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

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS (ACRS)

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FUKUSHIMA SUBCOMMITTEE

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OPEN SESSION

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WEDNESDAY,

OCTOBER 19, 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

MARGARET CHU, Member

MICHAEL L. CORRADINI, Member*

WALTER L. KIRCHNER, Member

JOSE A. MARCH-LEUBA, Member

HAROLD B. RAY , Member

JOY REMPE, Member

PETER C. RICCARDELLA, Member

GORDON R. SKILLMAN, Member

JOHN W. STETKAR, Member

MATTHEW W. SUNSERI, Member

ACRS CONSULTANT:

STEPHEN SCHULTZ

DESIGNATED FEDERAL OFFICIAL:

MICHAEL SNODDERLY

ALSO PRESENT:

STEWART BAILEY, JLD/NRR

GREG BOWMAN, JLD/NRR

ANDY CAMPBELL, NRO

KEVIN COYNE, RES

MIKE FRANOVICH, JLD/NRR

HENRY JONES, NRR

STEVE LAVIE, NSIR

MARVIN LEWIS, Public Participant*

AIDA RIVERA, NRO

SELIM SANCAKTAR, RES

JOE SEBROSKY, JLD/NRR

MOHAMED SHAMS, JLD/NRR

MARTIN STUZKE, NRO

* Present via telephone

C-O-N-T-E-N-T-S

P R O C E E D I N G S

1:00 p.m.

CHAIRMAN 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 Ron Ballinger, Margaret Chu, I believe we=ll be joined by Harold Ray, Dick Skillman, Matt Sunseri -- there=s Harold now -- Dennis Bley, Jose March-Leuba, Walt Kirchner, Charlie Brown and Joy Rempe.

We=re also joined by our consultant Steve Schultz.

The purpose of this meeting is for the subcommittee to review and discuss the NRC staff=s white paper on enclosures on evaluation of natural hazards other than seismic and flooding with particular attention to high winds and snow loads, the evaluation of the periodic confirmation of natural

hazards and the evaluation of real time radiation monitoring.

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 except for portions which will be closed due to discussion of sensitive pre-decisional information, security-related information and/or proprietary information.

And we will close the end of the meeting for those discussions.

The meeting is being conducted in accordance with the 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.

Mr. Michael Snodderly 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.

A couple of reminders. Please turn off all of your little communications devices. And if you are up front make sure to turn your microphone on when you are speaking and please turn it off when you are not speaking.

We=ve received no written comments or requests for time to make oral statements from members of the public regarding today=s meeting.

I understand there may be individuals on the bridge line who are listening in on today=s proceedings. During the open portion of the meeting the bridge line will be open and on mute so those individuals may listen in.

And before we close the meeting, go into closed session in the meeting I will open the bridge line for any public comments.

We=ll now proceed with the meeting. Oh, I also believe that we have ACRS member Mike Corradini on the bridge line. Mike, are you out there?

MEMBER CORRADINI: Yes, I am out here.

CHAIRMAN STETKAR: Great. Thank you.

Sorry to have overlooked you. How could I do that?

MEMBER CORRADINI: Thank you.

CHAIRMAN STETKAR: You=re welcome. We=ll now proceed with the meeting. And I call upon Mike Franovich of the Office of Nuclear Reactor Regulation to open the presentations. Mike?

MR. FRANOVICH: Thank you, Chairman Stetkar.

I thought I=d spend a couple of minutes kicking off this session to share the perspectives of the staff of how -- or the lens that we applied in looking at the remaining Fukushima issues.

I mean, you=ve heard of tiering issues, grouping issues, phasing issues. The landscape can be quite confusing.

So I=m just going to go into some fundamentals about why we have tiers of information, and how we constructed that in the early days. The early days being shortly after the accident and the formation of the Fukushima Steering Committee which governs the staff=s activities and ultimately reports to the Commission.

The regulatory practices or I should projects of this magnitude definitely have a certain

life cycle and momentum behind it.

We knew early on that that momentum is finite. You get into issues in the long run about budgets, and fatigue, both internal stakeholder fatigue and external stakeholder fatigue. So a steering committee was definitely warranted both on the NRC side, and the industry has its own as well.

So, there was a burning platform for change. There needed to be some structure and order to how we were going to manage the recommendations from the task force itself, and additional issues that would be added as we evolve and learn from examining those recommendations.

Hence the ability to do that was done through a tiering process.

I should also note that we did apply lessons learned from TMI and the management of the TMI action plan. The TMI action plan as many members appreciate is a quite expansive plan. It covered more than just the immediate operating experience from the accident itself at TMI.

And hence that project took nearly 15 years to actually resolve the final issues.

And so we didn=t want to repeat that type

of approach here. We wanted to have a more focused approach that dealt with the issues most germane to the experience from Fukushima.

So I mentioned the tiering process. The tiering process was used to help essentially manage the actions and put some priority behind the issues that we could deal with immediately and those that would perhaps need more time or available resources to deal with.

The tiering approach or the formal definitions came in through a SECY paper that was endorsed by the Commission and is referenced here, SECY-11-0137.

The particular definitions we use are activities for tier 1 are activities to start without unnecessary delay that we could move on immediately.

Examples of those are the mitigating strategies order, the 2.1 evaluations for seismic and flooding, of course the hardened vent activities to improve the reliability of hardened vents for Mark 1 and Mark 2 containments.

And put hardened vents on Mark 2 containments that didn=t have hardened vents at that point in time with that caveat.

Tier 2 activities are identified as activities that could not be initiated in the near term, but they needed further technical assessment.

And they could be dependent on tier 1 activities.

An example of tier 2 activity which we=ll discuss further today is the periodic confirmation or evaluation of natural hazards -- I=m sorry, the evaluation of other hazards other than seismic and flooding is a tier 2 item.

And then tier 3 are those that we needed more support, staff available resources. An example of that one is dealing with the realtime radiation monitoring which we will cover later on today.

And external natural hazards reconfirmation - should it be on a 10-year interval, should it be done on a more continuous or a different periodicity to it.

Of course we needed time to evaluate that and apply some lessons learned from tier 1.

Okay, so what this slide is trying to illustrate is that it=s illustrating the tier 1 activities that are in play right now.

We tried to put it all on one graphic. I

won=t go through each element of it, obviously, but the rulemaking itself in terms of mitigation strategies has evolved significantly since the early inception of the rulemaking activities.

There were multiple rulemaking activities which eventually became a consolidated rulemaking activity and then today where we are with the lack of another word, or maybe DBE rulemaking.

And regarding that aspect we did integrate the seismic and flooding reevaluated hazards to ensure that there was some level of assurance that we would have mitigating strategies available and reasonably protected from those types of hazards.

So we think that will give us the biggest or greatest dividend, safety dividend, from the Fukushima work.

The reason I=m mentioning that, when we=re evaluating the remaining work we are considering what we=re going to be achieving by codifying the orders and through rulemaking capturing some of the additional items through this mitigating strategies or mitigating beyond design basis event rulemaking.

We do look at the remaining tier 2 and tier 3 issues on their merit -- the merit of the issue

themselves.

But again, we want to apply the context of what we=re going to achieve for safety dividend here out of this rulemaking that=s in play right now.

So what this slide is illustrating is that, hey, we have achieved quite a bit of work. It=s been five years since the staff and the industry have been working on Fukushima issues.

We try to bin categorically the types of issues that we are dealing with. And it ranges everything from protection to mitigation, regulatory philosophy.

There isn=t a legend on this chart, but the blue indicates that the issues have been resolved or closed.

The issues that are in green are ones that are obviously ongoing, but may be captured by the BDBE rulemaking.

And then the ones in purple which are the three issues that we=re going to discuss today which are outside of the rulemaking.

Okay, so the issues that we are going to discuss today have been discussed previously with the committee in some level of detail. Of course today

we=re going to go in greater detail.

They have been captured in various Commission papers and there will be finalized -- the white papers that were shared with the subcommittee will be finalized in a SECY paper due to the Commission at the end of this year.

So again we=re going to talk about the periodic confirmation of natural hazards. Andy will cover that.

Realtime radiation monitoring. Steve Lavie will cover that.

And assessment of natural hazards other than seismic and flooding, we=ll have a group of staff dealing with that issue as well.

So with that I=m going to turn it over to Andy Campbell to cover the first topic.

MR. CAMPBELL: Thank you, Mike. Good afternoon. My name=s Andy Campbell. I=m the deputy director of the Division of Site Safety and Environmental Analysis in the Office of New Reactors.

And it has been our division doing the technical reviews of the flooding and seismic hazard reevaluations, and has also been working on developing the 2-2 process.

As Mike mentioned, recommendations 2-2 is a tier 3 item. And we need to just keep in mind what was originally proposed which is that staff initiated a rulemaking to require licensees to confirm their seismic and flooding hazards every 10 years, and address any new and significant information including, if necessary, updating design bases.

So, in supporting this recommendation the NTTF indicated as seismic and flooding knowledge continues to increase new seismic flooding hazard data and models will be produced.

So thus in recognition that the state of knowledge will continue to evolve, rather than being kind of periodically occurring it=s going to be an evolutionary process and it=s going to pretty much depend on what the hazard is and what our state of knowledge is.

We would benefit from incorporating new information in the models used to assess hazards and determine if any changes were significant enough to warrant additional regulatory action.

So, staff proposed that recommendation 2-2 be a tier 3 item and be informed by the results of the reevaluation of the flooding and the seismic work that

we=ve been doing over the last several years as well as in looking forward what we=ve done in the new reactor licensing area.

So, on slide 7, in developing this SECY we looked at the various things and we decided enhancing the existing processes to yield a proactive approach, and that=s what we=re recommending.

So we want to leverage and enhance our existing NRC processes such as the generic issues program to ensure information is proactively and routinely evaluated.

So, what we want to do is leverage what we=ve learned from all the flooding hazard analysis and all the seismic hazard analysis into essentially what amounts to a knowledge base about the current plants and how they can respond to things.

So, if you move to the next slide, slide 8, this discusses some of the advantages to the process. We feel it=s systematic, it=s timely and predictable.

And as I mentioned it already leverages what we=ve learned. We now have in place an External Hazards Center of Expertise. EHCOE is the acronym that we=re using for that. That=s now been approved

by the executive director of operation and we=ve informed the Commission of the development of that.

So that would include all the seismic analysis, all the flooding analysis as well as external hazards that are caused by humans such as gas pipeline near a nuclear power plant.

And we=re also going to leverage the research databases that they=ve been developing, both the user need and basic research.

So all this will be put into a knowledge base of new reactor information on a site-by-site basis as well as generically.

CHAIRMAN STETKAR: Andy?

MR. CAMPBELL: Go ahead, John.

CHAIRMAN STETKAR: Let me interrupt you for just a second because I had one question, but you prompted another important question.

You said that the External Hazards Center of Expertise will be collecting information on manmade external hazards in addition to natural hazards. Is that correct?

MR. CAMPBELL: That=s incorporated into the center of expertise.

CHAIRMAN STETKAR: It is?

MR. CAMPBELL: Yes.

CHAIRMAN STETKAR: That is something that I had not heard. It=s not evident certainly from your white paper.

I would suggest in your white paper if that is there that you explicitly address that because the -- I=ve forgotten whether the ACRS has weighed in on this, but certainly the subcommittee members have expressed concern about comparable treatment to manmade external hazards in addition to natural hazards.

So I think that it would be excellent to telegraph that information in the white paper. Because I honestly hadn=t heard about that scope.

The reason I was originally going to ask you because the white paper, and so far in your discussion of natural hazards has emphasized flooding and seismic, flooding and seismic, and occasionally I see the word Awind@ in there.

There are other natural hazards that we have addressed I know in at least one ACRS letter. For example, geomagnetic storms. And the staff had indicated that, yes, you=re following that.

So, there are other types of natural

hazards in my mind that would certainly come under this area of expertise. And I wanted to make sure that it was certainly addressing those other natural hazards.

MR. CAMPBELL: Yes, and it does. Our meteorological and oceanography team is part of the center of expertise. The hydrology branches in NRO are in the center of expertise and the seismic branches.

And staff in NRR that used to be located there are now located in our organization. So we=re centralized for all natural hazards as well as in our radiation protection and accident consequences branch in DSEA.

We do that type of evaluation and that individual or individuals working on manmade hazards would be part of the center of expertise, are part of that.

CHAIRMAN STETKAR: Again, this is a subcommittee meeting so it=s only my personal recommendation, if you could at least highlight the manmade aspect of that somehow, somewhere in the white paper in terms of when to discuss it --

MR. CAMPBELL: We=ll take that back and

figure out where to tweak.

CHAIRMAN STETKAR: That would be very helpful.

MS. RIVERA: Andy, can I add something? Aida Rivera. I=m the branch chief over in the SEA. And I was heavily involved in the development of the recommendation 2.2 program.

I want to clarify that the manmade hazards initially were not intended to be part of the recommendation 2.2.

It is part of the center of expertise that was formed. However, it was -- we were not intending to include that as part of the reconfirmation of hazards.

We did expand to other external hazards, but not manmade. If it is the ACRS=s intention for us to consider that we can take it back and consider that going forward.

But initially it was not the intention of the staff. It was more other external hazards as winds, tornado missiles and all those winds type of hazards that were added later on.

Because the initial recommendation was only seismic and flooding, and we expanded to other

external hazards, but not manmade was not our intention.

CHAIRMAN STETKAR: Well, now I=m officially confused again.

First of all, let me try to parse this up so that I understand a few things.

There are things called other natural hazards and for the moment I will classify manmade as an unnatural hazard.

Those other natural hazards include a large litany of things some of which are seismic, external flooding, high winds, tornadoes, tornado missiles, others of which are things like geomagnetic storms, climate change, increasing temperatures, a couple come to mind.

