, the "D" deep well, pump to supply the aux feedwater system and then to get water into the steam generators to remove decay heat. We are silent on the reactor coolant system. There was a stakeholder comment that we received that said if you didn't provide cooling to the pump seals you could have a potential for a reactor coolant pump seal leakage.

That's not the case at Robinson. They've installed the reactor coolant pump passive seals, the SHIELD seals. We had more of a discussion about that and there's plenty of capability through the refueling water storage tank

to maintain primary pressure control.

So those are the additional things that we're adding to the Robinson writeup to bolster the conclusion that no further regulatory action is needed to address the Robinson downstream dam failure.

MEMBER RAY: Not to disagree with that conclusion, but just to ask a question, having operated and re-licensed dams quite often, I wondered how the seismic qualification of the dams was established. Was it just what they were asserted to have been designed to or was the design reviewed in any way?

MR. SEBROSKY: So I don't know the answer to that off the top of my head. I know that if you go to that March 11, 2016 document and you look at the public version of the document, there's also the risk analysis that's non-public that, obviously, the ACRS folks have access to.

There is a discussion about who is the regulatory authority for each one of those dams and I forget if Robinson, who the regulatory authority is, if it's FERC or not, but --

MEMBER RAY: Well, as you can imagine, most dams are pretty old and the technology and the

analysis basis for their design --

MR. SEBROSKY: So one of the concerns that we had, and it gets back to the NTTF 2.1 recommendation, is the non-trivial change in the seismic hazard. The "D" deep well pump is not seismically qualified, right? And for this argument to work, it's a sunny day dam failure, right? You don't assume the dam goes away.

But the concern was, with the non-trivial change in the seismic hazard as part of the 2.1 activity, is the licensee's intention, they've committed to doing a seismic PRA, and the timeframe for them giving that to us is the 2019 timeframe, is the licensee's seismic PRA going to look at the robustness of that dam given the new seismic hazard?

And the answer that we got from the licensee was yes. The concern that they have isn't necessarily related. It's my understanding there's a portion of it that's concrete, but there's also a large portion that's earthen. It's my understanding that they're not necessarily concerned about the earthen part of the dam, but they're looking at the gates, the floodgates, and their capability to handle the new seismic loading.

From our perspective, we just want to make sure that they're looking at that, and they've told us they're not sure, when they do the seismic PRA, if it's going to result in a conclusion to upgrade the "D" deep well pump seismically or upgrade the dam to make sure that it can handle the new seismic hazard.

MR. SHAMS: So if I may add, just in a generic fashion, you know, you asked the question of who looks at these dams, you know, in general, and Joe alluded to it. They're owned and operate by different federal organizations, the Corps of Engineers, FERC, Bureau of Reclamation, for the most part, these organizations have periodic inspections and periodic risk assessments.

I wouldn't testify to say that I know for a fact they do that, and they take the re-evaluated hazard, but I know they do have regular dam safety programs to look into their dams and inspect them on regular basis and analyze them.

MEMBER RAY: Well, that's certainly true, but I just was really focusing on the terms of non-seismically qualified downstream dam versus seismically qualified, and I know how very difficult it is to assert something is seismically

qualified that was designed 100 years ago or even 50 years ago.

MR. SEBROSKY: Yes, so as part of the mitigating strategies one of the things that we inspect, or audit, is, if a licensee assumes that a dam is robust, we look at that to make sure that we can come to the same conclusion. It's disingenuous to suggest that involves a detailed assessment of the dam.

CHAIR STETKAR: I wanted you to get through this before I brought up my, sort of, couple of issues. Let me try this, when I went through the white paper and NEI 12-06, and everything associated with it, I had to create a little table for myself, so I did, and I either have a seismically robust dam or I have a not seismically robust dam.

So I figured, okay, well, let's look at, suppose I have a seismically robust dam, how do I dispose of that? If it's seismic failures of a seismically robust dam, those don't occur. If it's an overtopping -- and I thought of three failure modes, by the way, seismic failures, overtopping because of, let's say, a flood-induced overtopping, and just random sunny day failures.

So if I have a seismically robust dam, seismic failures of a seismically robust dam are N/A, overtopping failures of a seismically robust dam are included in the scope of the external flooding hazard assessments, and indeed, I've traced that through, so I got that, random failures of seismically robust dams are addressed by what's documented in Appendix B of the white paper, and we've discussed here, the risk assessments that were addressed as part of the generic issue, right?

Okay. So I've taken care of seismically robust dams. I've got a not seismically robust dam, seismic failures of not seismically robust dams are, indeed, included in NEI 12-06. I found statements in there that says, you have to account for seismic failures of not seismically robust dams.

Overtopping failures of not seismically robust dams are part of this other issue of the flood wave comes down and takes it out, and I'll get back to that in a second. Where are random failures of not seismically robust dams addressed?

MR. BAILEY: So this is Stewart Bailey with the JLD. They're basically addressed implicitly by the fact that the mitigating

strategies are designed to not take credit for the water impounded by that dam and so --

CHAIR STETKAR: I'm sorry.

MR. BAILEY: And that's even superimposing an ELAP and --

CHAIR STETKAR: Stewart?

MR. BAILEY: Sure.

CHAIR STETKAR: As a matter of fact, they are explicitly designed to take full credit of the water that's impounded by that dam. In NEI 12-06, it is stated explicitly that, this goes back to my ranting about the bucket of water, the bucket is there, the water is in the bucket and it is capable of cooling. The only thing that I've lost is the ability of transferring water from the bucket to the plant.

MR. BAILEY: Correct.

CHAIR STETKAR: Okay. So how does the mitigating strategies take credit for the fact that the bucket drained due to a random failure, not --

MR. BAILEY: So for plants where the dam is not considered robust --

CHAIR STETKAR: Okay.

MR. BAILEY: -- meaning that it is not seismic, they have other sources of water that they

can access if that water goes away. 12-06 is designed such that I can only credit a water source that is robust. If the downstream dam is not seismic, the impoundment is not robust, and therefore, I have other means, via wells, or other methods of getting water, not full functionality safety-related, but sufficient for the functions of floods.

CHAIR STETKAR: Could you do me a favor and point me -- I must have missed it, could you have somebody point me to where in NEI 12-06 it says that?

MR. BAILEY: Sure.

CHAIR STETKAR: I mean, you don't have to do it now, because that's really important in terms of completeness. Now --

MR. SHAMS: Just to add, Mr. Stetkar, I'm sorry, I don't know where that's going to be in 12-06, and I know Stew will get us there, but I know that the staff, when we talked to the staff that audited the sites, when they went to a site and the downstream dam was not seismically qualified, they required the licensee to identify an alternate source of water in the strategy.

CHAIR STETKAR: And I'm fully happy

with that. I'm just trying to make sure that nothing got lost in --

MR. SHAMS: Yes. No, I wanted to provide --

CHAIR STETKAR: -- because there's too many documents out there, there's too many sets of guidance, and I wanted to make sure that they all tie together.

MR. SHAMS: Sure. We'll provide that.

CHAIR STETKAR: Let me make a note here because I'm a slow writer and I don't remember anything. Okay. Now, when I started thinking about this stuff, will the analyses that are done under NEI 12-06, the assessments or whatever's done, account for the following type of condition, I know that they will account for a condition where the flood from an upstream source is severe enough to both flood the site and take away the downstream dam, so flood wave comes through, I get some flooding onsite, downstream dam goes away. That seems pretty clear to me.

Will they account for conditions where the flood wave is not severe enough to inundate the site buildings, but could overtop and fail the downstream dam, follow me, such that I now remove

my ultimate heat sink? I may not have destroyed offsite power. This goes back to the type of screening assessment, will they do that?

It's not a site flooding event, it's what's called a riverine flooding event, that through the failure mode of overtopping, takes away my ultimate heat sink, and I don't think they will.

MR. SEBROSKY: So let's talk about this for a second.

MR. BAILEY: So I'll hesitate a little bit because I have not looked at every single plant, but if you look at the more contemporary writeup of Robinson in the paper, and it's represented as --

CHAIR STETKAR: I, by the way, read all of the Robinson stuff.

MR. BAILEY: Okay.

CHAIR STETKAR: It's now public.

MR. BAILEY: Well, I don't know if you have the absolute latest, but --

MR. SEBROSKY: He does not.

MR. BAILEY: Okay. Very good.

CHAIR STETKAR: The non-public stuff?

MR. SEBROSKY: No, so what we're talking about is, you don't see on this bulleted

list what Stew is about to say.

CHAIR STETKAR: Okay.

MR. BAILEY: And that is, as part of the flooding re-evaluated hazard, as part of 2.1, the licensees were to look at the re-evaluated flood hazard and implement interim actions as needed. So again, I have not done a full inventory of the plants, but in the Robinson case, they do have actions identified to be taken for the flooding event because it is postulated to overtop the dam.

So whether or not it floods the site, the licensees --

CHAIR STETKAR: That's a question that --

MR. BAILEY: -- as an anecdotal anecdote.

CHAIR STETKAR: Let's say the site is perched on, you know, a nice plateau above the river, and therefore, is not subject to whatever additional flood might come down the river, but that flood is severe enough to take out the downstream dam, and therefore, remove the ultimate heat sink.

MR. SEBROSKY: So the flood hazard re-

evaluation report for Robinson, what it looks at is, the probable maximum precipitation event, what it does to the site, and what it does the downstream dam, and it asks a simple question on the downstream dam, does it -- do the gates have the capability to handle probable maximum precipitation event? And the answer is no.

CHAIR STETKAR: Okay. But does that probable maximum precipitation event also have implications within the footprint of the site?

MR. SEBROSKY: It absolutely does.

CHAIR STETKAR: See, that's my question. Suppose that it didn't, it had zero impact on the footprint of the site, but it takes away the ultimate heat sink, and only the ultimate heat sink, but it takes it away in a way that's irretrievable. It drains my bucket.

MR. SEBROSKY: So the question that you asked that we owe you an answer on is, when they look at the downstream dam failure, and if you look at the random -- the non-robust dam failing, I have to think about that for a second, but for Robinson, the sequence that was looked at in the flood hazard re-evaluation report is the probable maximum precipitation does a couple bad things.

The gates cannot pass that probable maximum precipitation.

CHAIR STETKAR: Let me back you up. This is not a question about Robinson. I don't care about Robinson. I know Robinson has a problem. I know that somehow you're going to deal with Robinson. I'm talking about this generically. I'm talking about plants, and I don't know how many, if any, are out there, I'm asking about whether plants, as part of their flooding re-evaluation, part of looking at probable maximum precipitation, other sources for, typically, riverine sites, but other sources of flooding on a watershed that, for lack of a better term, can have a wall of water coming down the watershed that does not affect the footprint of the plant because the plant is up on sufficiently high stilts.

The water passes through there, takes out the downstream dam, and takes away their ultimate heat sink, leaving them without water to cool the plant. That's what I'm talking. And I don't know if there are any sites, honestly, whether there are any sites susceptible to that.

I know Robinson thought about it, but they probably thought about it because the probable

maximum precipitation also had impact within the footprint of the plant.

MR. SHAMS: If I may, and --

CHAIR STETKAR: And I don't --

MR. SHAMS: Yes, I'm just going to try to share a thought and see if that gets close. So when Joe went through, he sort of divided the downstream dams into two buckets, one that's seismically qualified, one that's seismically not qualified. So for the seismically not qualified, we just assume that they're not there, and that satisfies --

CHAIR STETKAR: And that was my first question about where's the pointer in NEI 12-06, or whatever, that takes care of it. That's a different issue. We're past that one.

MR. SHAMS: Right. As I shared, we feel good that we've asked the question and the licensees have identified alternate sources of water.

CHAIR STETKAR: Right.

MR. SHAMS: For the seismically qualified, what we consider the random failure, wouldn't that, essentially, cover hydrological failure as --

CHAIR STETKAR: No. This is not a sunny day failure. This is, I have the biggest dam in the world upstream from my site and that thing decided to fail, for some reason. I'll get to other reasons in a moment.

MR. SHAMS: Right.

CHAIR STETKAR: And the wall of water came down the river and took out my downstream dam due to overtopping failures. You know, it might be an earthen dam, it might be sluice gates, you know, I don't know what failure mode it is.

MR. SHAMS: Okay. I was just --

CHAIR STETKAR: But did not inundate the footprint of my plant, such that, I watched the water go through --

MR. SHAMS: My thinking is, the loss of the ultimate heat sink is the ultimate result of both, be it the random failure and the hydrological failure, so if I'm able to deal with it and a random failure through alternate means of water --

CHAIR STETKAR: That might be a way out of it if people looked at it. That's right. But again, in my little matrix here of seismically robust, not seismically robust, seismic overtopping, random, I had a blank for not

seismically robust random and I had a question about whether or not the scope of what people are looking at for downstream dam overtopping would flag these types of scenarios if the flood was not sufficient to impact the footprint of the plant.

MR. SCHULTZ: So you're just looking to see if the discussion has been completed.

CHAIR STETKAR: Indeed. That's all. Because I don't know. All I have is the white paper and I know what --

MR. SCHULTZ: We've looked at it in terms of seismic and non-seismic. We've looked at it in terms of flooding.

CHAIR STETKAR: Flooding meaning inundation of the site with, perhaps, an additional effect.

MR. SCHULTZ: But is there a potential hole in-between there that hasn't been --

CHAIR STETKAR: That's exactly --

MR. SCHULTZ: -- fully addressed because there may have been some confusion.

CHAIR STETKAR: There may have been some confusion and I don't know. Now, the other thing that this got me thinking about is the issue of, does, and it's not so much -- I'm between

today's meeting and tomorrow's meeting now, and that is, how does the whole process address seismic failures of upstream dams that cause flooding?

Because I see guidance in NEI 12-06 that says I need to look at seismic failures of downstream dams. We had a meeting back in June of last year that I raised this and I said, oh, yes, it doesn't really do that because that's considered to be two independent events. It's a flooding event and a seismic event.

Well, it's not, it's a seismic event -- it's like Fukushima, it's a seismic event that triggered a tsunami, in this case, it would be a seismic event that triggers a flood wave coming down. The reason that I don't know whose meeting it applies to is that, the protections assessments and mitigating strategies assessments seem to be going in the direction of, I will perform an assessment for one and only one hazard and I will justify that I either have adequate protection or adequate mitigation of that hazard, a hazard being a seismic event.

And perhaps I have a different protection and a different strategy for a flooding event, like, I can move this stuff because I have

adequate warning time for a flood. I don't think that they address concurrent, or coincident, or dependent events where I have a seismic event that could result in a flood.

And I don't know whether they do or they don't, but every time I've asked, I've gotten the answer, no, we'll have to look at that. Well, it's starting to be, we'll have to look at that in the sense of where in the regulatory guidance, whether it's JLD or proposed reg guides, or the guidance that's being developed by the industry under NEI 12-06, primarily, where that is in the sense of completeness in terms of looking at the types of hazards.

So I don't know if you guys have an answer for it.

MR. SHAMS: I'll venture one and see how far I can go.

CHAIR STETKAR: Okay.

MR. SHAMS: So that issue, the failure of an upstream dam due to a seismic hazard, is addressed in our dam failure analysis for upstream floods. And I'm pointing to a couple of upstream dam failure that's causing flood. I mean, in my mind, there are a couple of examples that I know of

that we've looked at the dams and we looked at three failure modes, you know, the random failure, the hydrological failure, and the seismic failure, and I can point to Oconee and North Anna for that.

And the staff systematically went through which one of these events are the plausible one, the likely one --

CHAIR STETKAR: But when you did -- we need to get to all of the topics today, so I don't want to get to specific analyses, which is why I wanted to turn off the Robinson discussion a little bit, did you, when you did that, look at the possible seismic effect onsite?

MR. SHAMS: Well, not on the site, but rather, on the dam itself.

CHAIR STETKAR: Yes, but I'm talking about now, the whole integrated enchilada, especially if I develop strategies at my site where I have two sets of FLEX equipment, one of which I nominally protect against seismic events and the other which I nominally protect against flooding events, because I'm allowed to do that in the context of my now focused assessments that are going to be done under Appendix G and Appendix H of NEI 12-06 for the sites that have problems.

And I just don't know whether there's a gap here. I honestly don't know. And I don't want to talk about it in a sense of you looked at, you know, Oconee, or you looked at, you know, some other sites. I just don't know if there's a gap.

MR. SHAMS: It was just, rather, examples I wanted to provide that we've looked at the dam itself. I can't say with certainty that we've looked at the dam concurrent with the site.

CHAIR STETKAR: That's the concern that I have because I see the process moving toward, rather than kind of a generic now in the whole context of FLEX, and again, this is between today's and tomorrow's meetings, in terms of how people are starting to address this going from something that we're trying to develop flexible strategies that are capable of coping with anything to, well, we have this for this particular one, and we have that for that particular one, and we're allowed not to consider some combination of things because we didn't think about them or we're allowed not to think about them.

So that's the concern that I have and it -- I'll just leave it there. I'll bring it up tomorrow. It's tomorrow -- one of tomorrow's

meetings.

MR. SHAMS: The issue of, you know, seismically-induced fire and flooding have been -- so I want to make sure that we're not getting back to that.

CHAIR STETKAR: The issue of seismically-induced fire and flooding has been addressed, but I will tell you that it was addressed in the context of seismically-induced internal flooding.

MR. SHAMS: Okay.

CHAIR STETKAR: There's a lot of discussion about pipe breaks, tank failures, and things, but we're not talking about a dam failure that brings a wall of water down through the site.

MR. SHAMS: We'll take that back.

MR. RECKLEY: We just decided, that's tomorrow's meeting.

CHAIR STETKAR: That's fine. No, it is -- in some serious, but it's a bit of the frustration that I've had in terms of things are parsed up among different activities, and sometimes you have to step back from all of it, and I can't figure out what bin it goes into, so I'm trying to raise it in different bins and see what sort of

feedback I get from it. It'll be brought up tomorrow. At least they'll have time to prepare for it.

CHAIR STETKAR: So the next two slides are, again, high level summary of what you can find in Appendix B. Low water conditions due to a seiche, prior to this paper, the staff was addressing this issue as a pre-generic issue and if you look at the March 18, 2015 letter that's referenced here, it is several pages long and it goes into detail on why Region III, the regional administrator, believes that there's an issue here that is a possible generic issue.

And what it argues is, we understand what you're doing for flood hazard re-evaluations and you look at seiches from a high-level perspective. You're looking at that as part of the 2.1 activity. The concern that the Region III regional administrator expressed was particularly associated with plants along Lake Michigan because it had recently, within the past five years, experienced drought conditions.

So the water level in Lake Michigan was lower than normal and the concern that was expressed in the Region III regional administrator

letter is not the high level from a seiche, but as the water oscillates, the low level from a seiche, possibly air binding the safety-related pumps, ultimate heat sink pumps, or damaging the impeller because of the low water level conditions.

The Region III letter talks about the three plants along Lake Michigan in particular. It notes that it does not believe the phenomenon is just associated with those plants. It talks about the possibility for other Great Lakes being affected by the same phenomenon. And also, plants along the Gulf of Mexico, potentially.

We've looked at the Gulf of Mexico plants and we determined that because of their ultimate heat sink configurations, low levels due to a seiche was not a concern. We did identify, though, that Calvert Cliffs was a potential concern for the same reason that the plants along the Great Lakes were, so that's why the evaluation that you see is for Great Lakes and maybe Chesapeake Bay. We also mention, very briefly, the Gulf of Mexico plants.

CHAIR STETKAR: Joe, are there any -- and I know nothing about these types of analyses or what causes the phenomenon, I read what you wrote

about the Gulf, I read what, you know, why Chesapeake Bay is part of the population, could it apply, and I don't know, to any other coastal sites that have a fairly well-protected bay for their cooling water intake?

MR. SEBROSKY: There weren't --

CHAIR STETKAR: You know, follow me, you know, some sort of mostly enclosed, but communicating with the larger water body.

MR. SEBROSKY: And I'm not a hydrologist, we can take a look at that, but there was the fundamental presumption is bodies, if it was along the Atlantic Coast, or for that matter, Diablo Canyon, that we did not believe that that was a phenomenon that was of concern. I understand what you're asking is if you could have a body of water big enough that you could have a wind-driven seiche just affecting that body of water and not the broader ocean.

CHAIR STETKAR: Right.

MR. SEBROSKY: And I don't have an answer for that question, but we did, like I said, what you see in the evaluation is a discussion of the phenomenon. There's a much more detailed discussion in the Region III letter on the

phenomenon and what they were concerned about, and with specificity, they talk about seiches that they actually experienced on Lake Michigan and what it did to the water levels in the four bays for DC Cook and also for Palisades. Go ahead.

MR. SHAMS: One thing, my understanding is, in our reviews of flooding scenarios, we looked at seiches on sites on Atlantic as well as the Pacific, so I'll confirm, you know, whether or not we got those.

CHAIR STETKAR: But just a question --

MR. SHAMS: We're looking at seiches in general --

CHAIR STETKAR: I don't have any examples of things that I can point to, you know, as counter examples or any particular sites because I just don't know.

MR. SHAMS: I was told we did, but I'll confirm.

CHAIR STETKAR: Okay. Good.

MR. BAILEY: Yes, so they did look at that, and I guess the seiche drawdown would be comparable to a seiche runup, and our experts focused right in on certain bodies of water, so I'm not sure that we can answer that in much greater --

MEMBER POWERS: What you're asking is if you have a sheltered bay --

CHAIR STETKAR: Yes, but --

MEMBER POWERS: -- but it feeds into a larger body.

CHAIR STETKAR: Right.

MEMBER POWERS: Okay. So that you have a feed-in that's resisting the drawdown.

CHAIR STETKAR: Yes. That's right. And how big is it. I mean, you know, I can draw things that look like a little neck and something that, for all practical purposes, looks like a lake and it just happens to be that above this little neck is the ocean.

MEMBER POWERS: There's some point at which the opening is so small that it can't reverse the effect of the seiche.

CHAIR STETKAR: That's right. Of the seiche, that's right, and I don't know if there are any sites that even look like that or whether the folks who walked their way down the coast --

MEMBER POWERS: But it seems like a back-of-the-envelope analysis that would be useful to have.

CHAIR STETKAR: Someplace.

MR. SHAMS: So my understanding is, we have -- and to your point, Dr. Powers, the issue was raised about the gradual drop in water in the lakes and that would not happen in the condition you described, because the bigger body of water would feed that smaller body of water.

MEMBER POWERS: That's right. I mean, there's a point where it's so big that the in-rush of water compensates and there must be a point at which it's so small that the in-rush doesn't. We just don't know what that is.

MR. SHAMS: We'll take a look at that.

MR. SEBROSKY: So if you go to the second sub-bullet here where it talks about the site evaluation of sites that could be impacted, the evaluation that's in Appendix B looks at the sites using FLEX support strategies that, can they withstand 24 hours? Is there enough water supply without relying on the ultimate heat sink that they'd be okay? The reason that we picked 24 hours, there's several reasons, one is that seiches in our kind of thing, it's not day, week, month kind of thing, so by the time you go to put the FLEX equipment in the ultimate heat sink, after 24 hours you should be able to use it.

The other -- so that was a fundamental premise, but there was also a fundamental premise that if you can withstand that condition for 24 hours, you would have the capability of other sources outside coming in to help you under the three phases of FLEX, and it doesn't have to come from one of the response centers.

The plants that we looked at are within hours drives of other plants. We're not talking about Columbia or Power, so the Phase 3 of FLEX isn't just getting something from the centrally located response centers. The expectation is, utilities will help each other out. That was another basis for the 24 hours.

The preliminary conclusion is that additional regulatory action is not warranted. The one bullet, there are three sites that don't have the 24-hour water supply that you see in the discussion, and their disposition using a combination of whether or not the hazard is applicable to their site and then site-specific conditions.

So for example, for Point Beach, the intake structure goes out into the water 1/4 of a mile and it's, 18-feet of water is on top of it.

There's an argument for Point Beach that it is not as susceptible to a seiche as some of the other plants along Lake Michigan. There is some qualitative data to support that. The Region III letter, when it mentions seiches, noted that Palisades and DC Cook experience fluctuations. That same event did not cause perturbations at Point Beach. That's Slide 16.

Slide 17, what is not in Appendix B right now is some additional information that we're adding as a result of stakeholder comments. And similar to the HB Robinson, we're silent when you talk about PWRs about the reactor cooling system inventory control and how we have confidence that that will be maintained for at least 24 hours, so we're adding a discussion about that.

The majority of the PWRs, the vast majority of the PWRs, that are listed in that table either have installed low-leakage reactor cooling pump seals or are committed to do that. And there is a specific discussion, like I said, of plants that do not have a 24-hour water supply onsite that we're bolstering.

So that's what we're adjusting Appendix B to do now that's not in your white paper. That's

all I have on seiches.

MR. SHAMS: If I may, I just want to take this opportunity here to point back to the discussion we had earlier about the geomagnetic storms and how we're, if I may use the term, deferring that to another process, regulatory process, to take care of. Those two activities, the low-water condition due to dam failure and seiche, we'll actually be making every effort to close them in the paper.

The challenge is the other regulatory activities, being the pre-GDI activity. They have their own processes, concurrences, with the appropriate senior management, so we will continue to put the logic that we have in the paper itself and just see if we can close it ahead of time, if not, we would point that there are other activities going on that might shed additional light, but nonetheless, we believe no regulatory action would be needed based on what we've done, so I just wanted to mention that.

MR. SEBROSKY: Next slide. So we talked about extreme temperatures earlier on in the -- to address Mr. Stetkar's question, so this is another issue that we're proposing to disposition

as part of Step 2, both extreme high temperatures and extreme low temperatures.

We had this discussion earlier about there is either an explicit technical specification that covers it or there's an implicit technical specification that if you start seeing temperatures outside your design basis, licensees are expected to take actions and have done that in the past.

It is subject to NRC inspection and oversight. The last bullet on here indicates that the mitigating strategies equipment, if you look at NEI 12-06, the expectation is they consider the potential impacts of high temperature for procurement and operation of the equipment, but they're also expected, if you have the equipment stored in a bunkered facility, you have a high temperature day that you'll be able to open the door. It won't be because of expansion you won't have a challenge there, expansion due to the high temperature.

Extreme low temperatures, again, the logic for extreme low temperatures --

MEMBER SKILLMAN: Joe, please go back one. This is an example of what I tried to raise a couple of hours ago. When you introduced the topic

of some of these phenomenon, you said, for example, sites designed for 100 degrees Fahrenheit, they know they're getting a weather of 105 Fahrenheit, and so they do some form of an assessment, and they communicate with region, and they go to an NOED.

MR. SEBROSKY: Well, that's an outcome.

MEMBER SKILLMAN: Yes.

MR. SEBROSKY: That's a possible outcome.

MEMBER SKILLMAN: That's very, very commonly done, by the way. So here we are talking about whether or not there needs to be more regulation, and I just want to observe that this is an example where we acknowledge the plant is not in its design base, and we're also acknowledging that it is acceptable for the plant to request permission to operate outside of that design base.