I would hope that within the purview of this periodic reconfirmation activity and the activities of the center of expertise that you are collecting information and kind of checking in on the full spectrum of other external hazards, not just seismic, and flooding, and winds because those are the ones that you sort of have focused on. Is that correct or not?

MR. CAMPBELL: That can be exactly what we

intend to do. Because the idea of creating the center of expertise goes beyond 2.2. The center of expertise is an organization within the NRC that will be responsible for this spectrum of things including external manmade hazards for new reactor licensing, for ongoing operating reactor license amendment requests, tech spec issues.

A large range of issues that can occur for both the operating fleet and new reactors will also be dealt with by the center of expertise.

2.2 will be part of the responsibility of the center of expertise as well as some areas in the Office of Research.

So, does that help you?

CHAIRMAN STETKAR: That helps me a lot on the natural hazards I think. What I=m still now a bit confused about is if we can discuss manmade hazards.

Because I hear you saying that the center of expertise will collect information regarding manmade hazards. Because this is kind of a knowledge management activity.

MR. CAMPBELL: Well, it will be -- the center of expertise includes the individuals who do that kind of analysis because they are serving the

entire agency.

And this seemed to be the most efficient way to put the center of expertise together, because there=s a call for their services in other offices, the NRR in particular for licensing actions. So that=s the overall goal of the center of expertise.

Within the center of expertise 2.2 and the follow-on activities that are being proposed here will also be part of the center of expertise.

If you=re proposing something to include manmade hazards in 2.2 that can --

CHAIRMAN STETKAR: No, no, I don=t care about people holding things for NTTF recommendations, or rulemaking, or guidance. I don=t care about that for the moment.

I care about carrying forward information regarding the risk to nuclear power plants from external hazards, whether they be natural, manmade, some amalgam of natural and manmade, or something.

So, for the future of the U.S. nuclear industry and the regulatory agency. I don=t care about NTTF recommendation 2 point whatever the heck it is. That=s -- I understand what was in the recommendation. I understand how people are

responding to that.

For example, suppose that we over the course of the years because of increased -- I don=t want to point at any particular industry, but I will -- increased air traffic, or increased air traffic density of specific types of aircraft learn that the crash frequencies from aircraft are much higher, or there=s a greater disparity among different types of aircraft in terms of crash frequencies rather than just a single frequency for a commercial aircraft falling out of the sky regardless of what it is.

That to me would be useful information to look at in the sense of do we adequately understand the risk to nuclear power plants from the perspective of aircraft crash frequencies.

This is just accidents, not intentional events, obviously.

MR. CAMPBELL: Right.

CHAIRMAN STETKAR: And that perhaps one should check in on that periodically to see whether or not our current state of knowledge regarding that particular hazard remains as it has traditionally been with the crash frequencies of 10 to the -10 per flight mile I think it is that people have used for a generic

commercial aircraft.

MR. CAMPBELL: And does it make a significant difference in terms of the safety of the plant.

CHAIRMAN STETKAR: And then if there is a change in information does that make a significant difference in terms of our state of knowledge regarding the risk to nuclear power plants.

Is that part of what you=ll be doing? Because I hear you saying, well, kind of, but then I hear others saying well, no, we=re not going to do that.

MR. SEBROSKY: So, this is Joe Sebrosky. Just to make sure we=re all on the same page I understand going forward, the concern is going forward.

CHAIRMAN STETKAR: Exactly.

MR. SEBROSKY: I understand that. So, I just want to make sure that I get one piece of information across.

When we looked at other natural hazards, and this is documented in SECY-16-0074 which we=re going to talk about shortly, there is a discussion in that SECY paper about manmade hazards. And it=s in

Appendix A.

And what happened is we said -- and this is a one-time assessment -- we looked at manmade hazards, we evaluated in the generic issues program, and as a result of that evaluation determined that manmade hazards did not reach the threshold of needing further regulatory action. That is a one-time assessment.

So that is why when you look at SECY-16-0074 and you look at this white paper, when it comes to evaluation of other natural hazards other than flooding and seismic, manmade hazards are not discussed.

So that is the starting point and the presumption for the SECY.

Now, I understand the issue that=s before us right now is going forward when you look at the process of continuous evaluation of hazards, whether that includes both natural and manmade.

But there was an assessment that is documented in Appendix A as SECY-16-0074.

CHAIRMAN STETKAR: And we understand that completely, and we at the subcommittee level raised questions about that. I don=t recall whether we wrote

it in a letter or not. I honestly don=t remember.

MEMBER BLEY: My memory was we did, but I don=t know for sure.

CHAIRMAN STETKAR: I don=t remember. Maybe Steve remembers.

MR. SCHULTZ: There was a comment made by the committee that manmade hazards ought to be incorporated at some time.

Not particularly in the 2.2 activity, but that it should not be forgotten.

CHAIRMAN STETKAR: I just couldn=t recall whether the committee spoke on it. I know we had some discussions at the subcommittee level.

MR. CAMPBELL: So, if I may interject, once we go through and describe the process with the flow chart and everything for how we=re going to do this for natural hazards I think you=ll see that there will be opportunities because we=re creating a knowledge base and we=re going to be periodically developing things that as other things evolve and change one could have a knowledge base about manmade hazards. None of this precludes that.

The initial focus as we talked about was on flooding and seismic. We incorporated other

natural hazards into that, into the 2.2 process, but there=s nothing about the process itself that we=re proposing that would preclude looking at as a separate area manmade hazards and having a database.

CHAIRMAN STETKAR: And I know you want to present the process, but having -- and I agree with you, there=s nothing fundamental about the process that applies to a restricted set of hazards. It=s a knowledge management type process.

I=ll just reiterate what I said earlier, that if it=s the intent of the staff that this center of excellence will be collecting information on manmade hazards, compiling it, examining it, in the same manner as laid out in the charts that you=re going to show us for other natural hazards I think it would benefit us and it might benefit external stakeholders to have that clarity in this white paper.

I simply say that the scope of that organization and the scope of this activity is -- includes the assessment of manmade hazards. Without being explicit about is it aircraft, or is it trains, or is it boats, or whatever.

That=s something you may need to work out among yourselves, but that was new information.

I personally would encourage that. Again, it=s a subcommittee meeting. This is only individual subcommittee members. Thank you.

MR. CAMPBELL: Okay, thank you.

MEMBER CORRADINI: Can I ask a question?

CHAIRMAN STETKAR: You may. Mike. Just make sure that you state your name, please.

MEMBER CORRADINI: Corradini, member of the committee.

So, I want to make sure that -- John kind of went on a bit, so I want to be clear.

So, the confirmation could include manmade hazards, but it=s just that in the writing of the document it doesn=t explicitly say that. Is that correct?

MR. CAMPBELL: That=s correct.

MEMBER CORRADINI: Okay. Then the second part of this was that the reason it=s not in 2.2 at this point is because you did an evaluation and you felt that it was fine as it is. For manmade hazards.

MR. SEBROSKY: So, the clarification on that is the evaluation that we did for the tier 2 activity on other hazards included manmade hazards. And there=s a one-time assessment on that that

indicates or dispositions manmade hazards as being resolved.

MEMBER CORRADINI: Okay, all right. That=s fine. Thank you.

Third question, just to get it done. You talk about this reorganization, but is there any substantive difference on what the people do? Or are you just putting them in different boxes?

In other words, if I am dealing with -- let=s just take John=s favorite, aircraft impact. Is there something substantively different that the staff is doing, or are they monitoring what they would always monitor, but now they=re part of a different organizational structure?

MR. CAMPBELL: The latter.

MEMBER CORRADINI: Okay. So, substantively they would be doing the same sort of analysis, the same sort of keeping up on the state of knowledge and trying to understand how things are going on, but substantively things don=t change as to level of expertise activities with those individuals.

MR. CAMPBELL: That=s correct.

MEMBER CORRADINI: Thank you. I=m done, thanks.

MR. CAMPBELL: So let me turn to page -- well, let me quickly say, so, the last bullet on page 8 there, we=re assessing the potential for new information on plants and defines issues requiring further action, does it go into the generic issues program, does it become part of a research activity, either a hazard-specific user needs to research from the center of expertise, or research programs.

And then finally, whether or not there=s a specific issue that=s come up at a particular plant, say a new fault is found that has some potential for impacting safety or needs to be analyzed.

So, those are the areas. So if we turn to page --

MEMBER SKILLMAN: Please hold that slide. I=m Dick Skillman. Let me ask this question.

The title of this presentation and of your slides includes the word Aperiodic.@ And that word is absent from the white paper, and it=s really absent from the SECY-16-0074.

The periodicity, the idea of a periodic review in my personal opinion was the keystone to this recommendation.

And I have sensed right from the beginning

an avoidance of wanting to do something periodically.

I will tell you from having spent many years at a plant some of the most valuable things that you do are done periodically. You take a hike, you take a look, you do an assessment, you do it on a schedule. You report it. You identify what it is, why you did it and what your results are.

But in none of this documentation is there even a hint at doing this on some frequency. Whether it=s once each 10 years, once each 20 years, once each 5 years.

Is there a reason? Now, all your titles are periodic, but there isn=t any periodicity identified in these white papers. How come?

MR. CAMPBELL: Many of the hazards evaluated, for example, there were eight flooding hazards and even the seismic hazards can=t be tied to a particular time schedule for evolution of knowledge about the area.

And part of the concern I think we have, and I think Aida could probably confirm that, is that if we tied ourselves to, say, a 10-year time frame some of the hazards might have evolved to the point where we maybe would have taken action earlier had we

known that there was a development in a particular area. Sea level rise due to global climate change.

It could be our understanding about how hurricanes or tornadoes actually behave as we develop more and more information about that.

All of those can=t necessarily be tied to a 10-year time frame. And so this is a more continuous look out into what other federal agencies are doing, what is going on in the scientific community, a research program that we=re developing.

So it looks as, if you will, the periodicity is a much shorter time frame than every 10 years because we were worried that something would fall through the cracks if you waited 10 years to do a reevaluation.

MEMBER SKILLMAN: Wait a minute, let me respond to Andy.

If I accept your thesis what initiates the effort by a professional individual to go and take a look?

Because if the status quo is well, we=ll find out in enough time, or gee whiz, there are other feedback mechanisms that will keep us informed as long as silence prevails there will probably be no action.

So what is it that causes an individual to say, by golly, I better go take a look? Or gee whiz, there=s new information, and I just happen to have tumbled to it even though it=s 18 years old.

What gets the process moving so there is accountability for new information?

MR. CAMPBELL: So why don=t I walk through the process and lay out what we=re proposing here to get to just that issue of how this is supposed to work so that we can say -- and it=s not a matter of tumbling to an issue. It=s really an intentional approach that will evaluate it. So let me walk through those.

MEMBER SKILLMAN: I interrupted Joe and Joe had something to say.

MR. SEBROSKY: The only thing I wanted to add is there=s a simple reason why it says periodic confirmation of natural hazards.

And the reason it says that is because that=s what NTTF recommendation 2.2 was. And it=s described in enclosure 2 of the white paper in the background section.

And what it says is recommendation 2.2 recommended the NRC initiate a rulemaking to require

licensees to confirm seismic and flooding hazards every 10 years. So that was the recommendation. Periodic. Every 10 years. Rulemaking.

What is described in the enclosure is the response to that is we don=t believe there=s a basis for a rulemaking.

The process to address the underlying recommendation that=s titled periodic recommendation is a continuous process that is outlined in the paper.

So the paper describes the background, what the original NTTF recommendation was, and how we=re responding to it. And that is the development of the process that Andy=s talking about. That=s where the title periodic came from.

MEMBER SKILLMAN: I understood where the title came from, but Andy, I=m interested in hearing how this process will flesh this out.

MR. CAMPBELL: Okay.

MEMBER RAY: Before you do that there=s still another question I=d like to ask.

What does any of this have to do, or what effect do you think it will have on the obligation of the licensee to identify things which traditionally have been outside their licensing basis?

MR. CAMPBELL: This is primarily focused on how we=re going to go about doing that.

Of course the licensees do have to identify if new information becomes available that impacts the safety of the plant.

And then a determination would have to be made whether it=s outside the licensing basis.

MEMBER RAY: Well, I understand there=s not an explicit relief of licensees= obligation, but do you not -- does the agency have any view as to how this new emphasis, whatever you want to call it, what effect that will have on the licensees duty and obligation?

MR. CAMPBELL: Well, primarily this approach will leverage the existing processes that are already there, the generic issues program, or research program, a variety of other areas.

And a determination will be made as we evaluate new information. And it will be probably best to actually walk through this process, and then come back to the specifics that you=re raising about, well, how are we going to determine whether or not it should impact what should be done.

We do that already with the generic issues

program, for example, make a determination.

MEMBER RAY: Well, all right. I don=t think we=re getting to what I=m trying to identify, but I don=t want to take any more time now.

The issue of it being periodic would obviously stimulate the licensees to be doing things in anticipation of this periodic event.

The fact that instead the agency is doing something on a continuous basis with no specific milestones in the future it seems to me as a long-term licensee I would say, well, I didn=t receive a call today, there must not be anything going on and leave it at that. So, all right.

CHAIRMAN STETKAR: Andy and Joe, I know you want to get into the process, but I think we=ve all read the process.

I=d like to follow up on Dick=s comment that there=s nothing in here that to me responds to the NTTF=s concern about taking a periodic look at stuff.

And I understand your arguments. It=s continuing evolving. It=s a knowledge management process. Why, why, since you=ve established this center of expertise doesn=t the guidance or the

suggestion, the white paper simply say that every 10 years that center of expertise will produce a white paper. Here is the NRC=s current snapshot of the whole spectrum of external hazards. Manmade, whatever.

That in my experience has been very, very useful for people because it kind of focuses attention. Things that have subtly changed that people don=t realize necessarily have crept up on them.

If they decide that, oh, today I have to write a paragraph about my area of expertise I get to think about that a little bit more carefully than perhaps I have over the last decade.

So why isn=t there just something that says every 10 years the center of expertise will produce a report? To the Commission or to -- I don=t care who they produce it for, but will produce a report.

A snapshot at that point in time. Maybe six years ago you identified something and made a determination that it didn=t rise to the level of a generic issue, or that perhaps one site might have been affected by it and you had some discussions with

them.

But at least it=s a periodic snapshot that says, look, this is what we=ve done, and this is our current state of knowledge. Ten years from now there will be another one. Here=s our current state of knowledge.

MR. CAMPBELL: So, because, as I explained earlier, the perception or the concept here is that some of these hazards are evolving on a faster time scale than that we felt this would be the appropriate process and still do feel it would be the right way to update things as needed.

CHAIRMAN STETKAR: And again, I have no argument with that process at all. No argument with that process at all.

Every 10 years take an across the board look at all of those hazards that you=ve been looking at and say at this point in time here=s our snapshot look at everything across the board.

MR. FRANOVICH: If I can add, this is Mike Franovich. What I think I=m hearing is you=re suggesting something that=s supplemental to the process, not for the process that=s outlined in the paper.

CHAIRMAN STETKAR: The process looks fine. It=s just that there=s no accountability. There=s no periodic accountability to the process.

You claim that there=s periodic accountability because it=s an ongoing process. My claim is the agency has claimed that they=ve been doing this for the last 40 years and it hasn=t worked all that well in some areas.

Do you want to discuss those areas? I can discuss those areas, but there are subtle changes that have happened that are always low priority and it just hasn=t worked all that well.

And without the forcing function of having somebody sit down and say today here is my snapshot in my area of expertise it=s still going to work equally well.

MR. CAMPBELL: So, the process itself is supplemental to and in addition to the existing processes. It=s not a status quo approach.

I understand what you=re saying so what we have proposed to do is to develop an evaluation process that is continuously updating what we know about plants.

First of all, it would be to develop -- if

I can have the next slide, Joe, I can actually start walking through it.

CHAIRMAN STETKAR: And we do have to be a bit cognizant about time.

MR. CAMPBELL: I mean, I understand what=s being said here, but -- so for knowledge base activities we=re going to have a series of near-term activities to gather and preserve relevant materials that have been submitted by licensees or developed as part of the 2.1 activities and new reactor licensing reviews.

So we develop a database for each of these hazards. And that would be both hazard-specific and, as appropriate, site-specific. You know, where sea level rise might be an issue for coastal plants it wouldn=t be for the other plants, and so on.

Under the probabilistic flood hazard research plan Research is building a digital tool for organizing flood-specific information.

And it=s envisioned that this digital tool can be expanded to include information related to a range of external hazards.

So, again, this gets to the question about the manmade hazards versus natural hazards. Once you

have a tool for gathering knowledge, have it in a knowledge database, and a way of pulling out is there a significant difference in terms of hazard to the plant this tool can encompass some of these various hazards.

So, and then the technical engagement and coordination part of it involves interactions with internal and external partners, federal agencies, industry, international counterparts as well as academia and other technical and scientific organizations.

Examples of ongoing research coordination activities, there=s work that=s ongoing with NIST in terms of tornado winds, and agreements with other federal agencies similar to MOUs just signed for environmental models.

So, it is an active engagement in a continuous fashion as opposed to every 10 years you step back and say we need to reevaluate.

MEMBER BLEY: Let me ask a little something about that. And I haven=t studied your document well enough yet.

I don=t see anything in this picture of the process.

What I see here is new things come in. You have a process that will let you take a look and say this one we ought to do something with.

Is there anything here or in your vision that looks at the things that have been sitting there awhile, or maybe are being repeated and showing up again that forces you to sort of elevate them?

This hasn=t been resolved for a very long time, and let=s either get rid of it or resolve it kind of thing. Do you get what I=m asking?

MR. CAMPBELL: Yes.

MEMBER BLEY: Is that part of the process? And if so, I=m not sure where it is. It doesn=t quite fit on the picture here.

MR. CAMPBELL: So, you=re developing a knowledge base from licensing actions, from activities that the agency has done to review licensing actions, from the research program, from a wide range of areas.

And if there=s something that=s been perking out there and we essentially come across information that says, you know, we really need to take a look at this because it could be significant since we know what the licensing basis of the plants are because we=ve established that part of our

activities.

If it exceeds, you know, rises to a level of significance that it could impact the licensing basis of the plant then we would take a look at it as part of this process.

MEMBER BLEY: I guess staring at the picture the place it would pop up. If you keep going to the knowledge base more and more things will fit in there.

But this information aggregation, that=s either a person, or that=s some kind of a computer program that=s looking at things that kind of --

MR. CAMPBELL: It=s both.

MEMBER BLEY: -- looks for this sort of thing.

I guess that=s not something that=s well defined yet, or is it?

MR. CAMPBELL: Well, the paper itself defines this in more detail than I=m presenting here. But it is a process of looking at hazards, of comparing that to the database that you have about how the plants are -- what their licensing basis is, how they=ve responded to things, and then being able to assess is this a significant increase in the hazard

that we weren=t aware of, that=s crept up on us.

Or is this still within -- is the plant still able to handle it in terms of the impact of those changes.

So I would envision that that would be part of this process, to evaluate changes in the science and in the technology, and our understanding.

I mean, you could come across evidence that a certain fault near a particular plant may have moved more frequently, or have stronger ground motion than was originally intended. So you would take a look at it.

Could that challenge the plant safety systems. Could that challenge the design basis of the plant.

And if the review concludes it might then there would be a panel created to evaluate it and decide, okay, where does this belong. Is it affecting a lot of sites, which would be generic issues program, or is it a site-specific issue that needs to be dealt with in licensing space.

MEMBER BLEY: I guess we have to wait and see. In a way this is like a licensees= corrective action program some of which work really well and

other ones stuff hides in and eventually comes back and gets us one day.

And how that information aggregation and assessment of significant hazards, how that=s actually handled is kind of the key to how well it=s going to work.

MR. CAMPBELL: So let me talk about the assessment activities.

So, if new information is found to have a potentially meaningful effect on site hazards the issue will be referred for further action.

Potential regulatory referrals include transfer of an issue to the relevant program office for resolution such as a plant-specific regulatory action under LIC-104, or the reactor oversight process, transfer of the issue to the generic issues program, or identification of the need for further long-term research activities.

MEMBER BLEY: I=ll drop one more thing and I won=t come back to it again, but I do want to drop it in here.

What we often see in looking at programs here and elsewhere is when something occurs we look at that in isolation against some criteria that we decide

applies to it, and we don=t look more broadly.

And this idea of a knowledge base hints that we ought to be doing better than that. We ought to be looking to see this in the context of everything we=ve gathered in our knowledge base, does something crop up here looking more broadly at it.

And I hope that somehow is built in to the process when it=s working.

MR. CAMPBELL: That=s the intent of the process. I have to turn to Aida because she wants to say something.

MS. RIVERA: Yes. So the aggregation, that=s the intention of the aggregation. The aggregation is intended to take all the different type of changes that could have been included and see how that as a whole will have an impact into the site.

So it=s not intended to take only one piece of information and analyze them individually. The idea is to aggregate as we learn. Then as a whole what is the effect to the plant.

MR. SCHULTZ: It seems like as we=ve talked already, but just to summarize, it seems like what=s required is some type of forcing function to assure that that happens across the board.

And a periodic evaluation or assessment would be one type of forcing function that would cause that evaluation to occur. Again, across the board.

Absent that you really need to develop a fairly detailed process that you can assure will identify when in fact there is an issue that needs appropriate attention.

Otherwise the appropriate attention will be given to those things where individuals or groups shout the loudest. And other things that could be important will not get the attention they deserve, even though things might be developing in the background they won=t be identified until they get its proper voice.

So you need to find that forcing function that=s going to make that evaluation occur at the right time.

MS. RIVERA: Yes, and we acknowledge that. And our intention is to follow up after the SECY paper to institute more procedures in place, and make it more durable for the rest of the staff to continue this process and detail some of those areas and when things need to be happening.

So there is more detailed procedures to

follow after this.

MR. SEBROSKY: So this is Joe Sebrosky again. And Aida, I just -- I=m going to say something. I want to make sure that I don=t mischaracterize it.

We had a public meeting on this topic. The white paper was available. We had a public meeting on September 28.

And during that discussion this block here where it talks about the potential significant effect on site safety, both industry and members of the public were particularly interested in this block.

And they understand if you get it into any of these processes here that they will know that it=s in that process.

The question that was asked is if the answer is no, and the examples of what=s in this process are things like the research program or generic issue program. There=s mechanisms to inform all stakeholders that we=ve elevated an issue and placed it in this process.

The question that was asked by both industry and members of the public is if the answer is no, it talks about this knowledge base update and how

would they be aware of an issue being evaluated.

And that was an action that we took. Did I characterize that correctly?

MS. RIVERA: Yes, yes, you did. So, and the answer is we do have in the paper acknowledge that we will do periodic reporting of the work that the staff analyze and the outcome of those.

And what we talked about is we will make sure that those reports are made public so that the public can know what is the type of information that has been analyzed by the staff, and what was the outcome of each one of them.

And you can find that under section 4.3 of ongoing assessment activities. There is a paragraph in there that talks about that periodic reporting.

MEMBER REMPE: So, I don=t recall that particular paragraph and how often the periodic reporting will be done, but I know that this enclosure also talks about interactions between the staff and other agencies.

Could you comment about how often that reporting will be done, and how often the staff interacts with other agencies to collect their data? Because some of the agencies are international, some

are domestic.

MS. RIVERA: We haven=t decided yet as to how often those periodic reporting are going to come. We have talked about annual, biannual type of reporting. And so I would say at this point it=s between every year, every two years type of thing.

MEMBER REMPE: And the staff is in communication with other agencies at least once a year if not more frequently?

MS. RIVERA: Exactly. In specific situations. It depends on the topic and whatever activities are going on in those topics, yes.

MEMBER REMPE: Thank you.

MR. CAMPBELL: So, what this process is intended to do is to take a lot of existing, somewhat disconnected activities, ongoing interactions with other federal agencies, ongoing research projects and tie that all together to be able to basically triage and look at new information as it becomes available.

And so the process considers new information that affects potentially a single plant versus the GI program that looks at multiple plants. So that=s what we feel is an area of improvement.

We feel it=s a more structured approach

because it takes a variety of different sources of information and continues to update your database of knowledge, and it gets it out there to the public.

The evaluation process uses a structured team approach to determine if the aggregated information -- so we put together I believe the phrase, Aida, is a task group, or kind of a committee of people who are experts in a particular area to look at new information that has become available, make a determination whether or not that is a significant impact on plants.

Have I characterized that correctly, Aida?

MS. RIVERA: We will rely on our experts under the COE to determine and use their judgment when those information as they are involved in with the other organizations, and when it=s determined that we need to look into more detail to determine if there is significance on the effect of that information.

So it is our technical experts that are being engaged ongoing with those organizations, and then they will continue to do that as well.

CHAIRMAN STETKAR: Hold on, because I often get upset when I can=t find things.

You said in section 4.3 there=s some

mention of periodic reporting? I=m reading -- I=ve read that section now twice in realtime and I can=t find it.

MS. RIVERA: It=s the fifth paragraph under that section. And it starts with, AIf the significant assessment indicates that the new hazard information does not significantly.@

It goes on and says, AThese updates will include a short summary of the hazard information and the information used.@

So there is -- the staff will document the results of the assessments.

CHAIRMAN STETKAR: Yes. That says I have a file in my computer and I document the results and it stays there. It doesn=t say a periodic report to anybody.

MR. CAMPBELL: All it=s missing is the word Aperiodic.@

CHAIRMAN STETKAR: It doesn=t say an external report to anybody. It says I put something in my files documenting the fact that I didn=t think it was a problem. End of, you know.

MS. RIVERA: Yes, I agree with you.

CHAIRMAN STETKAR: Okay, thank you.

MS. RIVERA: As Joe mentioned before this was one of the comments we got from the public meeting that we had.

And since then -- this is a draft. We haven=t finalized it. And we have already made changes to make it more clear that it will be public, and that it will be periodically assessed.

CHAIRMAN STETKAR: But there too, and again, I don=t care how late we go. We=re going to run over today anyway.

Dr. Bley raised this notion that what we=ve tended to I think collectively as an agency in the past is something pops up, we look at it in isolation, we reach a conclusion regarding its significance. We write up that conclusion. We file it away.

Six years later something else pops up, maybe not the identical thing, somewhat similar, we do the same type of isolated evaluation. We document. We file it away.

We don=t recognize necessarily that there might be a trend because we do all of these -- and everything is documented, and everything is reported, but it=s reported in isolation.

Nobody steps back and says, hey, wait a minute, we=ve seen four of these things happen -- we=ve seen four 100-year floods in the last decade. Hmm. Ought that to raise an issue?

MS. RIVERA: Yes. And we agree with you that has been the term that we have seen in the past. And that the idea of this process is to correct for that.

And where we are aggregating all the information in one place. And then once the new information has been assessed it will be included with the other prior information. And so it will be analyzed all together at the same time.

MR. CAMPBELL: So, the intent, John, to this whole process is to avoid exactly what you=re characterizing that we=ve seen is issues can not necessarily be brought up in a systematic fashion, but the intent of this is to have this process in place that we=re systematically bringing up issues, looking at them, within our framework, assessing whether or not they impact either a specific plant, or multiple plants.

But also what does the trend look like. As you=re mentioning, is there a longer-term trend we

have to be worried about that we=re seeing accelerating, for example.

So those are all part of this assessment process that we=re thinking about.

What we didn=t want to do was say we have the answer, it=s every 10 years. Because we know some of these events or processes will have a greater frequency than that.