So it just seems to be, in my mind, a peculiarity. The real topic of John's Subcommittee is, are there natural phenomenon for which there needs to be more regulation? Believe me, I'm not advocating more regulation. What I am trying to point out is, there are events that have been going on since some of these plants were built, including pre-GDC plants, where the plant staffs have been

clever in adapting to the conditions that the plant is experiencing because of where the plant is located, whether it's on an oceanfront, or it's in a river basin, or it's high and dry in the middle of someplace where it gets mighty cold or mighty windy, and the way those are being handled is with NOEDs; Notice of Enforcement Discretion.

A call to region, an explanation, here's what we think is going to happen, here's where we're vulnerable, I'm thinking particularly of changes in the heat sink temperature, where you know you're going to go outside of your design basis for your ultimate heat sink.

I'm just observing a way this is being handled is, instead of making new regulations, there is the option to go to enforcement discretion when you find yourself moving out of your license basis.

MR. SEBROSKY: And my response to that is, an acknowledgment that that absolutely does occur, but when you look at the NOED process, in order for us to grant a Notice of Enforcement Discretion, there's a test to make sure that you're not abusing the process.

MEMBER SKILLMAN: Oh, yes.

MR. SEBROSKY: And if you could have reasonably foreseen the event or you have time to put in an exigent license amendment, that you use that process. And I understand the assertion that licensees are pretty clever. Our procedures recognize that and that's one of the checkboxes that you got to check that the licensee is not, essentially, these are my words, it's not in the NOED process, that they're abusing NOEDs.

MEMBER SKILLMAN: I don't think I'm communicating what I'm thinking very well, and I apologize here, that what I'm suggesting is, we're here talking about, does there need to be more regulation over natural events, and all I'm trying to do is to observe that this has been going on for a long time, and the body of regulation has allowed reasonable individuals to navigate through this, but I'm wondering if this isn't even a part of what we ought to be talking about. I guess that's what I'm trying to say and thanks.

MR. SEBROSKY: I understand.

MR. SHAMS: I mean, we do acknowledge that, that is true, and I would say to the way we're looking at it from our end, has it risen enough to limit or a risk level that would compel

us to take action? We discuss in the paper that there are notices that we're sending out related to some of these topics and, you know, what licensees need to do for it, but, you know, I would like to believe that as it gets to a level where we believe that the operation of the plants are impacted, we will take action.

MEMBER SKILLMAN: Thank you.

MR. SEBROSKY: So Slide 19 is the low temperatures. We use similar arguments for low temperatures that we use for high temperatures. We do add additional insights based on information notices that were issued back in the '90s; degradation of cooling water systems due to icing and issues with cold water protection measures.

One of these issues, if you look at the information notice, and it's discussed in detail in the Appendix B, talks about frazil ice and the problems that Wolf Creek experienced with that. So it was meant -- the discussion on the information notices was meant to go back to a point that we were trying to make earlier that the operational experience that we have for these plants is something that is continually done and continually assessed.

And that is certainly part of our argument for why we have confidence that we don't need additional regulatory action for items that fall out in Step 1 and Step 2. Again, you see the subject to NRC inspection and that the mitigation strategies equipment, NEI 12-06 specifically mentions ice blockage and frazil ice.

The preliminary conclusion for extreme temperatures is additional actions are not warranted. We have not received any substantive comments from stakeholders on this portion of the assessment. Next slide.

Step 3 of the process, as we discussed earlier, wind and missile loads from hurricanes and tornados, and snow loads, moved to Step 3 of the process. The fundamental reason that we were taking a hard look at these hazards is from the 2007 to 2011 timeframe, or 2000 to 2011 timeframe, there's new guidance that was promulgated for new reactors in both these areas that was issued after the majority, the 99 out of the 100 operating plants, were given operating licenses.

The preliminary assessment includes a discussion of the issue and the staff's preliminary process for evaluating the issue. So we are not

intending to inform the Commission that we're done with Step 3. We're intending to outline what we see as the issue of concern and what we're doing to address that. The complete assessment, we intend to provide to the Commission by the end of December, so we believe we're going to be coming back here to talk to you about Step 3. Next slide.

Snow loads, the guidance that was updated for snow loads can be found in this DC/COL Interim Staff Guidance 007, and it talks about the assessment of loads on seismic Category 1 structures from extreme precipitation events.

And with the sub-bullets, what you see is a 100-year snow load event and then an extreme snow load event. The extreme snow load event is a combination of the 100-year snow event plus a 48-hour probable maximum precipitation event occurring while the 100-year snow is on the roof.

The theory is that the 48-hour probable maximum precipitation event, the snow acts like a sponge, the water doesn't come off the roof, and you have to be able to show that your roof capacities can handle that combination event. The next slide.

So our preliminary assessment, when you

look at the -- for both snow and for tornados, you see a discussion in the white paper that bifurcates the plants; the 1975 version of the SRP and then the pre-1975 -- plants that were licensed prior to that 1975 version of the SRP.

The 1975 version of the SRP, when you look at the guidance in ISG-007 and you compare it to the 1975 version of the SRP that was supplemented with the branch technical position, they look pretty close. And the 100-year snow load is typically, what we found with this version of the plants, typically found by the plant design or their structural margin associated with it.

When extreme snow loads are evaluated against the structural margin, we believe, preliminarily, that the beyond-design-basis snow load is not likely to cause a catastrophic failure of the seismic roof, Seismic Category 1 roof. We still need to do work in that area. We're continuing to assess the design conservatisms and also warning time.

The combination, when you look at the 100-year snow load, it is over a period of days, 48-hour PMP on top of that would add time to that, so this is not something that has no warning time

associated with it. We believe we can take advantage of talking to the plants that are along the Great Lakes that have to deal with lake effect snow on a yearly basis; what they do that can help inform our assessment. To date, there's no substantive comments that we've received on the snow load evaluation.

The wind and missile loads from hurricanes and tornados, there's a couple slides on this. I'll try to walk through the nuances and the changes to the guidance. There's Reg Guide 1.76 Rev 1 that was issued in March 2007 and there's a brand new reg guide, Reg Guide 1.221 on Design Basis Hurricanes.

Reg Guide 1.221 did not exist. There is not a 1975 version of the SRP that talks about design basis hurricane missiles. The fundamental presumption of the 1975 version of the SRP and the reg guide was that a tornado missile will bound a hurricane generated missile, and we didn't need to -- if you design to the tornado missile, you didn't have to worry about hurricane generated missiles, and in a couple slides I'll tell you why that's changed.

If you look at Reg Guide 1.76 Rev 1 and

compare it to the previous reg guide, there are different missile spectrums. There's different missiles. You'll see three missiles in the 1976 version of the reg guide. If you go back to the 1975 version of the Standard Review Plan, that's where you find up to six different missiles.

And although the tornado wind speeds generally went down, if you look at the automobile missile speed in the 1975 version of the SRP and compare it to Reg Guide 1.76, the missile speed went up slightly, in some cases, for the automobile. That's the difference there. If you go to the next slide.

MR. SCHULTZ: Joe, before we leave this one. The white paper also talks about work that's being performed at NIST with regard to tornado wind speed risk and evaluations that are being done there, or plan to be done. It wasn't clear to me how that was, or if it would be, integrated into what's being evaluated between now and the end of the year. It sounded like it was a project that was ongoing at NIST and might take some time to develop an ample result, even though it sounded like a good approach and work.

MR. SEBROSKY: So one of the challenges

that we have, and that we continue to have, is there's research activities that are going on, and it's not just for natural hazards. We mention this when we were talking to you about the containment designs and the SOARCA work. So the issue, do we have enough information right now with confidence that we can say, we believe we have enough information to close this issue out, but please recognize that there's additional research going on that has the possibility to inform --

MR. SHAMS: Provide new information.

MR. SEBROSKY: Yes, provide new information and inform a different decision.

MR. SCHULTZ: It would be good to cast the discussion that way in the SECY document.

MR. SEBROSKY: I understand. So that's a challenge that we're going to have with tornados because there's certainly work that's going on, and research, and at NIST that is going to continue past the end of this year.

MR. SHAMS: If I may, Joe, just give a little bit further. So as we were writing the paper, and the logic we were trying to drive to you is, we're looking at the design basis for different facilities and what different things, you know, has

been done, or have been done, and is going to be done, so as Joe is going to get into, for tornado, for example, we point to a risk study that the staff have done and identified the risk from a tornado and a missile heading from a tornado is low risk.

So we wanted to balance, you know, and say, well, here's studies that are pointing to this, but we recognize that it's a dynamic process and there's new information, so as we see things right now, we don't particularly see concerns, but nonetheless, if we learn from these other ongoing activities, we would certainly use our standard processes, generic issues, or what have you, and we would inform the Commission and do what we need to do, so that's kind of how we were balancing the multitude of pieces of information we have.

But we'll cast the paper to make sure that it balances that way.

This slide, Slide 24, talks about the Reg Guide 1.221 and the changes there. The first bullet, when you look at the hurricane wind speeds, in general, there's only two sites where the tornado wind speed does not bound the hurricane wind speed, and that's the Florida sites. In

general, the hurricane wind speed is bound by the tornado wind speed.

However, the next slide, or the next bullet, the hurricane missile speeds are higher for a comparable tornado wind speed for sites that are susceptible to hurricane. And the reason for that is captured in the sub-bullet. The theory is that if you have a missile that was generated by a hurricane, it has a longer time in the hurricane wind field and it can come up closer to the speed of the hurricane.

The tornado, it doesn't spend as much time, it gets spit out, for lack of a better term, and does not, when you look at the delta between the tornado wind speed and the tornado missile speed, there is a bigger delta there than there is for hurricane.

MR. SCHULTZ: You mentioned that as a theory, is there data to back that up?

MR. SEBROSKY: So Reg Guide 1.221 is based on NUREG and we reference the NUREG, I think it's NUREG 7005. There is an extensive discussion in there that suggests that's why -- one of the issues was, and it was a New Reactor Office activity, with the tornado wind speeds going down,

can you stick by the conclusion that hurricane wind speed is always going to be bounded by the tornado wind speed?

And it was that presumption that led them to start looking at that and come to the conclusion that that was no longer the case, that even though the hurricane wind speed went down, the reason that they pursued the reg guide is because they showed in that NUREG that the missile speeds could go up.

There is some discussion that we're going to talk about as we go forward about automobile missiles. You know, when you look at that NUREG, there are non-trivial changes in the automobile missile speed. NUREG 7005 has a discussion in it that they haven't really seen, in hurricanes, automobiles being lifted up in the air.

MR. SCHULTZ: That's why I asked if there was data to backup what they had proposed.

MR. SEBROSKY: Well, they caution it. They basically say, these are the new automobile missile speeds, but recognize we haven't seen physical evidence that, although an automobile will tumble along the ground, because a hurricane does not have a lifting component, like a tornado, we

haven't seen automobiles elevated.

MR. HARVEY: This is Brad.

CHAIR STETKAR: No, it was on at first, Brad.

MR. HARVEY: Okay. I can hear myself. Hello. This is Brad Harvey. I'm the acting team lead for Meteorology and Oceanography. First, slight correction, it's NUREG CR-7004 that discusses the missiles. And the other point I wanted to make, that the automobile is really a surrogate for any large missile that might be prone to travel in a hurricane wind field.

And the way that the -- to answer your question, Dr. Schultz, is that, it was a mathematical formulation that came up with these wind fields, and what we assumed is that there would be some sort of object the size and weight of an automobile that would start at about 120 feet off the ground, and we would put that into a hurricane wind field, and through the equations of motion and everything, watch it fall.

And the reason why we wouldn't necessarily expect it to be an automobile at 120 feet above ground, but there are other plant structures that might have equipment on their roofs

that are not safety related and not tied down that could become airborne objects in a hurricane.

And so that's -- the whole idea of lifting a car off the ground, I agree, is not, during a hurricane, particularly realistic, but there are other structures of that height that necessarily are not safety related that you could see bits and pieces of building possibly become airborne at that elevation, if you've got HVAC units that sit on top of structures. It's a surrogate for that type of missile.

CHAIR STETKAR: Brad, stay there because they're only going to call you back up again. I was going to wait, but as long as you're standing there, this is an interesting exercise because it makes you think about things, which is part of why we're going through this. All of the winds are always cast in the context of hurricanes and tornados.

Has anyone looked at derechos? Those are, you know, high intensity, straight line winds that are not generated by something that's called a hurricane, and they happen -- we had a set come through Maryland a couple years ago. I mean, they happen all over. It doesn't have to be a coastal

zone, and they can generate hurricane force winds.

Now, again, I'm not a meteorologist, so I don't know the persistence, but I understand they can be pretty damaging. I know I was looking at a site, different part of the world, and they were not prone to hurricanes, but they were prone to damage from things that they called, they didn't use the term derecho, but severe straight line wind storms. Have you looked at that?

MR. HARVEY: I think, off the -- is this on again?

CHAIR STETKAR: Yes, it's on.

MR. HARVEY: Okay. I'm sorry. Brad Harvey once more. I think that the fall 50-year return period with wind speed, off the top of my head, for most of the United States is like 90 miles an hour, and then you multiply that by a factor of, again, off the top of my head, 1.22 to come up with a 100-year, so you're looking at design for 100-year return periods of over 100 miles an hour, which I think is going to bound most of the phenomenon, and it's also safety factors that are built in at that 100-year return period wind speed like a 1.5, 1.62 safety factor when you actually go into the resulting load.

So I do --

CHAIR STETKAR: I'm sorry, but for hurricanes and missiles we're looking at -- I'm sorry, for hurricanes and tornados, we're looking at return periods that are much longer than 100 years, aren't we, for the extreme winds?

MR. HARVEY: There are two design basis when it comes to winds, one is a 100-year return period, which uses a load factor, I think, of around 1.6, and then we look at the hurricane and tornados, and those have a load factor of merely 1.0.

CHAIR STETKAR: Okay.