And we don=t want to wait 10 years to get a report out. What we want to do is, and maybe as Aida said we will incorporate -- we can incorporate and I think we will incorporate the suggestion we got from the public meeting.

So we understand exactly what some of your concerns are. That=s what this process is intended to address. We=ll evolve it as necessary to address those concerns.

So, I think those were the main areas that I wanted to cover. I think in terms of what our final slide is -- and first of all, you=ll have opportunity for more questions. Are there other questions at this point in time that you think we need to address?

Okay. So, we feel that this complements the existing processes for evaluating new information.

We think we=re going to leverage existing agency capabilities to the extent possible.

We=re going to have a proactive, predictable and stable process for evaluating new information. And before we go out to the licensees we want to know what=s going on in the particular field that may or may not impact their licensing basis of the safety of the plant.

And so with that I=ll turn it back to Mike.

MR. FRANOVICH: Next Steve Lavie=s up.

MR. CAMPBELL: We=re waiting for Steve=s slides.

MR. LAVIE: Good afternoon. My name is Steve Lavie. I=m a senior emergency preparedness specialist in the Office of Nuclear Security and Incident Response.

In this brief time this afternoon I=m going to discuss the staff action on the NTTF 11.3 recommendation regarding assessment of realtime radiation monitoring.

This was the recommendation. They asked us to study the efficacy of realtime radiation monitoring onsite and within the emergency planning

zones, including consideration of alternating current independence and realtime availability on the internet.

In the paper and in the slides I=m going to use an acronym to refer to these monitors which is FSEM, fixed station environmental monitors.

In starting this study we focused on a large number of areas. We already knew and understood that around the time of the TMI accident the agency had actually required these monitors, and then three years retracted the recommendation.

So we needed to dig through all of that material to find out if they documented why they made the decision.

So we first looked at the currently available post-accident radiological monitoring capabilities. What=s built into the plant, what they have on portable instruments, whatever is available. We wanted to understand that up front.

Do we need to add additional monitors? That was our focus.

We did a general regulatory overview on relevant emergency planning regulations. Once again to try to figure out why the staff back in 1980 may

have required these.

We then weaved through the entire history of the TMI documents, the various letters, the various NUREGs, and on, and on, and on, to see if we could find any wisdom on why the staff decided initially to put them in, and then decided not to.

When the staff published this requirement, and I=m going to use the word Arequirement@ because at the time of TMI reg guides were being issued for interim use and comment. And they were treated as requirements. That got fixed a few years later.

They published Revision 2 to the Reg Guide 1.97 Accident Monitoring in which they required these monitors.

However, when they published that they noted that they weren=t ready to enforce it. Because they had started to get some information that kind of questioned how reliable these instruments would be.

In that regard they contracted with Exelon Nuclear to do an evaluation in 1982.

We read through that assessment that was done then to see whether or not there was data in it that was no longer valid, and whether or not their decision still beared fruit.

It obviously beared fruit because in 1983 the staff issued Regulatory Guide 197 Rev 3 and they omitted the requirement.

We then went to look at a very limited sampling of the installations where these monitors are in place in the United States.

We were aware, for instance, that the Illinois Department of Nuclear Safety had put in 16 of these monitors around 11 plants in their jurisdiction.

We also understood that New Jersey Department of Environmental Resources had put monitors around Salem, Hope Creek and Oyster Creek.

We found some other information in nuclear journals that discussed additional systems.

So we looked at these sampling systems to get a feel from the people who were actually maintaining these systems of what was involved.

And one of the big questions we wanted to hear their answer on is do they release this information to the public.

We found out that none of them wanted to release the data to the public. They all had concerns that data might get misused.

In an article the director of emergency

planning at Indian Point made the comment, ADo people understand that every time it rains these monitors spike?@ What does that mean to somebody that=s looking at the dose rate on the bank building?

So none of the people we talked to recommended making this stuff publicly available. Even the Environmental Protection Agency=s system, RadNet, they hold the data for three days before they release it.

We had a look at the system in Japan. Since the recommendation came out of the Fukushima event was there some wisdom we could get from the system they had in Japan.

We didn=t find a whole lot of information there other than the combination of the loss of offsite power and the tsunami pretty much took care of the fixed environmental monitors.

We then looked at -- because the whole focus of emergency planning is our ability to make protective action recommendations to the public through the states we wanted to see how we do that.

Do we wait on a rad monitoring rating? And the answer to that is no. The guidance we=ve given our licensees is to base it on a plant

condition. Don=t wait for the release to start. This monitor is useless until the release starts.

That was a particularly interesting piece of information.

And we also looked at the action recommendations in Japan. And at the time of the accident the Japanese government was relying on dose rate to issue the recommendations for evacuation.

In 2013 the Japanese government changed and they=re using a system very similar to what we do in the United States. Plant condition first.

Now, based on all this data we collected and read we came up with some conclusions. We determined that the existing means of monitoring and assessment are adequate to support the protective action recommendations. What we have is adequate.

We determined from reading the various reports that the fixed station environmental monitors are unable to provide reliable indications of the dose under all conditions. And I=ll show you in the next slide what we mean by that.

MEMBER BLEY: Quick question. Some of these are pretty old systems? Others are fairly new? What kind of technology are we looking at?

MR. LAVIE: There=s one major manufacturer who is Reuter-Stokes. They=ve been making them for years.

Over time they have improved their models, but they=re still pressurized ion chamber instruments that are mounted on a pole somewhere out in the environment with an instrumentation box to process --

MEMBER BLEY: Basically the same technology.

MR. LAVIE: Same technology.

MEMBER BLEY: Except I noted in the white paper that that 1982 study that was cited here apparently for a 16-station system the authors estimated a range of $670,000 to $1.62 million in cost.

Apparently for some reason the State of Illinois can do it for $20,000 per station which is -- that=s apparently current cost for solar powered installed battery backup radio -- I=ve forgotten what they used for communication.

It is the state. On the other hand, perhaps there are economies of scale in terms of cost with new systems.

MR. LAVIE: They put in 11 sites, 16

monitors each. And they did the work with state employees. So they weren=t going out for a contract to get someone to put them in.

And as a result, and they=re using state employees to maintain them. So they=re not building up contract costs.

They also, being the state, they also didn=t have a real problem with getting access to the site they wanted to put them. Licensees would have to negotiate with private landowners to get that.

So that was a true statement. And it=s still true today.

Okay. One of the big conclusions is making the FSEM data public would not enhance the ability of the public officials to implement effective public protective actions.

And in fact, they could be counterproductive by increasing the amount of shadow evacuation, people who just up and leave, blocking road networks and so forth.

As I pointed out already the licensee, state and local officials maintaining the existing systems at a total of 10 sites. None makes the data publicly available in a realtime basis.

The big conclusion for us was the absence of the FSEMs would not preclude the issuance of protective action recommendations since in the United States our initial powers are based on plant condition rather than radiological assessments.

With that we come to the overriding conclusion that there=s no substantial increase in the protection of public health by requiring the monitors.

Those are important words because they factor into the backfit analysis. If there=s no improvement in increase in public health you don=t do it.

The last slide, this is a graphical representation to try to explain why the conclusion was that these were not 100 percent reliable.

I=ve taken at stability. This is nighttime. The atmosphere. It=s one of the more limiting conditions to use, the least detection. In other words false negatives is what I was trying to look for.

If you take the 16 sensors and spread them around a 1-mile radii they end up being 2,061 feet apart. Now, that=s assuming you actually got them all in a radii. In most sites you can=t always get them

on the radii. You have things like rivers, or swamps. The big thing at Salem and Hope Creek, most of their site is a swamp.

Now, the plume, given that stability and normal dispersion the meteorological books talk about plume width as the distance at which the dose rate has dropped to 10 percent of its centerline value.

So, you look at the plot I have here and what we=re saying is that only 10 percent of the centerline value would occur at the outer edge of that plume.

The two adjacent monitors would see a much reduced reading. They certainly wouldn=t see the centerline value.

Now, for A stability which is bright Sundays, accidents never seem to happen in the middle of the day. They typically happen in the mid-shift. Is that if it was A stability you=re in a better situation because the plume width would be 3,800 feet and would include two sensors.

The other factor in this is that a lot of our plants are boiling water reactors with high stacks, and it=s highly likely at 1-mile radius out from the plant this plume will still be overhead and

the monitor still not seeing the true reading.

So that=s what the authors of that previous report and what we mean by they=re not reliable in all cases.

Okay, that concludes what I wanted to say. If there are any questions I=ll be happy to field them. If not, thank you, and I send it back to Joe.

MEMBER KIRCHNER: May I ask a question? So, let me take your conclusion and -- it. Do you see any value in having these environmental monitors?

MR. LAVIE: There is a small value. Well, there is a value. And the State of Illinois for instance obviously decided since they put in so many of them.

And they tell me that they like them because if the plume does go over the monitor they have an immediate indication.

And that may be useful to them. But in the case of the plant, the plant isn=t waiting for that monitor to read before they make a protective action recommendation. They=re going to base it on plant conditions.

MEMBER BLEY: And the emergency plans have portable monitors out there probably.

MR. LAVIE: Oh yes. And that takes care of the ac independence. The plants have large numbers of portable -- as a previous health physicist at a plant we have a lot of monitors.

And in addition to the monitors the radiation technicians use for personal monitoring and so forth they have monitors designated specifically for the emergency plant.

CHAIRMAN STETKAR: We=re going to hear about high winds and snow loads here, so apparently we=re changing bases.

MR. SEBROSKY: So my name is Joe Sebrosky. I=ll be doing the presentation just at a high level.

And Mo Shams who is my boss=s boss is going to be joining me. Mo was involved with this evaluation of high winds and snow loads. He has a doctorate in structural -- in civil engineering, and he was the lead manager that was placed on this activity, and assembled a team of structural engineers to help us do this assessment.

So, just at a high level, before we get into the discussion and the slides I wanted to place in context what this activity is and why we=re doing it.

What this activity is is an evaluation of natural hazards other than flooding and seismic, and make a determination on whether or not we need to take additional regulatory actions.

So, what you=ll see when we discuss this in the slides is the genesis of this recommendation comes from two places. It comes from an ACRS recommendation in the aftermath of Fukushima, and it comes from a congressional appropriations act.

Both the ACRS and the congressional appropriations act had the staff review the current operating fleet against current guidance to determine whether or not based on that review if we had a basis for additional regulatory action.

And there was a recognition from both the ACRS and from the appropriations act that when the operating fleet was licensed back in the sixties, seventies and eighties the majority of them, the guidance in this area has changed in some cases.

So fundamentally what we did that=s described and we=ll walk through this, fundamentally what we did is we asked ourselves the question is there a new hazard. Has the hazard changed? Or is there new guidance in a particular area?

And for high winds and snow loads the reason we did the detailed review of this is because there was a new guidance that was promulgated since the majority of the current operating fleet was licensed.

One of the other things I wanted to mention is there=s multiple staff members out in the audience that reflects that this was a team effort. We had folks from the New Reactor Office, the Division of Site Safety and Environmental Assessment which is Andy=s group.

They were responsible for providing us information on whether or not a hazard has changed, or also alternatively if there=s new guidance for a particular hazard that was recently promulgated.

We also had risk folks in NRR and Research help us with this activity, and other folks within NRR including structural engineers within NRR help us do the review.

So with that as background go to the next slide.

So, you heard Mike Franovich talk about tier 2 and tier 3 activities. This SECY paper 15-0137 provided a process and recommendation for the open

Fukushima tier 2 and tier 3 recommendations.

And we discussed this paper with the ACRS. It was issued last year. There was a section on natural hazards other than seismic and flooding.

It was binned as a group 3 activity. And what you see in the sub-bullet here is what a group 3 activity means.

And what a group 3 activity is, which are the three activities we=re talking about today, is we inform the Commission that a more detailed assessment needed to be performed, or justification for resolution needed to be prepared. And we also needed to talk to the ACRS about that.

So, what we said in the SECY last year is we would complete the work in 2016.

The Commission wrote a staff requirements memorandum on the SECY paper. They directed us -- they agreed with the staff=s recommendation and closed the group 1 items.

They directed us to provide an assessment on what we identified as group 2 items, and directed us to provide the results of that assessment by the end of March 2016.

And again, the group 2 items were

activities that we discussed with the ACRS. And just as a refresher this was upgrades to instrumentation to address severe accident events for designs other than Mark 1 and Mark 2, and hydrogen control measures.

So we did that. Again, we talked to the ACRS about that and we issued that SECY paper in March of 2016.

When it comes to the group 3 items the Commission did give us specific direction on one of them, and that was the other natural hazards.

We identified a four-step process. And the Commission directed that we provide them with the results through step 2 by the beginning of summer of this year. And that=s what we did which is the next slide.

So, the next slide is a discussion of SECY-16-0074. Again, we talked to the ACRS about this before the next SECY was issued.

And it provided the staff=s assessment through task 2 for hazards other than seismic and flooding.

I note in a sub-bullet that we engaged both this subcommittee and also the full committee. There was a May 17, 2016 letter that the full

committee issued which we=re going to be talking about later in this session on task 1 and task 2 activities.

But for the purposes of the SECY what we outlined in the paper was a four-step process. And that four-step process is synonymous with the four tasks.

The first task was identify and define the natural hazards other than seismic and flooding.

The second task was determine if you need to do a more detailed review.

And then the third task is perform a technical evaluation and determine if additional regulatory action is necessary as part of task 4 based on the results of task 3.

So again, the SECY-16-0074 provided the results through task 2. And the bottom line in the SECY was it screened out natural hazards other than high winds and snow loads. So that=s why we=re here today.

The first bullet on this slide is a repeat of the last bullet on the previous slide. So the white paper that=s been discussed included as part of enclosure 1 the evaluation of natural hazards for high winds and snow loads in accordance with task 3 of the

process outlined in both SECY-15-0137 and SECY-16-0074.

So, for high winds, we=ll talk about high winds first and then we=ll go to snow loads. What was identified in the SECY and is repeated in the white paper is there=s a new guidance that was issued subsequent to the majority of the current operating fleet being licensed in two areas - one in the wind area, in the tornado area, and one in the hurricane.

So, when you look at Reg Guide 1.76 Rev 1 it was issued in the mid-2000 time frame. The tornado wind speeds generally went down from the previous version, but there is a different missile spectrum from the 1975 version of the standard review plan that was used for the majority of the plants that are currently operating.

And the automobile missile speed for the same weight automobile went up in some areas. And we=ll talk about that in a little bit.

For Reg Guide 1.221 for hurricanes this is a new regulatory guide. There was not a previously issued regulatory guide for hurricanes.

The basis for that is if -- the thought was that if a plant was licensed to the regulatory

guide for tornadoes the hurricane would be bounded by the tornado guidance.

That was revisited when Reg Guide 1.76 Rev 1 was promulgated. The thought was that -- to challenge that presumption in that missiles, because they are in a hurricane wind field for a longer period of time they have a better chance to come up to the maximum speed of the hurricane.

So, Reg Guide 1.22 was promulgated. The hurricane wind speeds are generally bounded by the tornado wind speeds for a given site if you compare Reg Guide 1.221 to the Reg Guide 1.76 Rev 1.

The hurricane missile speeds are higher than the comparable tornadoes for sites susceptible to hurricanes. And we=ll see that in the next graph, the Florida sites, St. Lucie and Turkey Point. If you look at the wind speeds they are higher for the hurricane than they are for the tornado.

And the sub-bullet, the next sub-bullet is what I already said, that the reason this reg guide was promulgated is because the missile spends a longer time in the wind field.

What we looked at is we looked at the two generation of plants. There=s the plants that were

evaluated to pre-general design criteria, and then there were plants that were evaluated against the 1975 version of the standard review plan.

We also considered a recently promulgated regulatory issues summary on tornadoes. It=s RIS 2015-06 and the associated enforcement guidance.

The reason that this RIS was promulgated and the reason that the enforcement guidance memorandum was promulgated is discussed in the RIS, but essentially what it boils down to is the staff was finding -- inspectors were finding multiple instances where key components weren=t protected, like a diesel generator or exhaust stack.

There=s a fundamental presumption that the diesel generator is safety-related. Because the diesel generator is safety-related in accordance with the general design criteria it=s protected against tornado missiles.

And what inspectors were finding is the exhaust from the diesel was not protected by concrete. And the presumption was that your design basis requires that the diesel be operable in a tornado, including, for example, the exhaust stack.

The theory was that a missile could crush

the exhaust stack and choke the diesel, and the diesel would be inoperable.

There were multiple instances of problems with things like the diesel generator exhaust, a key power supply=s cabling going into servicewater structures that were not protected.

So, what this RIS did is it looked at those instances and it allows licensees if they find those instances to use this enforcement guidance memorandum and essentially they have to meet certain conditions, but it allows them to not call the diesel generator inoperable and get into a shutdown limiting condition for operation per their tech specs.

It has a limit of three years from the date of the EGM for plants that are in a high tornado susceptible areas, and five years for plants that are in areas that are less susceptible to tornadoes.

What the RIS concluded and what the EGM concluded is that the design basis requirements are generally conservative. The staff is using existing processes to ensure that licensees continue to meet the requirements in this area, their design basis.

And the EGM provides a basis, and it has the risk arguments in it that tornado missile

scenarios that lead to core damage are low probability events. That=s what leads to the conclusion that you have three years or five years.

CHAIRMAN STETKAR: Joe, before you switch to this slide which is we=re finally getting to the analysis, that RIS though is just simply enforcing compliance with the current licensing basis of the plant, right?

So, if my plant, I have a plant and I was licensed according to the 1975 guidance my nominal -- depending on whether I use spectrum A or spectrum B in that guidance because I had to go do this, my nominal automobile missile speed would be 68 miles an hour, 69, 68.2.

The concern today though is that if I use the 1981 version of the standard review plan my automobile missile speed might be 126 miles an hour.

But I didn=t do that because my licensing basis was 1975.

So I don=t understand the whole argument about the RIS and all that stuff because that=s just making sure that people are conforming to their existing licensing basis which may not be consistent with our current understanding of high winds. Is that

correct?

MR. SEBROSKY: The reason that it=s in there is to provide a baseline for what we were starting at, and a recognition that if we did not have the EGM -- it=s hard to craft an argument that you have a basis for a regulatory action that includes backfitting a plant if you=re allowing plants three to five years to address concerns with their current design basis.

That was just one -- it was meant to be one data point to set the stage for what the challenge was, is the next step is take the new guidance, apply it to the operating plants and see if you have a basis. But recognize where you=re starting from.

CHAIRMAN STETKAR: I=m going to have some closing comments about how the arguments are put together here, but I understand that piece.

MR. SHAMS: There was another insight that I would like to share.

So, the EGM was accompanied by a risk assessment that NRR has done. And in my personal judgment there was an important nugget in that risk assessment.

What the assessment concluded is in terms

of high wind the risk contributor, the significant risk contributor from a high wind to a plant=s EDF is actually the loss of offsite power. And that happens at the range of 75-80 mile per hour wind.

So, if one is thinking about an automobile missile in the range of 100 miles per hour, or 120 miles per hour which is really where the game is today. It used to be 60, now it=s 100 miles.

That type of missile and that type of speed, it comes with a hurricane that is not at 75 miles per hour, but rather it=s 200 and 300 miles per hour.

So it shifts the argument now in the area of low risk. And that study sort of provides the insight and the background for that thinking.

CHAIRMAN STETKAR: When do you want to have the discussion about the risk numbers that you have in this paper? Because I have real problems with your misuse of all of this stuff.

First of all, you rely very heavily on results from IPEEEs most of which did not evaluate high winds. A few of them did.

The few that did, one you cite identified an important contribution indeed from loss of offsite

power. Most of them did not evaluate high wind loading on structures because everybody knew that it wasn=t important.

Do you have any idea what sort of mission times were used in those risk assessments in terms of recovery of offsite power after a high wind rated event? Was it the nominal recovery of offsite power that was used in the station blackout rules? If it was, you don=t get it back under a high wind.

Was it a 24-hour diesel operating mission time that generated those risk numbers? If it is, maybe they have to run seven days like they had to do down at Turkey Point.

Some of the studies that you cite didn=t even quantify risk. They just said, well, it=s less than 10 to the -6 because we satisfy the criteria.

So I have a real problem with you referring to risk numbers because I=d like to see the basis for those risk numbers. The actual studies for the plant-specific analyses that you refer to.

MR. SHAMS: The one I=m referring to --

CHAIRMAN STETKAR: Did you look at them?

MR. SHAMS: I know the one you=re pointing to --

CHAIRMAN STETKAR: I=m pointing to several of them, actually.

MR. SHAMS: I follow. The one that I was pointing to is the one that staff has done, and based the EGM on. And we can get people here to talk about that.

(Simultaneous speaking)

MR. SHAMS: We can call folks.

CHAIRMAN STETKAR: That would be good.

MR. SHAMS: Okay.

CHAIRMAN STETKAR: Let=s continue. Let=s get to this neat little drawing here that is the next page.

MR. SEBROSKY: So, when we look at high winds there were three parts of the new guidance, both for tornadoes and hurricanes that we looked at.

One was the wind loading. Then we=ll be talking a little bit about the capability of missiles to penetrate structures that are meant to protect safety-related components.

And then lastly there=s an automobile missile that=s used in the new guidance to look at gross structural capabilities of walls that are used to protect safety-related components.

This slide was presented at the last meeting, and it is also -- we had outlined in SECY-16-0074 some of the considerations that we were going to use when we evaluated high winds. And this is one of the slides that was presented.

And simply what it does is we looked at the design basis for the current operating fleet. The majority of the current operating fleet has a 360 mile per hour high-wind wind loading from tornadoes.

It is based on a 300 mile per hour tornado going at a tangential speed of 60 miles per hour. So that=s how you get to 360 miles per hour.

Then you have other sites that are licensed to 300 miles per hour, and then sites less than that.

What this plot shows, the purple plot, I had indicated previously that in general the Reg Guide 1.76 Rev 1 the wind speeds went down based on the review of the data.

There are three -- you=re in either Region I, II, or III for the new reg guides so that=s why you see this data, this data and then these two sites are west coast sites. So you see three distinct regions. That=s what this plot is, and it=s for every nuclear

power plant with the exception of Nine Mile Point 1 and Indian Point 2 which are not plotted on this graph because they do not have a design basis wind speed in their FSAR.

The red plot is a plot of the Reg Guide 1.221 wind speeds from a wind loading perspective. And what I had previously said is in general the hurricane wind speeds are less than the tornado wind speeds.

There are two exceptions to the rule. This one and this one which are the Florida sites. But the hurricane wind speeds are less than the tornado design basis wind speeds.

What you see in the white paper is a discussion of four sites where we looked at the IPEEEs and looked at the design basis.

Here you see that this site is not bounded. You have data from a current reg guide for tornadoes that is higher than the design basis. This plant is Ginna.

There are two other sites that are mentioned in the paper. Those are Nine Mile Point 1 and Indian Point 2. We provide a rationale in the paper for those two sites on why we did not have a

basis for additional regulatory action. That=s based on the observations in the IPEEE and also looks at what is being done as part of the mitigating strategies order to address some of the higher sequence core damage frequency events that were in the IPEEE.

There is a fourth site that=s discussed that is Oyster Creek. What was plotted here was the safety-related structures for Oyster Creek.

And the issue is not every structure has the same value at that site for wind loading. So we had looked at the results of the IPEEE for Oyster Creek and that=s what=s discussed in the white paper.

CHAIRMAN STETKAR: Joe, keep that slide up there because I want to probe this stuff for a little bit. I=m sorry, I just -- it=s my personality.

So, I understand the four sites, Nine Mile Point 1, Oyster Creek, Indian Point 2 and Ginna.

And I understand the arguments for Nine Mile Point 1, and I understand the arguments for Oyster Creek. Regardless of what the pedigree of the IPEEEs are you based them on that.

For Indian Point 2 you essentially say, well, they had a pretty high high wind core damage

frequency, but they=re invoking FLEX. So FLEX is going to solve that problem.

MR. SEBROSKY: That=s not what I recall the argument being. What I recall the argument being is if you looked at the core damage frequency -- and I don=t remember the numbers off the top of my head.

CHAIRMAN STETKAR: I do.

MR. SEBROSKY: But it was in the 3E-5 range.

CHAIRMAN STETKAR: Right.

MR. SEBROSKY: And the issue, when you get at regulatory decisions on whether or not you have a basis for a backfit, if you=re in the E-5 range you have a difficult time meeting the criteria for additional regulatory action either through a 50.54(f) letter or through a backfit process.

So, what I recall the argument being is from the IPEEE the core damage frequency for tornadoes was in the 3E-5 range. The highest contributor was loss of offsite power which led to a reactor coolant pump seal LOCA.

And the argument is that sequence -- we did not do an analysis, but we believe that sequence would be lower because of the use of FLEX that

specifically addresses that scenario.

CHAIRMAN STETKAR: And I thought that=s what I just said.

If that=s the case, and this is going to come up again, what assurance do I have that indeed the FLEX equipment and its protection is indeed robust relative to the current wind speeds at Indian Point?

So, for example, if Indian Point was designed to 1975 guidance FLEX has to be robust relative to those wind speeds.

So what assurance does the staff have that indeed when FLEX is implemented we have reasonable assurance that it is so-called robust relative to the reevaluated wind hazard at Indian Point?

I=m going to get specific here. You=re making specific conclusions about specific sites. And you=ve got missiles, you=ve got wind loading and all kinds of stuff here.

So, how will you do that? Is the staff going to look specifically at the FLEX at Indian Point to make sure that indeed it is designed robust, both the storage, the equipment, the connection points, the transport routes, et cetera, so that it can withstand not the design, current design of the plant, but the

reevaluated hazard? As you are doing for seismic and flooding.

MR. SEBROSKY: So, the issue, before we get to the reevaluated hazard, there is no requirement for licensees currently on the books to reevaluate any natural hazard other than flooding and seismic.

And what we=re trying to determine is do we have a basis to issue a 50.54(f) letter to the fleet or to a unit.

And what we said is we looked at Indian Point and we determined based on the arguments that we don=t have a basis for a 50.54(f) letter.

That=s based on them implementing the guidance in NEI 12-06 that allows them to do one of two things - ensure that the FLEX will work in a tornado event and that the phase II equipment is stored in a robust building, or alternatively there is the allowance that they could have two sets of equipment physically separated such that it=s highly unlikely that both sets of equipment would be damaged by a tornado.

CHAIRMAN STETKAR: I don=t know which of the plants here on this plot is Indian Point and for the moment I don=t care.

MR. SEBROSKY: Indian Point 2 is not plotted --

CHAIRMAN STETKAR: Oh, that=s right, because it doesn=t have any design basis.

MR. SEBROSKY: That=s correct.

CHAIRMAN STETKAR: Okay. So, I=ll come back. I=ve read all of the guidance. The guidance is focused on seismic and flooding.

It says yes, when I consider transport of these things I have to consider the fact that a storm might be going on.

However, the guidance is all focused on the current design basis with the exception right now of the reevaluated seismic and flooding hazards which we=ve had discussions in other meetings on.

This particular issue that we=re discussing right at the moment says that, gee, if we evaluate wind hazards according to currently available guidance we see that the wind hazards at some sites in the past have been underevaluated compared to our current state of knowledge. Fine.

Indian Point didn=t have any design basis wind, I guess. And you=re making the argument, well, they did a quantitative analysis as part of their

IPEEE submittal that came up with a number. And it=s not a teeny tiny number. It=s a small number.