MR. HARVEY: And 10 to the minus 7, so you get 10 to the minus 2 with a load factor of 1.6 and 10 to the minus 7 with a load factor of 1.0.

MR. SHAMS: Said differently, a straight wind generally maxes out around 110, 120, as Brad indicated, for tornado, a good portion of the United States is designed for 320 miles per hour.

CHAIR STETKAR: That's true, but we found hurricane force winds along coasts. The whole reason that we're having this discussion is that there's some coastal sites that are prone to

missiles because of the, for lack of a better term, because I don't know anything about it, energy imparted to something by a persistent straight-line wind compared to a rotational tornadic wind that can cause a concern.

And I don't know whether 120-mile-an-hour straight-line wind across, you know, some flat thing that looks like a cornfield can generate that type of energy. I just don't know.

MR. SHAMS: On the next slide, we'll show you the comparison between tornado back then, tornado today, and hurricane today, and the difference where you indicated that there are differences by some Atlantic Coast sites is small. It's not particularly large, but we'll show you that.

CHAIR STETKAR: Okay. Thank you.

MR. SEBROSKY: Similar to snow loads, what we see is different capability with pre-GDC plants, the 1975 version, the plants that were reviewed against the 1975 version of the standard review plan in plants that are earlier vintage, there are different capabilities, depending on the vintage of the plant. Next slide.

What we reference in the white paper

are insights from a recently issued regulatory issue summary on tornados, 201506, and enforcement guidance memorandum that went along with it. If you look at the enforcement guidance memorandum, it also references risk evaluation that was done. And essentially, what the risks and the EGM conclude, we've seen issues with plants that may not meet their current licensing basis.

Give an example, the exhaust stack for the diesel generators. The diesel generator is protected, but the exhaust stack for the diesel generator, it was noted, is not protected against tornado missiles.

What this risks and what this EGM argues that if you meet the going in conditions for the enforcement guidance memorandum, you can, if you're in an area of the country that's susceptible to tornados, you have three years to avail yourself of this enforcement guidance memorandum, if you're in a lower risk portion of the country when it comes to tornadoes, you have up to five years.

And the basis for that, and the reason that we thought it was germane is, if we thought that there was a high risk from tornados, we wouldn't be granting three years of enforcement

discretion. So it reasserts that when you look at the tornado missile protection design basis requirements, the conservative, the staff's using existing processes to ensure licensees meet their current licensing basis and the enforcement guidance memorandum provides a basis for enforcement discretion, noting that tornado missile scenarios that lead to core damage are low probability events. That's why it's referenced in the document.

If you go to the next slide. This slide, I understand, is kind of busy, but I'll try to walk you through what's on this. We don't think wind loads are an issue. That's our preliminary assessment, and the reason we don't think wind loads are an issue is, this blue represents what plants' current licensing basis are.

The majority of plants have a 360-mile-an-hour design basis tornado. It's 300-mile-an-hour tornado moving at 60 miles per hour. So the wind that hits the site is 360 miles per hour. The majority of the sites have that.

If you look at Reg Guide 1.76, what Reg Guide 1.76 Rev 1 does, it's this purple line. This purple line is what the wind speed would be based

on Reg Guide 1.76. And what you actually see is there are three wind speeds. There's a Region I wind speed that's higher, a Region II wind speed that's a little lower, and way over here you see a Region III wind speed. The Region III wind speeds are for Diablo Canyon at Columbia.

And the argument is, for the vast majority of the sites, the tornado wind speeds are less than the design basis wind speeds. There are some pre-GDC plants that we're taking a closer look at to make sure we don't have an issue with those.

When you look at the hurricane wind speeds, those are the bar graphs, and the first thing you notice is not every plant has a hurricane wind speed. That's because of the inland plants. If you're far enough inland, you don't have an issue.

There are some plants that you wouldn't consider coastal plants that actually show up on this data, and it's important when we get to the next slide that a plant like Farley and Hatch, which you think are pretty far inland, actually have automobile missile speeds that, from the hurricane winds, are pretty close to the tornado Reg Guide 1.76, so it's not just coastal plants.

MEMBER BLEY: The bars for each plant, is that a calculation or is it the highest?

MR. SEBROSKY: No, this is from the Reg Guide 1.221.

MEMBER BLEY: Oh, this is from the reg guide, but so is the wiggle line on top.

MR. SEBROSKY: This wiggle line is from Reg Guide 1.76 Rev 1.

MEMBER BLEY: 1.76, okay.

MR. SEBROSKY: Rev 1. It's tornado wind speeds.

MEMBER BLEY: Oh, okay.

MR. SEBROSKY: This bar is Reg Guide 1.221, and it's hurricane wind speeds. And what you see, what I said, in general, the tornado wind speeds bound the hurricane wind speeds. If you look at this unit, and we don't name the units, we're still doing evaluation, and this, these are the Florida sites, Turkey Point and St. Lucie, where the hurricane wind speed is suggested to be higher than the tornado wind speed.

In general, though, the argument is, for wind speeds and wind loading, based on this graph, in general, we don't think we have a concern with wind speeds. We're still looking at some of

the pre-GDC plants that don't have this delta. If you look over here, you see the tornado wind speed higher than what the design basis is for the plant.

CHAIR STETKAR: It's basically, it took me a while to figure this thing out, but if you stare at it long enough, tells me that there are four sites. If I look at the purple laying right coincident with the blue.

MR. SEBROSKY: And so we don't -- we did not, because it's preliminary, name the sites.

CHAIR STETKAR: No, no, and I don't care what they are, but it's correct interpretation that there's two where the purple is right at the blue, if you will --

MR. SEBROSKY: You have the ballpark, correct.

CHAIR STETKAR: -- there's one that the orange is above the blue, and there's one that the purple is measurably above the blue.

MR. SHAMS: Yes.

CHAIR STETKAR: Okay.

MR. SHAMS: And the purple measurably above the blue is because we don't have the blue.

CHAIR STETKAR: Right. Yes.

MR. SHAMS: So that's the one we're

going to, you know, change. Yes, and the bar extending above the blue is the one I was commenting a little earlier, the difference, we view it as small.

MR. SEBROSKY: There's a caution. If you added up the tick marks on this, you would get 100, right, and there's a 100 operating plants. There's two plants that don't show up on this because they don't have a design basis wind speed in their USAR at all. There is no design basis wind speed. So what they have is an evaluation that was done as part of the IPEEE, that we can take advantage of that.

So, Mr. Stetkar, you're correct, there's 100 tick marks, and the reason there's 100 tick marks is not every plant has the same design basis wind speed for the containment that it does for the aux build. So you see some plants on here twice where the containment is designed to one wind speed and the aux building, and some of the other safety-related structures, are designed to a separate wind speed.

CHAIR STETKAR: It's too bad I filed my taxes already. I got to get you guys to do my taxes for me.

MR. SHAMS: There's a reason we're taking this forward. It wasn't really straightforward.

MR. SEBROSKY: But you're correct, when it comes to wind speeds, there's a handful of sites, four, five sites, that we're looking at closer. You see two of them down here and then the two that don't have anything in the USAR, but have information in the IPEEE, we're looking at closer from a wind speed perspective. You go to the next slide.

MR. SHAMS: Before we go to the next slide, if I just may make a couple of thoughts. So this slide really captures how we're viewing the problem, or where we think the strong points are, where we think the areas that we're going to need to do further work on to identify that we're missing some information, but in general, as we look at the slide, we see that the wind speed, the original design basis wind speed, is sufficiently large that, ultimately, when we combine it with how the missiles have changed and picked up additional speed, the combination of the higher wind and the lower missile versus today, the lower wind with the higher missile, they ultimately come together to

almost the same amount of force, if you would, that's kind of imposed on the structure.

So that's why Joe, earlier, put the bullet of we believe that tornado missile protections as they are, are adequate in general. Also, the Tornado Risk Study itself gives us the understanding that the phenomenon of tornado in general is of a low risk to decide in terms of core damage frequency, so the fact that the missiles have increased in the upper portion of the wind, not the 70 mile per hour, but rather in the 200 and 230 miles per hour, that's an area that's of low contribution to the risk to begin with, because the risk is dominated by the 70, 75-mile-per-hour where offsite power is lost.

So we believe that the changes in the area, that it's not particularly significant in terms of risk or dominant. So we see out of this and where we're going to end up going forward in our analysis is, we see that the tornado is not challenging, overall, hurricane would not be challenging, except for how we deal with the larger missile, be it the vehicle or the object that it represents in a hurricane, because that missile picked up two to three times speed, so that's the

area we'll be focused on going forward.

MR. SEBROSKY: So what Mohamed just said is kind of captured in this slide, and just walk through the bullets. When you look at the Reg Guide 1.76 Rev 1 and also Reg Guide 1.221, there are three missiles that are representative missiles. There is a rigid missile, it's a pipe, it has certain attributes, and it is, the reason that that missile was picked is to demonstrate that you have enough concrete or steel to protect a safety-related structure or component that's on the inside.

And it's the missile won't either penetrate the concrete or it won't cause spalling on the inside wall of the concrete that could damage the equipment. So that's the reason that that missile was chosen.

The second sub-bullet here, the impact loading, is the automobile, it's a representative missile, and you're looking at gross structural impacts from that. And then lastly, in the NUREG guides, there is a small steel sphere. That small steel sphere is meant to show that you have protection against small missiles and doors, ventilation, inlets, that kind of thing, that you

don't have a susceptibility there. That's the reason those were picked.

If you look at the next bullet, the one that talks about the ability of wind-borne missiles to penetrate concrete, this is what Mohamed was talking about, and we can say, when you look at both the hurricane rigid missile and the missile from a tornado, and you compare it to the majority of the plants, their licensing basis, and you go back to the 1975 version of the SRP, there are six different missiles in that 1975 version of the SRP that actually are discussed.

One of them is a telephone pole that is a substantial weight, it is a relatively small cross-section, but it is substantial weight and substantial velocity. When you look at what plants are designed against and look at the missile spectrums, we've done comparisons to look at trying to look at the penetration capability of the missiles using a rigid pipe and comparing it to what's in the licensing basis. We think for the vast majority of the sites, they're okay.

What Mohamed was talking about is the impact loads from the automobile. The automobile missile is, again, these are 10e minus 7 events for

both hurricane and missiles, I mean for both for hurricane and tornados, and I think I told you that the Reg Guide for hurricanes, it goes up from 50 miles per hour at a site to maybe 75 miles per hour.

The real issue is with hurricanes. You see some sites going from a 50-mile-per-hour design basis automobile to an automobile that's going close to 200 miles per hour. So it's 4 times 1/2 MV squared. It's not a linear rel.

So it is a substantial change in the amount of energy that would be represented in the impact load, and that's the challenge that we try to layout when taking the new guidance and comparing it to the existing plants. If you go to the next slide.

So what we try to do as part of Task 3 is inform the Commission on what we're thinking and where we're possibly going between now and end of December. And as part of Task 3, we do think we can gain insights from the past IPEEEs and current wind studies. And what we see, and Mohamed alluded to this about, there's certainly structural margin in the plants when you look at impact loads, but also, the current insights from these high wind

studies are not suggesting that it's the 10 to the E minus 7 winds that you have to be concerned about.

It's the 100-mile-per-hour winds that take out offsite power and that you just have random failures on top of that that lead to core damage. So we're not just looking at the 10 to the E minus 7, we're also looking at what the high wind studies are telling us.

The other thing that we intend to do with industry is to gain further insights about what licensees do in anticipating the approaching hurricane. So unlike tornados where you don't have a long warning time, a hurricane, we have experience with this, both licensees and the NRC go into a mode where we see a hurricane coming, potentially impacting a site, or multiple sites, and we staff up.

Licensees take actions and we know they take actions that will the plant shutdown before onsite winds get to 75 miles per hour. They typically, if it's a couple days, they'll take their operators into the facility and run them through scenarios for loss of offsite power and what they're going to do. They also prepare the

site.

If you go back to Hurricane Andrew that happened in the '90s, while one of the units was getting prepared to go into an outage, it had a lot of equipment staged to support that outage, the licensee had enough warning time that it could move that equipment away. That's the kind of thing that we're going to look at or the kind of actions that we're going to look at to engage with licensees to see if that can be credited, the long warning time can be credited.

This last bullet where we intend by the end of December 2016 to provide the final assessment to the Commission, which means we would be coming to you in the fall timeframe to support that. We had not received any substantive comments on this portion of the paper.

MEMBER BLEY: Joe? I hadn't thought about this enough before, but looking at the figure you just showed us and thinking about a couple of the things you've told us, like missiles and hurricanes get much closer to the actual wind speed of the hurricane than they do in tornados, and thinking about missiles, just looking at the wind speed, if the tornado wind speed is higher than the

hurricane, that really doesn't say the tornado's the greater threat.

MR. SEBROSKY: From a missile perspective, you can't make that. We would have to plot, and we've done the plots --

MEMBER BLEY: Oh, you have? You played with that a little bit.

MR. SEBROSKY: Well, so based on very preliminary data, what we've plotted --

MEMBER BLEY: Kind of hard to integrate this in your head and think about it. Yes.

MR. SEBROSKY: So we tried to collect information that's in the licensing basis for all 100 plants, right, what's their design licensing basis, including the missile. What's the weight? What's the diameter? How fast is it going? And what we've done for the penetration is, we plotted, so we're comparing apples to apples, the penetration depth that you would get from that, using current calculational methods. Not the calculational methods that they use.

We take the missile and we say, this is calculational method, this is how much it would go into the concrete, their limiting missile, and then you compare it with either the tornado missile or

the hurricane missile for the site. And in general, what you see is, when you do that plot, the vast majority of sites are bounded by their design basis penetration missile, and that's because they have things like telephone poles.