Then you=re making the argument, you said well furthermore, they=re installing FLEX, and it=s reasonable that FLEX can provide them mitigation benefits against a loss of offsite power, and perhaps station blackout caused by a high wind event.

And I understand that argument. But if the high wind event is substantially higher than their current design basis which is no design basis, then how do I have assurance that FLEX is going to survive in that event?

In other words if the event takes out the existing plant, why won=t it take out FLEX?

Unless you=re looking at FLEX at that particular site to make sure that it is robust relative to the currently evaluated wind hazard.

MEMBER BLEY: I thought I heard Joe say that was true.

CHAIRMAN STETKAR: Well, I didn=t hear Joe say that.

MEMBER BLEY: I thought I heard him say that.

MR. SHAMS: I hope he did not say that=s

true.

MR. SEBROSKY: I did not.

MR. SHAMS: That=s good. I=d like to offer that -- I hear Mr. Stetkar talking about guidance, and the guidance is only focused on flooding and seismic.

So, when we talk 12-06 which is the design approach, deployment, and so on, and so forth for FLEX there is more than flooding and seismic there.

There is other hazards that are pertinent to the site that includes wind, includes ice, includes thermal, you know, a broad spectrum of hazards.

CHAIRMAN STETKAR: And just for the record before you continue is the guidance in 12-06 focused on the current design basis value for each of those hazards?

MR. SHAMS: So, I=ll answer that way.

CHAIRMAN STETKAR: Is it?

MR. SHAMS: Well, it=s nuanced a little bit. And if you allow me to answer it I=ll explain.

So, the criteria for the design of the FLEX building which is essentially the entity that=s providing the protection for the equipment is such that you either store the equipment in one of three

configurations, one being a Cat 1 structure that=s designed for the current licensing basis, or a structure that=s designed for ASCE 7 type criteria. That=s a building code that=s used for the design of commercial structures.

My understanding of the way the guidance is constructed around wind is I believe NEI has wind maps that are of a recurrence period of around 10 to the -6. I believe that was the wind hazard that was used. So that is current and essentially substantially higher than what would -- if we take the original design and we look at that as being a low value this is current, essentially 10 to the -6 type wind.

So, I want to say it=s addressed. I want to say it=s addressed for wind at a significantly higher value than one would think.

CHAIRMAN STETKAR: I=ll have to go back. I didn=t remember those frequencies. I=ll have to go back and look at the high wind guidance.

MR. SHAMS: I=m a little light on the wind side, but I recall it was 10 to the -6, the wind speed that was associated with the design of FLEX.

CHAIRMAN STETKAR: I can=t read the

section of the report and kind of keep engaged here, so I=ll go back and look at that. Okay, that=s Indian Point.

Now, Ginna. I=m really puzzled about Ginna because Ginna, the argument seems to be that, and this is a quote, AThe last site, Ginna did not calculate a core damage frequency, instead noting that as part of the systematic evaluation program review it made several modifications to the plant to increase the protection from high winds.

ABased on walkdowns coupled with a review of the SEP results the licensee for Ginna concluded that the CDF was less than 1E-6.@

Maybe I would have concluded it=s less than 1E-30. What basis for Ginna=s risk being that small? Given the fact that its current design basis wind speed is about 135 miles per hour, and the reevaluated wind speed would be whatever that little purple line is there on this drawing.

Because they asserted that they did a walkdown and it=s less than 10 to the -6 core damage frequency, never having done a quantitative analysis at all.

MR. SEBROSKY: So, what you see in Ginna=s

licensing basis is they are a pre-GDC plant, pre general design criteria.

So, they were licensed prior to the 1975 version of the SRP being available.

In the early nineteen eighties there was a review that was done called the Systematic Evaluation Program that took a look at the plants that were licensed prior to the 1975 version of the SRP, including Ginna.

Ginna was backfit. There were key systems, structures and components that were upgraded to address tornado winds.

There was much discussion about what exactly needed to be done. There were walls that were made more robust, and walls that were installed to protect key system structures and components.

And there was discussion about what that design basis should be. And it=s documented in the FSAR that the utility and the staff at the time came up with a missile spectrum that is not 1975 based, it=s based on this 135 mile per hour.

It was a deterministic evaluation, and at the end of the day the staff determined that it met adequate protection after the backfit was implemented.

If you fast forward and look at the IPEEEs that were done in the late eighties and nineties the question was does that need to be revisited, and does -- the licensee could do one of two things.

They could either demonstrate that they were in compliance with the 1975 version of the SRP, either they were licensed to that, or they could do a risk assessment.

And what is discussed, good, bad, or indifferent in the IPEEE that the staff wrote a safety evaluation on is based on the unique licensing basis of Ginna and based on the tornado risk of the site at the time.

Again, when you look at these values for wind speeds they are based on 1E-7 events. So if we tried to backfit Ginna to a 1E-7 tornado we wouldn=t get past the first step.

What it identified is do we have an issue applying new guidance to an old plant, and the answer was yes.

So what we did is we looked at what was done previously for that site. And as you indicated we referenced what the licensee asserted in the IPEEE that we agreed to at the time in a safety evaluation

that we wrote that based on the winds at that site we concurred with the licensee=s qualitative, not quantitative, qualitative assertion that the risk at that site was less than 1E-6.

CHAIRMAN STETKAR: I=m sorry, as soon as you say 1E-6 to me that=s a quantitative, not a qualitative --

MR. SEBROSKY: What is allowed, if you look at the IPEEE if you met certain criteria the IPEEE had guidance associated with it that if you met certain conditions the staff -- and they were deterministic conditions that the staff essentially agreed that the core damage frequency would be less than 1E-6 at that site and not -- the staff would not have a basis for pursuing backfit at that site.

So there was guidance that was promulgated with the IPEEE that said if you met this certain deterministic criteria that the staff agreed that the risk at that site would be less than 1E-6.

And that is the criteria that Ginna applied at the time of the IPEEE. So, the systematic evaluation program, the results of that upgraded the capabilities of that site when it comes to tornado missile protection. That was revisited during the

IPEEE.

That=s what we referenced because there was not the design basis. Ginna is plotted here and that=s this unit here at the end.

So, again, going back to first principles the question that we=re trying to answer is applying new guidance to old plants, do we have a basis for a 50.54(f) letter or a backfit.

This slide is a continuation of the assessment that was performed. This slide introduces -- we talked in the previous slide about wind loading.

The next set of slides gets to missile impacts including the ability of a windborne missile to penetrate typically concrete at a site.

So, the hurricane and tornado missile spectrum, what=s discussed is how it was chosen. And they were chosen to look at three different things - assess the design of a safety-related structure, provide protection against a missile, assess the design to withstand impact loads. These are gross loads that would potentially cause failure of a wall, for example.

And then there is a small missile that was looked at to assess the capability to protect against

small windborne missiles. These are -- the structures that you=re worried about here are doors, ventilation louvers, that kind of thing.

So, the first thing that we looked at is the ability of windborne missiles to penetrate concrete. And our assessment that we=ll talk about here in the next slide is that the majority of sites had design basis missile characteristics that bound the missile characteristics found in the latest regulatory guide.

So this is a plot of all the sites, again with the exception of Nine Mile Point 1 and Indian Point 2 which did not have an FSAR-based missile. And it is a staff-calculated value.

What was done is we picked the limiting missile that is in the FSAR licensing basis and we calculated using formulas from current reg guides, the missile penetration depth capabilities that that particular missile would represent. That=s these green lines.

So this is what -- the green line is what the FSAR gives you.

Typically -- and you don=t see it in the new guidance, but what you saw in the previous

guidance was a telephone pole that is close to 2,000 pounds that was moving pretty quickly.

That=s not always the missile that=s used here. We use the most limiting missile that would give you the most impact, penetration capability.

But it=s mostly because of that telephone pole missile, or another rebar, those types of missiles. We took the limiting one that you see the green line is based on.

The rigid missile, there=s only one missile for penetration capability. It=s a pipe. We looked at each site and we calculated for that site what the depth of penetration from the rigid missile would be for either the tornado or the hurricane.

So, the missile speeds, I think I previously told you that the wind speeds at two sites, and they=re here. This blue dot here represents one of the Florida sites, and this blue dot here represents the other Florida site.

In general the hurricane wind speeds are bounded by the tornado wind speeds. This plot though took the limiting value of the rigid pipe missile speed. It wasn=t always from a tornado, and it wasn=t always for the Florida sites, it was the hurricane.

But in some cases even though the wind speed was less at a site for a tornado versus a hurricane the rigid pipe was moving quicker, again because of this philosophy that the pipe was in the wind field longer.

So the blue line represents a calculation of the rigid pipe, either from the hurricane or tornado, and its ability to penetrate concrete in inches.

And we had to use this comparison, or we developed this comparison because of the complex nature, trying to make a determination on -- trying to get it to an apples and apples comparison for lack of a better term.

You have, again, a telephone pole that is not represented in the new guidance. Telephone pole. The plant was designed against that telephone pole.

How do you compare the telephone pole to the rigid pipe? And what we determined the best way of doing that is try to come up with a calculation that would represent that, the capability of concrete in inches.

What this concludes, what we concluded from this graph is when it comes to missile protection

capabilities the majority of sites, the current FSAR design basis bounds what would be required, or what would be used if we were to apply the new regulatory guidance for rigid pipes from the hurricane or tornado guidance.

There are six sites where the green is below the blue, here, here, here, here, here and here. Again, this one all the way to the right is Ginna. These are the Florida sites, and then there=s other sites.

Six of the sites, the six sites with specificity are named in our evaluation, and we also looked at, again, Ginna and Indian Point 2 and Nine Mile Point 1 because they=re not plotted on this graph.

We=ve looked at the IPEEEs for those sites, and we concluded based on the IPEEEs that we did not have a basis for additional regulatory action for the eight sites.

CHAIRMAN STETKAR: Joe, you know, when I read -- first of all, let me make a general comment that I have a real difficult time following the staff=s arguments in this white paper. There=s we looked at this, we looked at that, we looked at this.

And I can cherrypick each one of the things that you say you looked at and have substantial questions about the technical basis for your conclusions. And yet you finally reach a conclusion that there=s no problem.

It=s not in my opinion a well structured analysis to draw the conclusion. There=s a lot of as I read it, and I tried to read it several times, disjoint sort of spot checks of things.

Now, in this plot in particular I thought it was kind of an innovative way of thinking about the problem of the pipe missile if you will.

It was my conclusion reading the white paper that for four of the six sites, in fact it says four of these six sites have a ratio of the calculated penetration depth -- I won=t quote it all -- that is within a factor of 1.5.

In other words, if you look at the comparison of the green and the blue dots for four of the sites they=re within a factor of 1.5 of one another.

If I look at, for example, the furthest one on the left I get kind of a 10 and a 15, or a 9 and a 14, or something like that in terms of depth.

It then says based on structural margins

associated with safety-related structures the staff believes it is unlikely that safety-related SSEs will fail at the higher velocities assumed for the schedule 40 pipe.

Basically the staff concludes that there=s at least 50 percent design margin in the as-built plant.

What=s the basis for that conclusion? That says nothing about IPEEE analyses which you just said orally. This is strictly based on some assertion about as-built structural margins compared to the current design basis wind speeds, missile speeds for those plants, whether it=s a telephone pole or whatever they did.

And I=m not a structural engineer, so that conclusion for those four plants for the pipe missile seem to be based on structural margin, not IPEEE numerical results. Was it?

MR. SHAMS: It was, yes. In fact, I should -- maybe we can fast forward and say that in the LCS talk in our discussion for the snow of a factor of 2, let alone just a factor of 1.5.

CHAIRMAN STETKAR: Same -- you might as well do it. Same comment.

MR. SHAMS: So, because we=re dealing with a beyond design basis event, so we=re sitting back and trying to assess what we know about structures and assemble all that to a concept of what kind of margin we=re dealing with.

So we=re looking at primarily people use linear analysis. That in and of itself ignores non-linearities of response and ability for loads to be distributed differently.

Models are generally fairly simplistic, and they=re done in a really discrete manner that does not recognize the ability of a load to be distributed from an area that actually reached its maximum load versus another area that did not. So that=s another inherent capacity in the structure.

Material properties. If we look at standards and codes we=re dealing with minimum material properties, and we can look at how codes specify concrete strengths, for instance.

You would expect to have a concrete delivered to the site that=s roughly 1,500 psi larger than one would specify it to be.

Age effects, you know, again looking at the concrete, age effects would be another factor that

one would expect. It=s a phenomena that=s known. That=s not just an expectation. It=s a phenomena that the strength of the concrete will grow over time by a factor of roughly 20 percent or so.

Same thing on the steel side. Again, one would specify a yield strength of a certain amount. So it=s these factors, the non-linearities, the ability for the load to redistribute the material properties and more, the simplification of the models.

It=s these factors that we believe would give us that margin that we=re asserting.

MR. SEBROSKY: And regarding the risk argument, if you look at the top of page 14 of enclosure 1 we did look at the IPEEEs for all eight sites.

CHAIRMAN STETKAR: Those did, but it=s not clear as you said earlier, I don=t believe that the IPEEEs evaluated explicitly damage due to missiles. So that this particular analysis and the snow and ice loading, and hurling an automobile at this thing.

I would like you to show me any IPEEE that looked at the risk from those events. Perhaps wind loading.

MR. SEBROSKY: That=s not what we did.

So, what we were looking at, when the IPEEEs were done, and perhaps the logic needs to be made more straightforward.

We were not trying to say that the IPEEE looked at missile penetration failures. If you look at the IPEEEs you do not see the risk coming from missile penetrations. You see loss of offsite power events.

CHAIRMAN STETKAR: Okay, let me interrupt you because we=re going to have to take a break soon here.

What you see is what they evaluated. You do not see anything that they did not evaluate. So you cannot see something in an IPEEE that was not evaluated. By definition it was zero because they didn=t look at it.

MEMBER BLEY: There=s even something else.

CHAIRMAN STETKAR: So, you can=t say well, we didn=t see anything coming from these things because you couldn=t, because nobody looked at it. They didn=t look for it, they didn=t look at it, anything.

MEMBER BLEY: I know of at least one case since I was involved in one where the PRA for a

licensee did look, and it=s included in the detailed PRA.

But when it came time for the submission for the IPEEE, and I won=t say which plant it is, lawyers convinced the management that if they included the full PRA they would be considered non-responsive to the IPEEE request.

So they put together a special report that only addressed the things that were required by the IPEEE.

So even if they did it, it might not have shown up.

CHAIRMAN STETKAR: That=s why, you know, this reliance on we have all of this information from the IPEEEs, in particular for winds that we=re talking about, snow and ice loading that we=re talking about, that might be supportive arguments, but I certainly -- if it were me I certainly wouldn=t be hanging my hat on that.

I=d be hanging my hat on perhaps other things with that as far background information.

So I got it. Thanks, Mo, for the qualitative arguments.

On this one in particular -- so we=ve got

four of them that you say, well, 50 percent margin.

Then in that same section, 2.1.4.2, you say for one of the sites, Turkey Point -- that must be not the four -- the CDF was calculated to be less than 1E-6 from tornadoes.

And then you go on to say tornado-induced failure of the condensate storage tanks, and the smokestack falling on it, and all those types of things, and the smokestack won=t be there, and the risk is small.

Well, that=s okay for tornadoes, but last I checked Turkey Point was dominated by hurricanes. So, why are you discussing tornado missiles at a site where the missiles may be dominated by hurricanes as your justification for Turkey Point?

MR. SEBROSKY: So, the design basis for Turkey Point when it was licensed, Reg Guide 1.221 did not exist on hurricanes.

And the fundamental presumption is if you designed it for tornadoes the hurricane missiles would be bounded.

So when the IPEEE was done it was done against high wind events. I=d have to go back and look at the IPEEE to see what the fundamental

presumptions were in that.

CHAIRMAN STETKAR: In some sense I don=t care what=s in the IPEEE. What I=m questioning about is the argument that the staff has built here for -- on a case-by-case basis for each site, whether it=s Ginna, whether it=s Turkey Point, whether it=s Indian Point, whatever you want to give a name because there are specific sites, the justification that you=ve quoted in this white paper for Turkey Point with respect to the pipe missiles explicitly refers to risk from tornadoes when we know that the hurricane wind speeds are driving that.

So, my question would be, well, if it=s less than 10 to the -6 from tornado missiles, or tornadoes, or whatever they evaluated, what is it from hurricanes? Because they didn=t evaluate that as best as I can tell. I don=t know whether they=ve evaluated it.

MR. SHAMS: So, in our study every site was looked at from a hurricane missile perspective as well. I just want to get that on the record and make sure that I stated that.

In terms of the section and the way it=s written, I believe what we=re trying to capture is

what was in the IPEEE and just quote the numbers in there, and make some sense of the insights they=re trying to reflect on.

So, a good bit of what we=ve done from the IPEEE is going back to appreciating that the risk associated with high wind starts with a loss of offsite power. And we believe that that is at a low wind speed that actually renders the risk from a missile to be a smaller contributor that it just, it doesn=t matter.

So that=s the point. The fact that a missile went from 80 miles an hour to 100 miles an hour, the contribution of that is much --

CHAIRMAN STETKAR: Suppose I told you that somebody once did a risk assessment for a plant not in the United States that identified the most important contribution from wind events to be winds that did not take out offsite power in the sense you=re thinking about offsite power, but ripped siding of the turbine building and shorted out all the transformers, leading to a non-recoverable loss of offsite power, and diesel generators then failing during operation. What would your response then be?

Because many plants may not have looked at

that in their IPEEEs because they just assumed that a plain vanilla if you will loss of offsite power was the most likely consequence from a high wind event.

And that=s -- see, that experience really flavors my personal -- I don=t want to say that the IPEEEs are not useful information at all with regards to high winds, snow and ice loading, and those things. I think that they do provide some insights.

But I think that heavy reliance on them and presumptions about what they included, and what they did not include is dangerous.

MR. SHAMS: And I don=t want to present that we=re heavily relying on them. Obviously for all the sites we=ve done the analysis and looked at their design basis and what they have.

But for the few that certainly it was challenging to understand their design basis. We had to look for other information that we needed to rely on.

But getting back to the example that you were providing, I would like to think that the tornado or the storm that actually ripped the siding off of the side of the building and caused loss of -- unrecoverable loss of power is one that=s 10 to the -

7, the one that the facility is not designed for from a wind perspective.

CHAIRMAN STETKAR: From the risk perspective it was not. It was a measurable contribution to the overall core damage frequency until they fixed the siding on the building.

Other plants that I=ve seen, these are primarily in Europe, where people tend to look at external hazards more comprehensively than we have in the past, have done things like building shields around their transformers specifically for this type of thing.

So it is what it is. But I would encourage you to rethink about the reliance on numerical results from IPEEEs to justify the overall conclusions here.

MR. SHAMS: We=ll take that. Thank you.

MR. SEBROSKY: In no case do we rely on that as the one criteria. In no case.

CHAIRMAN STETKAR: Are we going to switch gears and go to the automobiles?

MR. SEBROSKY: That=s the next slide.

CHAIRMAN STETKAR: Okay. Before we do that, it=s getting late here. Let=s take a break and

reconvene at 3:40.

(Whereupon, the above-entitled matter went off the record at 3:27 p.m. and resumed at 3:43 p.m.)

CHAIRMAN STETKAR: We=re back in session.

MR. SEBROSKY: So, we=re on slide 11. This is a continuing discussion of the high wind and snow load presentation.

And we left off at the -- ended with a discussion of missile penetration capability.

The next thing that we look at was the automobile impact loads from either a tornado or a hurricane.

There=s a slide that we=ll be getting to that will explain why we developed the deterministic evaluation that=s on this slide. And essentially what it boils down to is the automobile missile speeds in the current guidance for tornadoes and hurricanes are generally higher than that found in the current plan updated as FSARs, final safety analysis reports, for some sites.

And what you see in some cases is an automobile going twice or four times as fast based on new guidance compared to what is in the design basis.

And you double the speed on that

automobile. The energy goes up by a factor of four, one-half MP2.

So, what we were challenged is looking at the new guidance, applying it to the current operating fleet. Do we have a basis for additional regulatory action.

One of the things that we did was a deterministic calculation, and that=s represented on this slide. And we took a 12-inch, 18-inch and 24-inch thick concrete wall which are representative of the walls that you=ll find in nuclear power plants.

Twenty-four inch and higher are typically what you see around containments. Twelve inch are typically what you see around aux buildings, diesel generator buildings, servicewater structures.

And we looked at the new guidance. And because of the automobile going much higher we converted what a 12-inch representative wall, or an 18-inch, or 24-inch could take from a 4,000 pound automobile, and what it represents.

So, what you see on this slide is the calculation was done, automobile impact speed to exceed a ductility factor of 10. Mo can talk more to this than I can, but a calculation was done to say how

fast does the automobile have to go before you have a concern that the 12-inch wall will -- the impact loads are such a concern that you have concerns about the structural capability of the wall.

Using a ductility factor of 10, 12-inch wall, the automobile would have to be going greater than 110 miles per hour for 18-inch, 180 miles per hour for a 24-inch thick wall. It would have to be going greater than 240 miles per hour. And we=ll show this on a plot here in a little bit.

To exceed a ductility factor of 30 you see 200, 275, and 360 miles per hour for a 12-inch, 18-inch and 24-inch representative wall.

What we say in the paper is, and again, this is just one of the screening tools that was looked at to determine whether or not we had a basis for a regulatory action, that based on this calculation if you had a 12-inch representative wall it can withstand all of the 1E-7 tornado automobile missile speeds, and all of the 6E-4 hurricane driven automobile missile speeds. We=ll show this graphically in a graph that=s coming up.

MEMBER SKILLMAN: Joe, let me ask Mo this question. Mo, 12 inches concrete must be supported

from behind at least to some extent to be able to take the mv squared from a 4,000 pound vehicle at 110 miles an hour.

So what is the assumption that holds up the 12, 18 and 24 relative to back-spacing or membrane size?

MR. SHAMS: When we put together this example we tried to look for a standard spacing that we would see between columns and a standard height of a floor.

So, my recollection is I want to say 30 feet wide and 20 feet tall or so. Those are roughly the numbers that we used.

So again, we tried to just stay within what would be a common panel size in a nuclear plant.

MEMBER SKILLMAN: This is a somewhat empirical plug and chug based on this concrete, this tensile strength and this band per membrane?

MR. SHAMS: It would be just -- the equations that would be used here would be a thickness of the concrete membrane, where it would be supported. This would factor into the equation, and then from there provided mv squared one would come up with a ductility factor which would be the ratio of the onset

of yield to where would you expect this load to take that panel to.

MEMBER SKILLMAN: Thank you.

MR. SEBROSKY: And the next bullet down here is we also concluded that if you assume a ductility factor of 30, a 12-inch representative wall can withstand a 1E-7 hurricane driven automobile missile speeds.

CHAIRMAN STETKAR: I did read, and I recollect, I don=t have the quote right here though, that the American whatever it is, Society of Concrete people because I don=t do this sort of thing design standard says you don=t exceed a ductility of 10. Is that correct?

MR. SHAMS: Yes.

CHAIRMAN STETKAR: So this 30 is -- you wouldn=t expect anybody to design it.

MR. SHAMS: No. That=s a great point. So, the reason we put the 10 is because that would be the limit prescribed in a design code.

Because this is a discussion about a beyond design basis we=re trying to tap into what additional margin that=s available. So we looked around in the literature and we came across the 30 as

being a value.

It is not a code value, but it=s rather a value that would stretch the membrane further, but nonetheless would not yield.

CHAIRMAN STETKAR: Sure, but essentially my question is given normal construction practices would you expect any of the plants in the United States to have that type of ductility, or would they follow normal design and construction standards and have a ductility closer to 10?

MR. SHAMS: I would -- knowing the conservatism built in a design and the way we build a nuclear plant I would expect them to have margin that would take them all the way up to 30.

The reality is designs are conservative such that I don=t think they get to 10 to begin with. I think that the designer probably kept it to 3 or 4, and not even -- made it anywhere near the 10, the limit that the code allows it.

The way we build structures would probably take you to 30.

CHAIRMAN STETKAR: From what you just said though I think you want to say it in reverse. Because if it was 3 or 4 it strikes me that something like a

50 mile an hour automobile might go through it for if it were 12 inches.

MR. SHAMS: I think, well, maybe I wasn=t clear in the way I said it.

I want to say that if the speed of a missile at a site such that would require a design to be 18 inches, or let=s say 12 inches, and 12 inches would be equal to the 10, the ductility factor of 10, I=m pretty certain -- well, that=s maybe too much to say.

I would say the standard would be that the designer made it 18 inches. So, it actually would not be a 10, it would end up being less because they needed to do a 12, they made it an 18. They built margin in there.

CHAIRMAN STETKAR: They would have the ductility of 3, but they built it 18 inches thick.

MR. SHAMS: Correct.

CHAIRMAN STETKAR: Okay, I understand what you=re saying.

MR. SEBROSKY: So, the next slide is another consideration. It=s discussed in the paper and this goes back to a point that Mo made earlier in the presentation, that when we look at the tornado and

hurricane impact loads the guidance in Reg Guide 1.76 Rev 1 and 1.221 is based on 1E-7 tornadoes and hurricanes.

We believe that the dominant risk contributors to core damage frequency are not from a 1E-7 event, but rather the risk profile is driven by higher frequency events that lead to loss of offsite power and then random failures of key systems and components.

So, if we were to pursue a backfit it=s unlikely that we would backfit a plant and say you have to be designed to a 1E-7 tornado or hurricane. That=s the point that we=re trying to make here.

And I=ll bring this up when we talk about the next slide. What we ended up looking at because of concerns with automobile missile speeds at coastal sites that are significantly higher, some cases two to four times higher than what=s in the design basis, we reviewed the hurricane preparation procedures for four sites.

Those four sites are mentioned in the evaluation. The four sites are the two Florida sites which are Turkey Point, St. Lucie.

We also looked at Waterford and Brunswick.

And what we found when we looked at the procedures is in all cases procedures direct operators to shut down the plant prior to the receipt of hurricane force winds onsite.

They direct staff personnel to perform walkdowns to specifically look for and address potential hurricane-induced missiles. They=ll move automobiles away from key system structures and components.

If there=s any kind of scaffolding, or if they=re going into an outage where they have a lot of equipment lying around they will clean that out and move it away from the site.

And they also ensure emergency diesel generators have adequate fuel supplies and have been recently tested.

So, one of the things that is an additional criteria that we looked at for when it comes to hurricanes in the hurricane missile spectrum is the warning time that allows licensees to take actions prior to the receipt of hurricane force winds onsite.

We believe that that reduces the risk of core damage from these types of events.

MEMBER SKILLMAN: Joe, let me ask a curiosity question. I=ve got a colleague that I went to senior nuclear plant manager school with back a long time ago. He was plant manager at Brunswick.

At the onset approach of a hurricane the tech specs at Brunswick gave so many hours to a hot shutdown.

And the hurricane was moving so quickly the plant was not able to respond in the required tech spec time. They got a violation for that, by the way.

What consideration do you have for approach of high winds that are faster or different from your assumption?

MR. SEBROSKY: So, when we reviewed the procedures -- and I don=t know the time frame for the event that you=re talking about, if that was in the seventies, eighties.

MEMBER SKILLMAN: About >95, >96, >94.

MR. SEBROSKY: And the only thing I guess I could respond to that is what the procedures suggest. Do your best based on the warning time that you have to reduce the risk profile at the site.