When you try to do the same plot with automobiles, it comes with vastly different results. The majority of sites are not bounded when it comes to automobile missile impact loading. We weren't looking at, it's questionable missile, an automobile is considered to be a questionable missile, so it's not a concern from a penetration capability and causing damage inside the plant, it's gross impact, gross damage, to the facility such that you damage the structure.

And when you do that plot, that's what Mohamed was talking about, the impact loading when you look at -- and it's not just hurricanes, there's a big delta on hurricanes, there's a non-trivial delta on tornado automobile missiles. We believe it's a pretty straightforward, when you look at the tornado automobile missile, we think that, pretty straightforward, we can show there's plenty of structural margin.

MEMBER BLEY: That kind of makes sense.

MR. SEBROSKY: But it's the hurricane automobile that's going four times faster than the design basis automobile that --

MEMBER RICCARDELLA: What do you mean by structural margin? I mean, you mean the whole structure being loaded and moving like that?

MR. SHAMS: Well, it depends on what missile, if I may answer.

MEMBER RICCARDELLA: The automobile missile.

MR. SHAMS: Yes, it depends on which missile we're looking at. Certainly, if it's the small missile that's actually going to go through and penetration, it would be a margin related to that mechanism. If it's one that's sort of pushing the structure to lean over, so it would be that type of a behavior, leaning over or a structure panel that's deforming, you know, in response to that load.

MEMBER RICCARDELLA: And that's for both the containment and the auxiliary buildings?

MR. SHAMS: Cat 1 structures in general; Category 1 structures in general.

MEMBER BLEY: Can that lead to a collapse of the building?

MR. SHAMS: Yes, I mean, I would see that as, really, a remote -- it could be. That's not, you know, an unlikely scenario. I'm sorry, it's not a possibility, but it's unlikely because what controls in that type of behavior is seismic, far larger, you know, load than in a hurricane. We control that mode.

MR. RECKLEY: And the other thing to keep in mind, if I can, is this is largely a deterministic screening, right? Because even if you find a plant that you're uncomfortable with from this deterministic screening process, doesn't mean that you automatically go to the fact that that missile is going to lead to a severe accident condition in the plant.

MR. SHAMS: That was precisely what I was going to go with, you know, when Joe was indicating that. When we looked at the automobile, and basically we just did a first plush, let's look at what first order type equations give us, you know, comparison, apples to apples, and the numbers were not particularly favorable because of, if the speed went up three, four times, you know, thank God to the telephone pole that that gave us a lot of capacity for many plants, but nonetheless, it

wasn't able to observe the three times automobile increase.

So we felt like, okay, well, a brute force for this particular problem may not be the easiest, because we know if you get into a more sophisticated type analysis and non-linear type response to the structure, you'll pickup a lot more capacity, two, three times more.

But also, we're looking at it pragmatically, you know, more in the sense that as Joe indicated, there's a lot of prep that goes on at the sites such that a missile of that nature is probably, you know, non-existent if, you know, that -- for vehicles, we thought about, after 9/11, all vehicles are parked away from Cat 1 structures where their barriers are --

MEMBER BLEY: Well, yes, but it was pointed out, it's a surrogate --

MR. SHAMS: Well, that's why I'm saying --

MEMBER BLEY: -- stuck up on top of --

MR. SHAMS: -- it's a number thing, so if we can eliminate a vehicle and say that they walked the site, they make sure everything is, you know, where it needs to be, bolted, nothing loose,

we can build the argument that maybe this is not as plausible as it seems.

MEMBER BLEY: Inside the plant, years ago, we started looking at seismic two over one and making sure we didn't have stuff that would fall on a Category 1. I don't know if we've gone around sites looking for masses at elevated heights worrying about, oh, we ought to tie this one down because of the hurricane possibility. I don't know if anybody's done that.

MR. SHAMS: I would venture we did in a walk-down early on with this, again, related to seismic.

MEMBER BLEY: Okay. During the walk-downs for this.

MR. SHAMS: Absolutely. Related to seismic early on with Fukushima. That was done to ensure that any two over one issues or other --

MEMBER BLEY: For wind as well as seismic.

MR. SHAMS: Well, it was for seismic in particular.

MEMBER RICCARDELLA: I guess I missed it. What causes the automobile wind speed to triple?

MR. SHAMS: From what Brad indicated, that the newer mathematical models for how a hurricane picks up an automobile is such that the automobile is in the wind field for the longest time, so it picks up an increasing amount of speed. That's what ultimately -- did I capture that right? Half right.

MEMBER BLEY: Brad, you're not on.

CHAIR STETKAR: Leave it on. Don't touch the mic.

MR. HARVEY: Brad Harvey again once more. If you look at a tornado wind field, it's circular, and the highest wind speeds occur when the tornado is moving, so we assume, let's say, in the old days, original Rev 0, which most of these plants are designed to, is 360 miles an hour. That assumes that a radial speed of 300 and 60 miles an hour traveling forward.

If you assume that the missile remains embedded in the highest part of the circular, it's going 360, but when it comes around, now you're going to subtract 360, so it's going only like 240. Okay. But that doesn't happen in a hurricane. In a hurricane you assume that the field is constant throughout the duration of the flight of the

missile. Does that help?

MR. SHAMS: Well, also, the tornado is of a finite size, if you would, so it picks up --

CHAIR STETKAR: Don't talk to people who live in tornado areas about the -- it is finite in the sense that it's not infinite. They're pretty darn big.

MR. SHAMS: Fair enough. I'll take that.

CHAIR STETKAR: They can be a half-mile wide in terms of damaging, you know --

MR. SHAMS: But compared to a hurricane that's, you know, covering half the state.

CHAIR STETKAR: That's true, but it's not a point source.

MR. SHAMS: That's true.

MEMBER REMPE: So I'm struggling with this thing about the surrogate, but yet the evaluation with the car, if you only -- we're always considering the car has a certain shape, right, and so does the analysis consider other objects that it's a surrogate for, but then I did hear you say, well, we walked the sites after Fukushima, so there aren't any other objects. Could you clarify that disconnect that appears in

mind, at least?

You should be evaluating other shapes and masses besides just a car, it puts an uncertainty, if there are such things, but if there aren't any, then perhaps you don't need to be doing that.

MR. SHAMS: Sure. In terms of the shape of the vehicle, when we analyze a vehicle as a missile for a client, it's rather just the weight of it and overall dimension. It's not the specific, you know --

MEMBER REMPE: And that weight and dimension you assume does cover other --

MR. SHAMS: Right. Would cover --

MEMBER REMPE: -- objects that apparently don't exist, because you've walked the site and there aren't any other objects, but you've covered those possible objects?

MR. SHAMS: No, thinking about the other -- you know, walking the site is to see if loose items are there. I'm saying in terms of --

MEMBER REMPE: So there are objects that --

MEMBER REMPE: There are.

MEMBER REMPE: And you think that the

analysis with the specific weight and dimensions has covered those other objects that might be --

MR. SHAMS: That was the premise in the selection of that object of being 4000 pounds with the given dimension, is to cover that spectrum of missiles. Yes.

MR. SEBROSKY: So one of the things, just to add on to the discussion, if you look at the IPEEEs, you have the surrogate missiles that were representative missiles, and if you could demonstrate -- the theory was that if you can demonstrate that your plant can handle those missiles, it can handle a broader range. So --

MR. SHAMS: One -- go ahead. I'm sorry.

MR. SEBROSKY: -- the point I was trying to make is that when you go look at the IPEEEs in plants that did high-wind PRAs, you see other things like chimneys from fossil fire plants that aren't designed to handle a hurricane, and what would that do, and you do see plants that made physical design changes to non-safety-related equipment so that it didn't present a hazard.

So when you talk about surrogates, you have the surrogates for the missiles, but you also,

when they did the PRAs, they didn't limit it to just those missiles.

MR. SHAMS: That's true, and one of the interesting aspects of selecting the missiles spectrums is written in the Reg Guide, be it 1.76 and 1.221, is, they sort of explained the logic for picking just the three missiles walking through the concept of, because you're dealing with a very rare event, that's 10 to the minus 7, it was fair enough just to pick a few that are common objects around a site without particularly getting terribly --

MEMBER REMPE: I understand it's being simplified, but as long as it --

MR. SHAMS: Sure.

MR. SEBROSKY: So this is the last slide, other than the acronym slide, and it just reiterates the next steps that we talked about, that we do intend to make adjustments to the assessment based on the feedback that we receive today. I think you heard that -- I heard we have two action items, to try to give you the updated assessment that we have that, again, is draft, preliminary, that has some additional information when it comes to low water level.

We also have an action to report back to you at the full committee meeting, what we plan to do based on some of the comments we receive today.

CHAIR STETKAR: That, you can handle orally, obviously, because that's not -- but we would appreciate, as I mentioned earlier, recognizing it's a draft, it could change from the time we see it until the time it goes up to the Commission, but a standalone document, beginning to end, so that we can read it over.

MR. SEBROSKY: And we'll get with Kathy. It'll probably be Tuesday or Wednesday of next week. And again, our thought is that it would have the appropriate caveats on it and that we would make it public. The other thing, there are items that we believe are publicly available, and if we can get you the reference to some of the things that you mentioned that we thought that we had available to us, were dam failure treatment within NEI 12-06 or our guidance that helps to address some of the concerns, we can get you those documents. We'll try to do that.

CHAIR STETKAR: I've got the documents, just point me to where in the document --

MR. SEBROSKY: I understand that. The point I'm trying to make -- you know, so --

MR. BOWMAN: Yes. This is Eric Bowman. The point of the document for NEI 12-06, Section 322 has the guidelines for the development of the baseline mitigating strategies, Number 5 includes the provision that limits the assumption of availability of cooling and makeup water for the mitigating strategies to cooling and makeup water that's retained by structures or systems that are robust with respect to the seismic flooding or high winds hazard as well as their associated missiles.

The staff, as well as all of the licensees, have interpreted the wording of that set of guidelines to apply to structures such as dams and levees that retain water as part of the ultimate heat sink or impoundments that are as backups to the downstream dams that were looked at the in the resolution that limited that downstream dam failure action item to Robinson.

CHAIR STETKAR: Okay. Thanks, Eric. I'll go back and reread that.

MR. BOWMAN: Yes, as far as the potential for assessment failure of a dam associated with a seismic event, we didn't have

explicit guidance on that. I'm aware of two sites where that's a potential issue. One of them, South Texas has a levee that impounds a great deal of water that's above the site itself. Their approach to the mitigating strategies was to install generators and pumps in a seismic Class 1 structure on top of the building where it wouldn't be impacted by the flooding.

And the other site was Diablo Canyon, where they've got the water ponds that are up the hill from the site, and the flow path from there, even though they're seismic, if they were to fail, doesn't go over where their storage site for the FLEX equipment is.

There are a few others -- there could be a few others.

CHAIR STETKAR: Yes, I was going to say, I was not trying to focus on individual sites, because I don't know all the sites and I don't care, actually, I was more focusing on areas where the combinations of what everybody is up to in this effort might have missed something, and in particular, whether there was something in this notion of seismic events that could result in a flood.

This is not necessarily downstream dam issues, but seismic events that could result in a flood that as we progress toward more focused analyses, let me call it that, that start to talk about either protecting or mitigating a particular known hazard in the context of that single hazard alone, so a particular seismic acceleration or a particular flood scenario which may or may not have some warning time associated with it, that we weren't somehow walking into a situation where if I have two sets of FLEX equipment and I decide to protect one against seismic, but it's not protected against flood, the other against flood, but it's not protected against seismic, that I can have an event that doesn't leave me with anything, because I have a seismic event that fails the thing that I'm protected against flood, but I got to get the thing that's protected against seismic out of the way of the flood and I can't use it.

MR. BOWMAN: That makes a great deal of sense, but to explain where we are with the guidance, in 2012, when we put together the initial set of guidance for the order, we had the ongoing separate action item that was the seismically-induced fires and flooding, so we did not include

seismic failures of dams causing it or failures internal.

CHAIR STETKAR: Okay.

MR. BOWMAN: Despite that, we looked at it, and the vast majority of the plants that have a potential for a seismic failure of a dam that could lead to the flooding, the distance between the dam and the facility is typically large enough so that you would not anticipate that you'd have the same level of effect simultaneously at both spots.

CHAIR STETKAR: Good. That's a better answer than the seismic-induced fire and flooding. I would caution you to rethink that because I looked at a lot of the seismic-induced fire and flooding, and it, in terms of flooding, looked at focusing on pipe failures and tank failures within the footprint of the plant.

MR. BOWMAN: No, no, I am well aware of that. That is included in the industry guidance and I thought it was a great idea, but we endorsed the guidance without exception. I was not going to take an exception for them looking at something beyond the task that we had at hand.

MR. SCHULTZ: If we rewind to where the information that Eric provided when he first came

to the microphone, I think that level of detail would be useful to add to the SECY document here to demonstrate that there is a full circle of information that's been provided and evaluated.

CHAIR STETKAR: Yes, I agree, Steve, that as I brought my little matrix out that I started out with, I literally had a hole where I couldn't see where anything that I could point to addressed --

MR. SCHULTZ: And that was the level of detail that helps to do that rather than just to refer to the NEI document. It's in there. That additional detail would be helpful.

MR. SHAMS: We'll get with Eric and make sure that that makes it into the paper. And I just wanted to add to what Eric's saying. I'm comforted by what he said. I happen to see my own, a couple of site that I mentioned the name early on that I know the nearby dams were looked at from a seismic failure as well as the --

CHAIR STETKAR: Yes, see, we don't have -- I read this as somebody who can look at the stuff that I can look at, which is what's publicly available, and I looked at some of the non-publicly available analyses that were done, that I can

access through ADAMS, I don't know what you've looked at, you know, each individual site. I don't even know where that's documented.

MR. BAILEY: Well, so our stuff is all being documented in the safety evaluation. And in the South Texas, I don't believe there's any difference between the seismic and flooding analysis, so a seismic-induced flooding would all be the same equipment, you've heard it's all in seismic Category 1 structures up on the roof because of the quick flood inundation at that plant.

Typically, your difference, when you get into the mitigating strategies, for the plants that have a different strategy for seismic and flooding, it's usually because the flooding is such an extent that they are taking credit for the warning time to move equipment around.

If it was seismic-induced dam failure, you would likely have a similar warning time for them to credit. There are sometimes differences in the credited water sources, you know, that they may take credit for some non-seismic water sources in a flooding event, so we would need to go back and look on a plant-specific basis to confirm that

that's covered for all plants, but I would suspect that, generally speaking, that's adequately covered in the plans that are already put in place.

(Simultaneous speaking)

MR. BAILEY: It's by the negative, right, so we say you can only credit it if it's robust. We don't explicitly say --

MR. BOWMAN: And that phraseology in the 322 has to be understood with respect to the definition of robust in Appendix --

CHAIR STETKAR: Yes, no, no, I -- yes, we'll talk more about what that means tomorrow, but --

MR. BOWMAN: That's why I waited until the end.

CHAIR STETKAR: No, that's fine. Okay. Thank you.

MR. SEBROSKY: So to finish Slide 29 to make adjustments to the assessment based on ACRS feedback, we mentioned the action items that we'll try to give you an updated assessment for low water level some time next week. We'll look at the action items. If there are additional documents that we can provide to address some of those concerns that are publicly available, we'll include

that when we send the information to Kathy.

Otherwise, we'll report back to the full committee in early May.

CHAIR STETKAR: One last question before we try to close up here. You're sending a SECY paper up to the Commission that's just an information paper, correct? It's not a -- you're not expecting a vote.

MR. SHAMS: They can turn into a vote paper if they wish, but the request was to inform the Commission of --

CHAIR STETKAR: You have no inclination that it may be a vote paper or anything -- the only reason I raise this is things have morphed in the past.

MR. SHAMS: And they can.

CHAIR STETKAR: And they can.

MR. SHAMS: But the intel that we have is not suggesting --

CHAIR STETKAR: So it's strictly an information paper on the path forward.

MR. SHAMS: Yes, send the information paper.

CHAIR STETKAR: Okay.

MR. SEBROSKY: But what Mohamed said

is, any one of the Commissioners can change it.

CHAIR STETKAR: Sure, we're aware of that, but just --

MR. SEBROSKY: I understand. So there's things that are in our control, then there's things that are not.

CHAIR STETKAR: That's right.

MEMBER SKILLMAN: Joe, I'd like to ask a question before we get to what John's going to anoint as the end here. On Page 3 of your white paper, you write, "To complete the Tier 2 activities", so on and so forth, we looked at a lot of information, "this included consideration of previously submitted licensee information on external hazards, such as", and the first bullet is, "Information associated with plants licensed in the late '60s and early '70s that were reviewed as part of the systematic evaluation program."

Do you see that sentence?

MR. SEBROSKY: Yes, you're in Page 3 of the enclosure.

MEMBER SKILLMAN: Yes. So here's my question. Back in that time period, there was no information, there was very little, what I'm going to call, communal information gathering, and most

of this information, in all candor, was tribal knowledge from the small number of plants that were licensed at that point in time. What confidence do you have that the early lessons learned on natural hazards have been swept up into your evaluation matrix?

MR. SEBROSKY: So our assessment is based on, there was a process in the early '80s that was called the systematic evaluation process, SEP, it looked at, at the time, I think it was 51 units that had been licensed using the pre-1975 version of the SRP, sometimes referred to as pre-GDC plants, and it did a detailed evaluation of 10 of those 51 sites.

There were non-trivial changes that were made to plants as part of that SEP process, so if you look at the generic issue program for tornados, if you look at the generic issue program for snow loads, there's a discussion in there, I think it's GI-156, I don't know the exact number, but there was a systematic process that went back and looked at those early generation plants, and in some cases, backfits were made, and non-trivial backfits.

So to answer your question, we're

taking advantage of that work that was done in the '80s that looked at those plants that were licensed in the '60s and '70s. We didn't stop there. The other thing that was done, as you know, is the IPEEEs that looked at all those plants and didn't matter what vintage.

And you can see, as evidenced in the NUREGs, that there's a, and I forget the NUREG number, we reference it, but you can look at that NUREG and it has all the plants, it tells you if the plant was a 1975 version or pre, and the type of evaluations that they did to demonstrate that the plant was okay.

The vast majority of the sites, the vast majority of the sites, when you look at the IPEEE, took the out that was given to them, that if they could demonstrate the plant met the 1975 version of the SRP through analytical methods plus walk-downs, they were okay from an external events standpoint.

MEMBER SKILLMAN: Thank you.

CHAIR STETKAR: I'll go around the table and ask for final comments from members and such, but as we always do, this is a public meeting, so we'll get the bridge line open to see

if there's anyone out on the bridge line, and while we're doing that, I'll ask if there any members of the public who'd like to make a statement, please come up to the microphone, identify yourself, and do so.

DR. DUBOIS: Hi. My name is Dr. Gwen DuBois, I'm an internist, a medical doctor, and I have an MPH, a member of the Physicians for Social Responsibility, and so two things I want to -- first of all, thank you for having it open to the public. In medicines here, you know, there's often a two-hit concept of events, a genetic predisposition and environmental exposure, and then a person gets cancer, for example.

So in talking about natural events, there's a belief here that there's a generator system that will, you know, come in and be available. There wasn't at Fukushima because of the Mark I, Mark II having the generators on the ground floor. The information about the seven NRC staffers who were concerned about out of 101 plants having generators that have a technical problem that they may not be available, you know, makes me wonder if there is a natural event, are we to believe that the generators will be the backup

system that they need to be.

And I didn't see anything in the newspapers about the NRC responding to that. You know, these events are going to happen, and especially, the second thing is with climate change, and there's going to be more water, and warmer waters. There's a good article in the New England Journal of Medicine after Katrina that you can expect more larger hurricanes, are these 100-year events now 40-year events, and things like that. So those are my two questions. Thank you.

CHAIR STETKAR: Thank you very much. Is there anyone else who'd like to -- oh, I'll leave it down. Just identify yourself.

MS. MINNISS: Regina Minniss and I'm a private citizen, concerned private citizen, and I was looking at your low water level conditions, and it seems like you have a minimum of -- one of the bullets says, specific discussion of plants that may not have 24 hours of water onsite.

Fukushima, as you all know, has been going on for five years and a 24-hour water onsite seems very low. And I guess the second part of my question is, with the water actually being rapidly depleted, how much longer can the nuclear energy

depend on water as a mitigator? That's it. Thank you.

CHAIR STETKAR: Thank you. And thanks a lot for putting it back up there. Is there anyone else in the room that would like to make a comment? If not, I hear pops and crackles, which is our indication that the bridge line is open. But again, to do me a favor, just somebody please say hello out there if you're on the line. Anyone. I'm not hearing anyone.

PARTICIPANT: Hello.

CHAIR STETKAR: Hello. Thank you. It's crude. It's the only indication we have, if you're not familiar with this process. Okay. We now know that the line is actually open. If there's anyone out there, a member of the public who'd like to make a comment, please identify yourself and do so. Okay. I'm not hearing any. We'll get the line re-closed so the popping and crackling stops.

And as we usually do in Subcommittee meetings, I'll go around the table and see if any Members have any final comments that they'd like to make, or suggestions, for the full Committee briefing. And so I can make him justify the fact

that we fly him up here, I'll start with our consultant. Steve?

MR. SCHULTZ: Thank you, John. I think we have discussed a number of issues that warrant additional attention, not only in the SECY, but -- and you've indicated that you've heard those, identified them, some of them you responded to already today, but to incorporate those in the discussions related to the full committee meeting, and also updating the SECY accordingly as you see fit would be appropriate, but I have no new issues to add at this point in time that we haven't already discussed this afternoon.

CHAIR STETKAR: Thank you. Pete?

MEMBER RICCARDELLA: I have no comment.

CHAIR STETKAR: Harold.

MEMBER RAY: Well, I just want to underscore that this is really important and it's -- I feel like we're making a valuable contribution in examining our ability to mitigate an event, but it's always, to me, better, if we can, to avoid the event in the first place, so the ability to discriminate between things that we should try and avoid as compared with being prepared to mitigate them in the very rare circumstances in which they

might occur, as well as things that we can't predict.

Both of them are valuable and important in my mind and so I'm going to always be focused on whether we are relying too much on mitigation and not enough on prevention. I haven't seen that today, but that's where I put my emphasis in these reviews, is, are we over-relying on mitigation, as important as it is.

CHAIR STETKAR: Thank you. Dick?

MEMBER SKILLMAN: I think the staff did a great job on the white paper. I think that they really pulled a number of pieces together that we might not have given much respect to and I think that they put them in a logical order and made sense out of a bunch of different pieces of information. It is valuable for us. Thank you.

CHAIR STETKAR: Dr. Powers. Dr. Bley.

MEMBER BLEY: I'm sorry. This has come a long way and I'm seeing it all come together, and although today, a few things give me things I really want to look at a little harder before the full committee meeting, I think it's a good presentation, and thanks.

CHAIR STETKAR: Charlie.

MEMBER BROWN: Nothing else.

CHAIR STETKAR: Joy.

MEMBER REMPE: No comments, but I appreciated the discussion and presentations today.

CHAIR STETKAR: Okay. Great. And again, I'd like to thank the staff. I think the -- I personally, despite all of the stuff that I've said today, I think the white paper was well thought out. I think what you've heard me comment on is, I'm looking for cracks to make sure -- to have better confidence that the cracks have been filled somewhere in the whole process, not necessarily here, but somewhere in the whole process.

And I know we'll be exploring more of that in tomorrow's discussions. I think we have an hour and a half scheduled on our agenda for the full committee briefing, so make sure you highlight the major issues that you want to do in that time.

I think that recommendation is that if you can address -- you know, if you go back through the transcript and can address, or your notes, anything that we brought up orally, even if it's oral, I think we'd appreciate that. Quite honestly, I think that less detail about individual

site-specific analyses for the full committee, I think you have to show that -- you know, tell the full committee that you did those, but it's not worth three or four slides, you know, out of an hour and a half presentation.

Yes, and I think it's also important for the full committee to -- because I didn't get it, quite honestly, I didn't get it out of the white paper that something could have been passed on to Task 3 if it affected one and only one site. That was -- one of my initial questions that I had jotted down was, why are you dwelling so much on, you know, whether it's the Robinson or, I've forgotten the other one, but it doesn't make any difference, Columbia, for the ash, you know, why are you dwelling on it in this context?

Other than that, unless you have any questions more about kind of organizing expectations for the full committee.

MEMBER POWERS: I think it would be useful if they included one slide on the status of their geomagnetic storms.

CHAIR STETKAR: Good suggestion. The geomagnetic storm issue. The thing that we brought up about, is this simply punting it to an infinite

research activity rather than trying to draw some sort of closure.

MEMBER POWERS: Yes, I mean, I think that will just attract enough interest rather than being bogged down and trying to describe orally.

CHAIR STETKAR: That's a good suggestion. Anything else from anyone regarding the full committee presentation, because you know how those go, given the fact that most of the committee is here, but it's still.

MR. SHAMS: You mentioned we have one and a half hour for this --

CHAIR STETKAR: The agenda is already set. Yes.

MR. SHAMS: Okay.

CHAIR STETKAR: And I'm assuming it'll be on Thursday.

MR. SHAMS: Okay.

CHAIR STETKAR: With that, nothing else, we are adjourned.

(Whereupon, the meeting in the above-entitled matter was concluded at 5:04 p.m.)

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

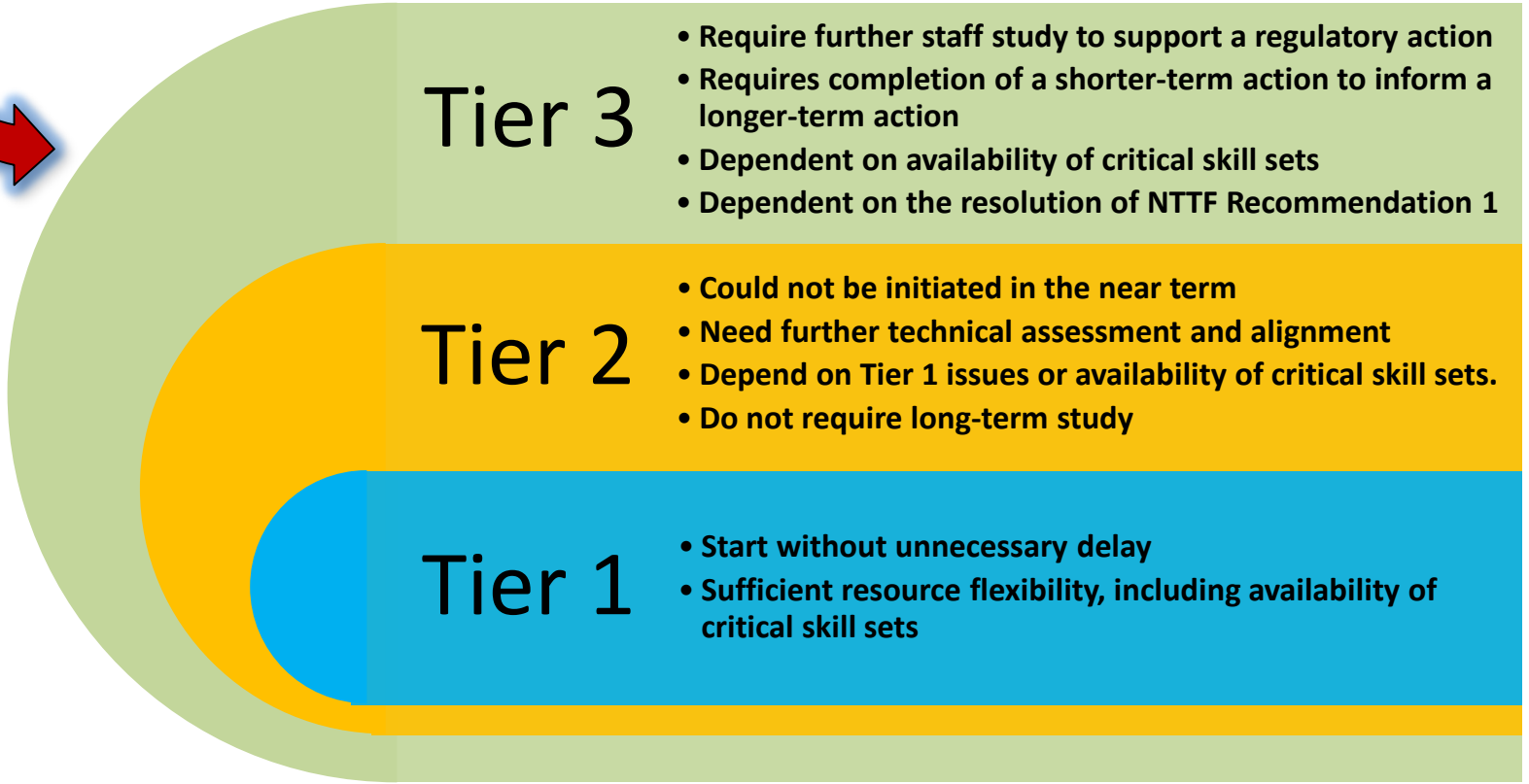
NRC Staff Preliminary Assessment of Natural Hazards other than Flooding and Seismic

ACRS Fukushima Subcommittee Meeting
April 21, 2016

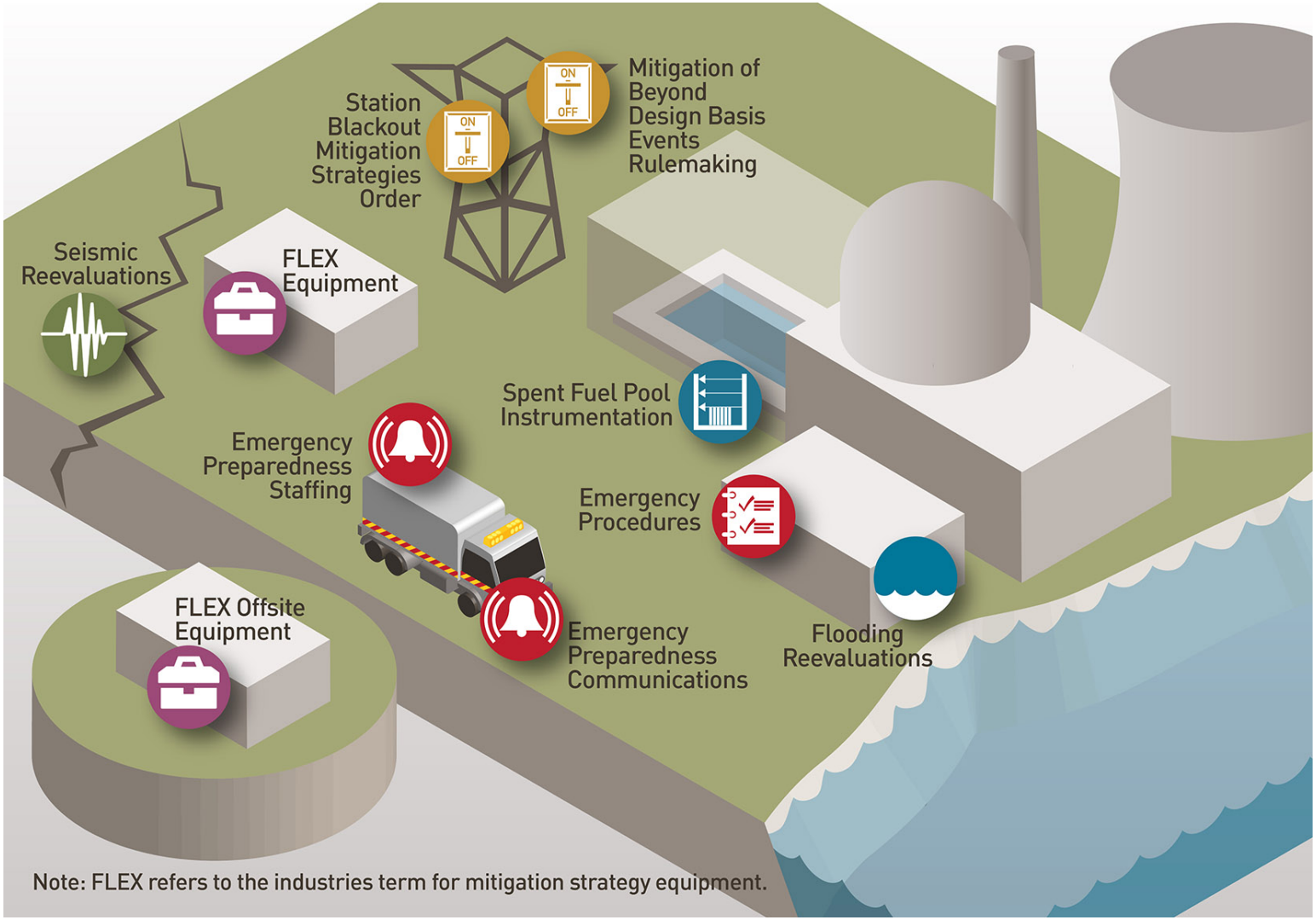
Japan Lessons Learned

Background

Fukushima Dai-ichi lessons learned developed and prioritized in a three-tiered approach (see SECY-11-0093 and SECY-11-0137)



Mitigation of Beyond-Design-Basis Events Rulemaking



Background

- Resolution plan for remaining Tier 2 and 3 activities provided in SECY 15-0137, “Proposed Plans For Resolving Open Fukushima Tier 2 and 3 Recommendations”
- Natural Hazards other than Seismic and Flooding binned as Group #3 activity in SECY 15-0137
  - More detailed assessment and/or justification for resolution being prepared; ACRS/external stakeholder interactions would inform resolution of the recommendation; work to be completed in 2016
- Commission decision on SECY-15-0137
  - Closed Group 1 items
  - Group 2 updated assessment to be provided end of March 2016
  - Other Natural Hazards interim status to be provided end of May 2016
    - Commission directed that the interim status include the results of the staff’s assessment through step 2 of the process outlined in SECY-15-0137

Background

- Staff plan to meet Commission direction for assessment of natural hazards other than seismic and flooding
  - White paper providing the staff's preliminary assessment publicly issued on March 24, 2016 (ADAMS Accession No. ML16039A054), to solicit stakeholder comments and to engage ACRS
  - Category 3 public meeting held on April 5, 2016, to solicit comments on white paper
  - During today's meeting the NRC staff will provide an overview of the white paper and provide insights to the ACRS on what areas the staff is considering changes to address stakeholder comments
  - Revisions to the technical content found in the white paper will be made to address stakeholder comments and ACRS insights
  - Staff plans to provide an updated interim assessment by end of May 2016 in accordance with Commission direction
  - Staff targeting providing final assessment to the Commission by end of December 2016

Overview of 4 Step Process for Evaluation of Other Natural Hazards

Four Step Process

1) Define natural hazard other than seismic and flooding to determine those hazards that could pose a threat to nuclear power plants

2) Determine and apply screening criteria to exclude certain natural hazards from further generic evaluations, or exclude some licensees from considering certain hazards

3) Perform a technical evaluation to assess the need for additional actions if the hazard or licensee was not screened out generically in Task 2
   - Consider whether a request for information in accordance with 10 CFR 50.54(f) is appropriate (approach taken for seismic and flooding)
   - Enough information at this stage to require action in accordance with 10 CFR 50.109 (backfit process)

4) Based on results of Task 3, determine if additional regulatory actions are needed

Preliminary Results of Step 1 Assessment

- Hazards identified for consideration found in Appendix A of white paper
- Man-made hazards excluded from further consideration
- Natural hazards listed in Appendix A Table A-1
- Natural hazards excluded from further consideration (basis provided in Appendix A) include:

Animals	Avalanche	Biological Events, coastal erosion, ice barrier, ice cover, biological plugging of intakes
Corrosion	External flooding*	Extreme air pressure
Fog/mist, frost, hail, landslide	Dust storms, forest fire, grass fire, ice storm/freezing rain, sleet, lightening, sandstorms, salt storm	Land rise, sink holes, soil shrink-swell, underwater landslide (impact on soil, that is not a tsunami)
Meteorite	Seismic activity*	Geomagnetic storms**
Waterspout	Volcanic activity**	

*Seismic and Flooding being evaluated in accordance with Recommendation 2.1

** Additional discussion regarding geomagnetic storms and volcanic activity on next slide

Preliminary Results of Step 1 Assessment

- Natural Hazards reviewed in accordance with Step 1 (continued)
  - Volcanic Activity
    - References work performed in accordance with 10 CFR 2.206 petition
    - Based on previous evaluations that concluded volcanic activity is hazard that should be considered, but only at the Trojan and Columbia sites. All other nuclear plant sites are too far away from active U.S. volcanos to have to consider this threat
    - Columbia evaluation of volcanic activity found in Updated Final Safety Analysis Report
    - Response to mitigation strategies order addresses volcanic activity and notes that structure housing phase 2 equipment to withstand loads placed on the structure from volcanic ash

Preliminary Results of Step 1 Assessment

- Natural hazards reviewed in accordance with Step 1 (continued)
  - Geomagnetic storms
    - Being evaluated as part of Tier 1 activity under mitigation of beyond-design-basis event rulemaking
    - Petition for rulemaking (PRM) 50-96 referenced in MBDBE proposed rule
    - NRC staff has received comments on geomagnetic storms in response to MBDBE rule and is currently assessing these comments
    - Because geomagnetic storms are being evaluated as Part of a Tier 1 activity and Commission will be informed of results of staff review as part of this activity, geomagnetic storms are proposed to be closed as part of Step 1 of the Tier 2 activity
  - To date no substantive comments received on Step 1 of the staff's assessment

Preliminary Results of Step 1 Assessment

- Natural Hazards reviewed in accordance with Step 1 (continued)
  - Hazards proposed to proceed to Step 2 of the process
    - Wind and missile loads from tornadoes and hurricanes
    - Snow and ice loads for roof designs
    - Drought and other low water conditions
    - Extreme temperatures

Preliminary Results of Step 2 Assessment

- Wind and missile loads from hurricanes and tornadoes and snow loads move to Step 3 of the process
- Drought and other low water conditions and extreme temperatures evaluated as part of Step 2

Preliminary Assessment of Low Water Conditions

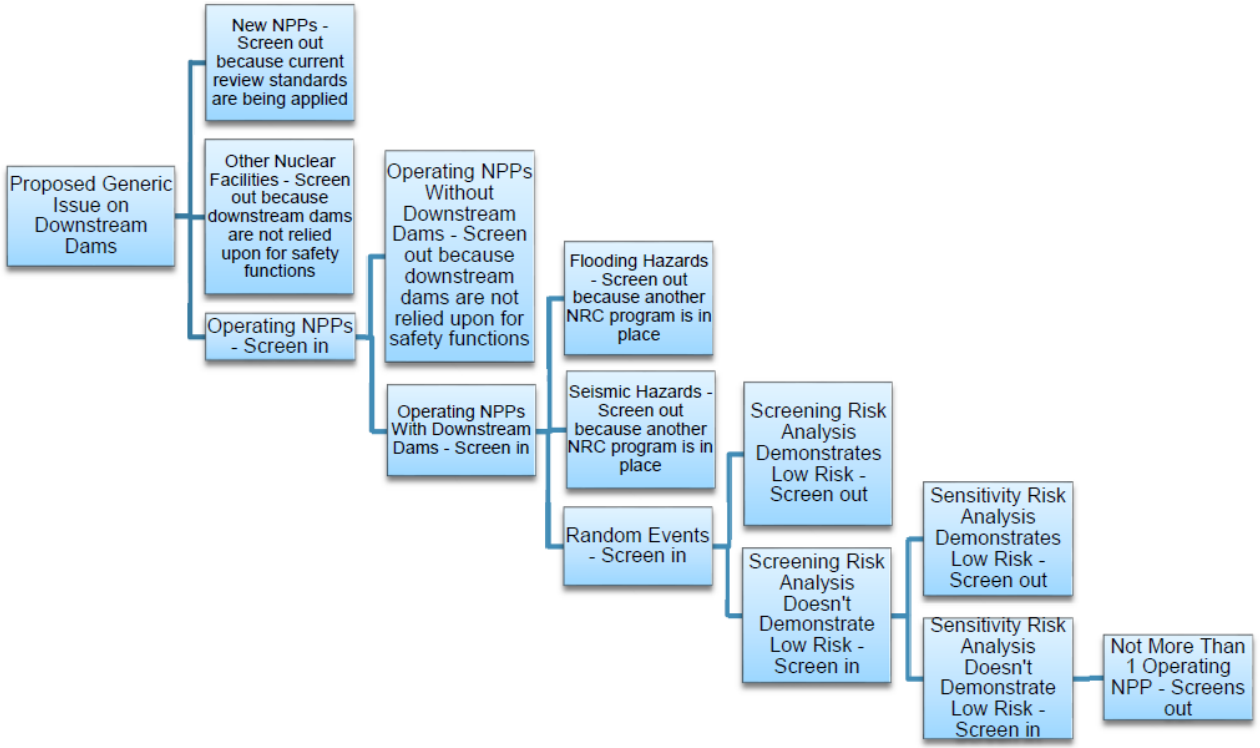
- Three low water conditions evaluated
  - Drought
  - Low water conditions due to downstream dam failure
  - Low water conditions due to a seiche
- Criteria applied include
  - Conservatism of design
  - Operational limits
  - Warning time

Preliminary Assessment of Low Water Conditions

- Drought
  - Warning time would allow licensees to take appropriate actions
- Low water conditions due to downstream dam failure
  - Staff addressed as pre-generic issue (next slide)
  - Pre-generic issue closed by March 11, 2016, letter based on:
    - Plants with non-seismically qualified downstream dam developed mitigating strategies to cope
    - Risk assessment performed for plants with seismically qualified downstream dams
      - All sites screen out except Robinson
  - Conclusion:
    - Generic regulatory action to address downstream dam failures not warranted
  - Robinson has been evaluated separately considering:
    - Capabilities of deepwell pumps
    - Newly-installed SHIELD seals
    - Further evaluation as part of NTTF 2.1 activities

Preliminary Assessment of Low Water Conditions

- Low water conditions due to downstream dam failure (continued)
  - Process for review outlined in March 11, 2016, pre-generic issue (ADAMS Accession No. ML15253A365)



Preliminary Assessment of Low Water Conditions

Low water conditions due to downstream dam failure (continued)

- Staff is considering changes to SECY write-up regarding Robinson as a result of stakeholder comments:
  - Adding more discussion regarding the capabilities of the alternate water supplies (i.e., deepwell pumps)
    - 4 deepwell pumps
    - “D” deepwell pump can provide cooling to the emergency diesel generators through a connection to the service water system
    - Wells can support FLEX long term cooling
  - Adding a discussion of how reactor coolant system inventory control is maintained
    - Use of low-leakage reactor coolant pump seals
    - Installed system or FLEX for RCS makeup
  - Conclusion that no further regulatory action needed at Robinson for random dam failure

Preliminary Assessment of Low Water Conditions

- Low water conditions due to a seiche
  - Staff addressing as part of pre-generic issue
    - March 18, 2015, Region III letter identified possible generic issues (ADAMS Accession No. ML15078A284)
    - One concern is storm can cause low water level conditions that result in damage to safety related ultimate heat sink pumps
    - Plants along the Great Lakes and Chesapeake Bay evaluated
  - Staff evaluation of sites that could be impacted
    - Majority of sites do not rely on UHS for FLEX or have at least a 24 hour water supply (outlasts seiche) before UHS is needed to provide decay heat removal capabilities via FLEX
      - FLEX can provide cooling when UHS water level recovers
    - Units that do not have 24 hour water supply are dispositioned using a combination of hazard and site-specific conditions
  - Preliminary Conclusion
    - Additional regulatory action to address seiche not warranted

Preliminary Assessment of Low Water Conditions

Low water conditions due to a seiche (continued)

- Changes that the staff is considering to the assessment as a result of stakeholder comments:
  - Adding a discussion of how reactor coolant system inventory control could be maintained in the event of the loss of the safety-related ultimate heat sink
    - Use of low leakage reactor coolant pump seals
  - Specific discussion of plants that do not have 24 hours of water on-site

Preliminary Assessment of Extreme Temperatures

- Extreme Temperature Assessment considered high and low extreme temperatures
  - Extreme high-temperature
    - Evaluation considered technical specification requirements
      - Example technical specifications includes ultimate heat sink, containment air temperature and control room emergency air temperature
    - If air temperatures outside of design-basis temperature are expected, licensees are expected to take actions
    - Subject to NRC inspection
    - Mitigation strategies equipment consider potential impacts of high temperature (both procurement and operation (e.g., consideration of expansion of sheet metal))

Preliminary Assessment of Extreme Temperatures (continued)

  - Extreme low-temperature
    - If air temperatures outside of design-basis temperature are expected, licensees are expected to take actions
    - Information notices associated with cold temperatures
      - IN 96-06 on degradation of cooling water systems due to icing
      - IN 98-02 on cold weather protective measures
    - Subject to NRC inspection
    - Mitigation strategies equipment consider potential impacts of low temperature (both procurement and operation (e.g., consideration of ice blockage and frazil ice))
- Preliminary Conclusion
  - Additional regulatory action to address extreme temperatures not warranted
- To date no substantive comments received on staff's assessment of extreme temperatures

Preliminary Results of Step 3 Assessment

- Wind and missile loads from hurricanes and tornadoes and snow loads move to Step 3 of the process
- Staff identifies issues
  - New guidance provided in both areas after current operating fleet began operation
  - Preliminary assessment includes a discussion of the issue and staff's preliminary process for evaluating issues
  - Staff to provide complete assessment to the Commission by end of December 2016

Preliminary Results of Step 3 Assessment

- Snow loads
  - DC/COL Interim Staff Guidance 007, “Assessment of Normal and Extreme Winter Precipitation Loads on Roofs of Seismic Category I Structures,” issued July 1, 2009, provides guidance for:
    - Calculating 100 year snow loads
    - Calculating extreme snow loads
      - Combination of 100 year snow load and 48 hour probable maximum precipitation event

Preliminary Results of Step 3 Assessment

- Snow loads (continued)
  - Preliminary Assessment
    - DC/COL ISG-007 guidance consistent with 1975 version of the SRP and branch technical position
    - 100 year snow load typically bound by plant design or structural margin associated with design
    - When extreme snow loads are evaluated against structural margin, staff's preliminary assessment is that a beyond-design-basis snow load is not likely to cause a catastrophic failure of a seismic Category I roof that leads to core damage
  - As part of Task 3 the staff will continue to assess design conservatism and warning time (including actions licensees take in the event of an extreme snow event) to determine if additional regulatory actions are warranted
  - To date no substantive comments received on staff's assessment of snow loads

Preliminary Results of Step 3 Assessment

- Wind and missile loads from hurricanes and tornadoes
  - New guidance documents recently issued
    - Regulatory Guide 1.76 Revision 1 on design-basis tornadoes and tornado missiles issued in March 2007
    - Regulatory Guide 1.221 on design-basis hurricanes and hurricane missiles issued in October 2011
  - RG 1.76 Rev 1 tornado wind speeds generally went down
    - Different missile spectrum from 1975 version of standard review plan
    - Automobile missile speeds for same weight automobile went up in some areas

Preliminary Results of Step 3 Assessment

- Wind and missile loads from hurricanes and tornadoes (continued)
  - RG 1.221 hurricane
    - Hurricane wind speeds generally bound by tornado wind speeds for a given site
    - Hurricane missile speeds higher than comparable tornado for sites susceptible to hurricanes
      - Hurricane-generated missile has longer time in hurricane wind field than tornado wind field
  - Staff assessment consists of:
    - Evaluation of Pre-General Design Criteria Plants
    - Plants evaluated against 1975 version of the standard review plan

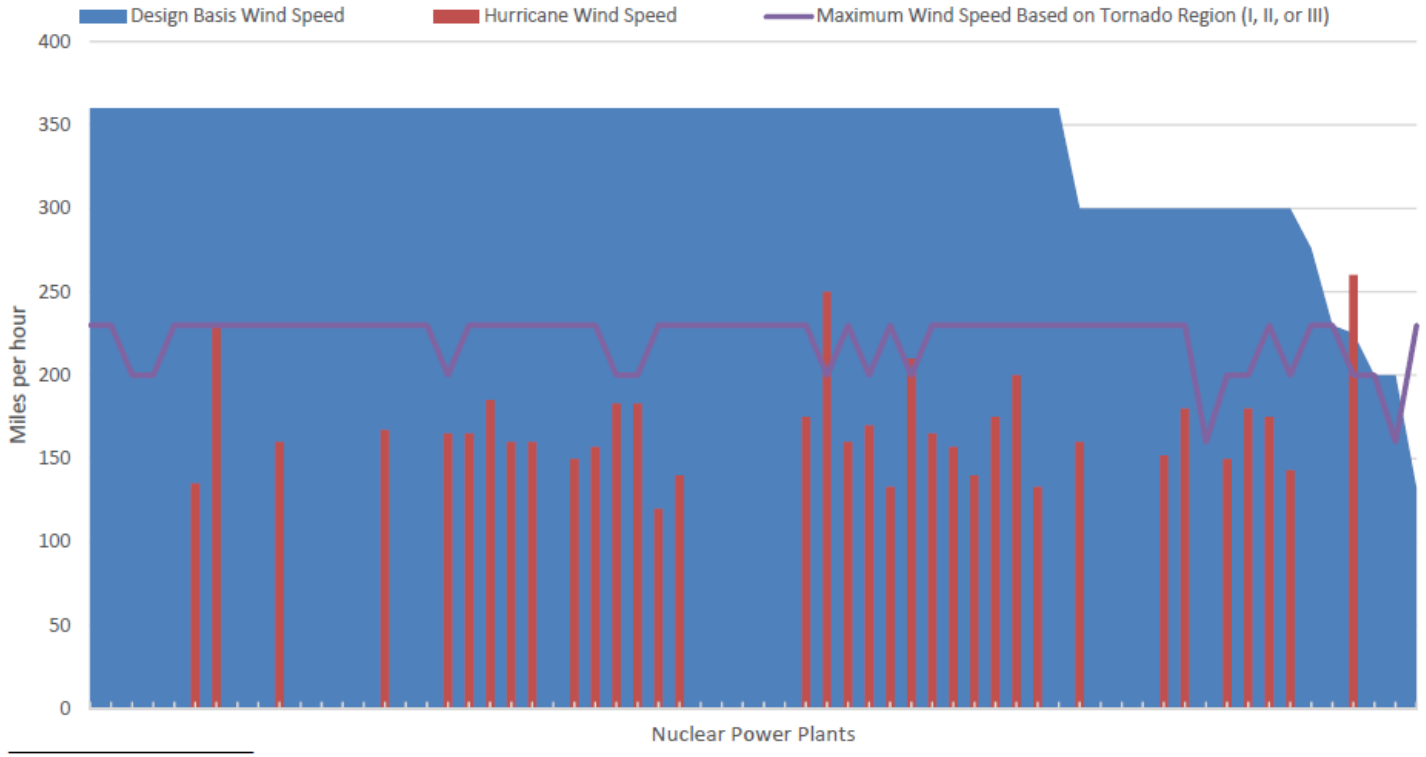
Preliminary Results of Step 3 Assessment

- Wind and missile loads from hurricanes and tornadoes (continued)
  - Insights from RIS 2015-06 and Enforcement Guidance Memorandum (EGM) 15-002
    - Tornado missile protection design-basis requirements are conservative
    - Staff using existing processes to ensure licensees continue to meet requirements in this area
    - EGM 15-02 provides a basis for enforcement discretion noting that tornado missile scenarios that lead to core damage are very low probability events

Preliminary Results of Step 3 Assessment

- Wind and missile loads from hurricanes and tornadoes (continued)
  - New wind load guidance generally bound by current plants design basis

Figure 3.4-1 Comparison of Curent Design Basis Wind Speeds vs Updated Tornado and Hurricane Wind Speeds[4]



4 Note that not every plant has a hurricane wind speed associated with it. For example, plants that are located away from the coast are do not have a hurricane wind speed value in Regulatory Guide 1.221, "Design-Basis Hurricane And Hurricane Missiles for Nuclear Power Plants."

Preliminary Results of Step 3 Assessment

- Wind and missile loads from hurricanes and tornadoes (continued)
  - Hurricane and Tornado missile spectrum chosen to:
    - Assess design of safety-related structures to provide protection against a missile damaging equipment internal to the structure (missile's penetration capability)
    - Assess design of safety-related structures to withstand impact loads (automobile missile)
    - Assess design of safety-related structures to protect against small wind-born missiles
  - Ability of wind-born missiles to penetrate concrete
    - Majority of sites have design-basis missile characteristics that bound missile characteristics found in latest regulatory guidance
  - Impact loads
    - Automobile missile's in current guidance higher than that found in current plant updated final safety analysis reports

Preliminary Results of Step 3 Assessment

- Wind and missile loads from hurricanes and tornadoes (continued)
  - Staff Assessment continuing as part of Task 3
    - Consider insights gained from past IPEEEs and current high wind studies
    - Gain further understanding of licensees anticipatory actions in preparation for approaching hurricanes
    - Updated assessment to be completed by December 2016
  - To date no substantive comments received on staff's assessment of wind and missile loads from hurricanes and tornadoes.

Next Steps

- Make adjustments to assessment based on ACRS feedback
- Provide updated assessment to commission by end of May 2016
- Completed assessment due to Commission by end of December 2016
  - Staff envisions public meeting(s) in the summer to discuss snow load and wind load assessments
  - Assessment will be updated based on stakeholder interactions and the results of additional analysis that the staff is considering
  - Engage ACRS in the fall of 2016 based on updated assessment

Acronyms

(Alphabetical)

- ACRS – Advisory Committee on Reactor Safeguards
- ADAMS – Agencywide Documents Access and Management System
- CFR – *Code of Federal Regulations*
- COL – Combined License
- DC – Design Certification
- EGM – Enforcement Guidance Memorandum
- FLEX – diverse and flexible coping capability
- IN – Information Notice
- IPEEE– Individual Plant Examination of External Events
- ISG – Interim Staff Guidance
- MBDBE – Mitigation of Beyond-Design-Basis Events
- NPP – Nuclear Power Plant
- NRC – Nuclear Regulatory Commission
- NTTF – Near-Term Task Force
- RCS – reactor coolant system
- RG – Regulatory Guide
- RIS – Regulatory Issue Summary
- SECY – Office of the Secretary of the Commission
- SRP – Standard Review Plan
- UHS - ultimate heat sink