And some procedures for some of the sites direct that the plant goes to cold shutdown. Other

procedures direct the plant to actually not go to cold shutdown, to consult with the TSC. Because you have different stages of hurricane actuation for a site. So, based on hurricane warnings the licensees will take actions. And you see a successive criteria.

What some of the procedures suggest is you consult with senior management, and you may actually want to stay in a hot shutdown condition that would allow you to use the turbine-driven aux feed water pump or RCSI in the case of loss of offsite power.

So my response to that is I understand that you could get a hurricane moving quicker, and you may not be able to implement all the actions, but I would certainly expect that you would be able to implement some of the actions.

MEMBER SKILLMAN: Fair enough. Thank you.

CHAIRMAN STETKAR: Joe, did you actually look at any of those procedures at any of the susceptible sites?

Because --

MR. SEBROSKY: We looked at the procedures. We had the -- so we had a public meeting on this topic, and we had the utilities for those four sites upload the procedures to the electronic reading

room. And we reviewed all four sets for those sites that I mentioned.

The conclusions that you see are based on all four sets having those characteristics.

CHAIRMAN STETKAR: Well, but I mean in my experience simply shutting down the plant and staying at hot shutdown isn=t any different than tripping the plant and having it being a hot shutdown.

So it=s not clear that the risk is de facto reduced simply because I shut down the plant.

(Simultaneous speaking)

CHAIRMAN STETKAR: With our risk assessment you=d find that it wasn=t any different.

MR. SEBROSKY: I would argue that it is. And the reason I would argue that it is is based on the decay heat profile.

CHAIRMAN STETKAR: If it=s shut down now. Again, if I shut it down two or three days ahead I=ve got it. If I shut it down an hour before, maybe not so much.

MR. SEBROSKY: I=m not disagreeing --

CHAIRMAN STETKAR: Maybe I can have 0.75 of a pump deliver flow rather than 1.0 of a pump, but it=s still a pump. And maybe I=ve got a few more

minutes for operators to take actions, but it might only be a few more minutes to operators to take action.

It depends on when they shut down, what that time window is and what condition they=re trying to achieve. Do they start in low diesels, or do they sit there and just have the diesels in standby and have confidence that they=re going to start?

MR. SHAMS: I want to share that from just the recent Matthew experience and having to work with the coastal plants in Florida and North Carolina, they actually -- they=re not waiting for a 10 to the -7 Category 5 type hurricane. They=re shutting down at a wind speed associated with like a Category 3.

So there is margin even built into that, just getting to the point that you were making.

MEMBER SKILLMAN: In the instance that I mentioned the tech specs for Brunswick were to shut the plant down, hot shutdown, once the eye of the hurricane crossed a certain latitude and longitude. Nothing to do with wind. It had only to do with a dot on the horizon of where the predicted coordinates were for the eye.

MR. SHAMS: I know Mike wanted to add

something, but the ones that I=ve witnessed over, again, with Matthew is it was related to wind intensity too. There was a couple of variables.

MR. FRANOVICH: Mike Franovich, JLD. The previous topic about the preparedness of licensees in terms of anticipated hurricane force winds.

If you look at plants like Turkey Point. I can=t say this is universal across all four, but regarding emergency power systems they make sure from a risk management standpoint that if they=ve got one diesel generator out for tested maintenance that they will try to recover that.

In fact, in the case of Hurricane Matthew St. Lucie actually backed out of some of the PM work they were doing on one of the diesels. They had the other unit in an outage, but one unit was online prior to where the hurricane eventually crossed the area.

The other thing about power systems is that in Turkey Point=s case there are a lot of portable generators. And I=m not talking about FLEX now, that=s a whole >nother layer of protection.

A lot of portable generators that are deployed out there to power low-voltage systems. So, they have applied a lot of the lessons learned from

Hurricane Andrew back in the early nineties.

So if you look at that and the fact that from a staffing standpoint, Joel will correct me, but it=s somewhere on the order of greater than 100 required positions that need to be staffed in terms of operators, maintenance craft, emergency response officials and so forth.

So, you take that in totality and compare it also that FLEX is going in place. That=s another layer of equipment that=s there, that=s protected against hurricane force winds.

And on top of that the staffing levels assumed for FLEX are far less than what they would assume for a hurricane. We=re talking about minimum operating crew, minimum security crew onsite.

So, that adds a little bit more flavor to preparedness and margin in the facilities.

MR. SEBROSKY: So, I was alluding to this slide and it shows a couple of things. We=ll start with the yellow line first.

This is -- so what you see in the reg guide is what the hurricane wind speed is, and what the tornado wind speed is.

We have to convert that wind speed into an

automobile missile speed using current regulatory guidance.

So, these are the calculated automobile missile speeds for all the sites. So this slide represents all the nuclear power plants.

And one of the things that I had said earlier is not only did the -- even though the tornado wind speed went down, the tornado automobile missile speed went up for many sites when we compared it to the design basis.

So, if you look, and you look at this line you=ll see this is around 90 miles per hour. Many sites have 4,000 pound automobile missiles going in the 30 to 50 mile per hour range. Some sites have 2,000 pound automobiles.

The velocity 1/2 mv squared is more important than the mass, but this slide just represents that we weren=t just concerned about hurricane automobile missile speeds, we were also concerned about tornado automobile missile speeds.

CHAIRMAN STETKAR: But in particular that -- whatever color that is, yellow or orange plot -- make sure I=ve got it right. That is on a site by site basis the automobile missile speed that I would

calculate for my site based on the current guidance in Reg Guide 1.76 Revision 1 for tornadoes, right?

MR. SEBROSKY: That=s correct.

CHAIRMAN STETKAR: The orange is tornadoes.

MR. SEBROSKY: That=s 1E-7.

CHAIRMAN STETKAR: Right, 1E-7. Okay.

MR. SEBROSKY: What the blue line represents is the calculated automobile missile speed for hurricanes, based on hurricanes.

And the reason you see a bunch of zeroes here is if you=re an inland site you don=t have a hurricane that you have to address even with the current guidance.

This slide is a 1E-7 value. And these are the sites that were of interest and why we asked for hurricane missile procedures because you see a significant bump up here.

We recognize and we discuss the guidance that we have for backfitting or taking regulatory action. And it talks about 1E-7 events.

What we were looking for is if we wanted to backfit a site to 1E-7 our criteria would kick it out immediately. We wouldn=t have to do an

assessment.

Do we have any data for hurricanes, recent data for hurricanes that have a frequency that is higher than 1E-7?

And it turns out that the American Society for Civil Engineers does for 5.9E-4 events.

So we got hurricane wind speeds for 5.9E-4 events and converted that to an automobile missile speed, and that=s what you see for this red plot.

So, again, over here to the right you see some of the sites, the coastal sites that drove us to ask for procedures.

What this green --

CHAIRMAN STETKAR: Joe, before you get to the green I want to ask you about whatever color that is, reddish sort of thing.

When I first looked at this two things struck me. First of all, why are you using ASCE-7 for those. And how do I derive 5.9E-4 exceedance frequency from that because I haven=t studied it. The only -- chapter 6 of it that talks about wind speeds, and the exceedance frequencies in there seem to be one in 50-year type events, not one in 1,700-year type events.

Second of all, though, it=s sort of jagged and doesn=t really track the blue line which is something that first caught my eye.

And I was curious why is it since I don=t know what you did. So I went back and I looked at not Reg Guide 1.221 but NUREG/CR-7005 which is the technical basis for Reg Guide 1.221.

And I found that in NUREG/CR-7005 if you look at -- and there=s a vast number of them, Figure 3-8, they have scaling factors.

So, for example, if I look at their location 1 which to me looks an awful lot like Miami, which to me looks an awful lot like Turkey Point I can actually derive exceedance frequencies of automobile missile speed at exceedance frequencies of 10 to the -3, 10 to the -4, 10 to the -5, 10 to the -6, 10 to the -7.

In fact, in the NUREG they actually plot curves at 10 to the -6 and 10 to the -7, and they cite curves from a paper from the authors of that NUREG at 10 to the -3.

So I checked those, and indeed my calculated numbers come out to those calculated numbers.

So I=m curious why you went to ASCE-7 which apparently doesn=t have the same wind profiles as the NUREG that is the basis for the regulatory guide with this 5.9 times 10 to the -4 which seems to be sort of a strange number.

MR. SEBROSKY: So, my response to that is we were just looking for data that was easily convertible. We had the wind speeds from that.

We could have I suppose used NUREG/CR-7005. We did not. And it was just to get an idea on higher frequency event, what kind of automobile missile speeds would be generated by a higher frequency event.

CHAIRMAN STETKAR: It seems in your paper though you don=t use that curve for anything except the right-hand point to say that, well, at 6E-4 I=m less than 110 miles per hour. And look, if I have a concrete wall with a ductility factor of 10 it=s 110 miles per hour.

So all of the jaggedness and everything that=s here site by site by site raises to me a heck of a lot of questions about why you did what you did. And you say data. I say other people=s calculations.

What are you using it for? I thought you

were going to do some sort of risk argument, but you didn=t. So why is it here?

MR. SEBROSKY: So, it=s there to go back to what we had earlier in the paper about what kind of frequency event would drive you to a regulatory action.

And we don=t think a 1E-7 frequency event would justify a regulatory action. We were looking for more frequent events that could lead to an argument.

Because understand at the beginning of this process we didn=t care what the results were. We applied successive screening criteria, and at the end of the day per the Commission direction we either have a basis for regulatory action because it meets the threshold or we don=t.

So, if the 5.9E-4 curve had shown 300 mile per hour automobiles were possible we would be using that curve to justify either a 50.54(f) letter or a backfit.

CHAIRMAN STETKAR: But Joe, at one level I understand where you=re trying to get to. At the other level if you listen to what I=m saying is the technical details of what you did make a difference.

If I can pick apart any one of those points on that red curve as being arbitrary because ASCE has -- and I=ve not looked at their stuff -- has some sort of very discrete notions of where their wind speeds are evaluated.

I don=t know how they came up with 5.9 times 10 to the -4. That=s 1 in 1,700, 1 event in 1,700 years which to me sounds like a really strange number.

If you=re going to develop this kind of technical detail as supporting information why don=t you do it consistently such that the blue curve and the red curve are derived from the same fundamental analyses done by the same people, because all of the information is available in that reference.

Why are you raising questions about -- my questions about why are you using a different reference, and why don=t those two curves track one another? I mean, they go up as you=d expect them to go up.

MR. SHAMS: Sure. As Joe answered there was no specific goal or reason here. I think this is very valuable feedback. We can go back and look at what CR-7005 does for us and we can use that.

The idea was to just sort of give -- I=m sorry, go ahead.

CHAIRMAN STETKAR: I know what the idea was, but again, if I=m looking at a technical analysis that=s done to support a conclusion, and you=re basing that technical analysis on both frequency and consequences, frequency being 6 times 10 to the -4 event per year, consequences being some missile speed, 107 miles per hour I think it comes out to be, you should have a strong technical basis for that.

And a consistent technical basis so I=m not comparing blue apples with red oranges.

MR. SHAMS: Right. So we feel we have a strong technical basis. I think we can address the consistent technical basis so that way we can sort of avoid the discrepancy between the red line and the blue line. We can take care of that. That=s not a problem.

But I think overall we feel like we have a reasonably strong technical basis. We showed that just for the 12-inch wall which is a fair, conservative estimate of what a safety-related structure would be behind.

We have this much capacity on a code

calculation, and if we get into a margin calculation we have that much more capacity. So, I think that=s what the graph overall is trying to communicate.

CHAIRMAN STETKAR: When I did -- and again, this is my calculation, and I have made errors in the past, and I will make errors in the future -- I came out with a 10 to the -4 exceedance frequency for an automobile missile speed of 125 miles per hour. That=s 1E-4. That=s still -- in regulatory space that=s still relatively high.

MR. SEBROSKY: So I would ask -- before you go on I would ask is that the wind speed, or is that the missile speed?

CHAIRMAN STETKAR: No, I did the wind speed from the NUREG because that=s all they do, and then I used the regulatory guidance in 1.221 which actually has tables. It says if you have this wind speed here is what your automobile missile speed is. So the reg guide actually has a tabulation that shows increments of about 10 to 11 to 12 miles per hour increment in wind speeds over a fairly broad range of what the automobile missile speeds would be. So they did that part of it. So that=s what I did.

I only did it for Miami because I knew

that was the right-hand on this curve, and I wanted to see how that calculation would come out when I looked at different exceedance frequencies and see where -- at about 60 to the -4 I got an automobile missile speed of about 102 miles per hour. You come up with 107. Those are pretty -- those are closer -- they=re the same. They=re the same.

But 60 to the -4 is a funny number, you know. And if you=re going to try to get that precise.

MR. SHAMS: We can get rid of that. It=s not fundamental to what we=re trying to say. It=s not fundamental.

CHAIRMAN STETKAR: Don=t raise questions in terms of the technical details of what you=re doing that might be unnecessary questions.

MR. SHAMS: I get it. Thank you.

MR. SEBROSKY: So, the other two points that are plotted are from the table that I previously discussed. The ductility factor of 30 on a 12-inch wall is 200 miles per hour, and the ductility factor at 10 on a 12-inch wall is -- I forget the value. It=s slightly higher than 100 miles per hour.

So, this was just graphically to show the screening calculation that we did, whether or not the

12-inch wall provided sufficient protection.

So, the conclusion for high winds, the preliminary conclusion that=s in the white paper is we do not believe we have a basis for additional regulatory action based on conservatism and design, the risk insights warning time associated with hurricane events, the additional capabilities to address these events based on the responsive mitigating strategies.

We also believe that lessons learned from past events have been incorporated into licensees and NRC actions. You see lessons learned from Hurricane Andrew. We issued documents on that. Katrina is another example.

So, that=s the conclusion for high winds.

MR. SHAMS: Before we go from high wind, Mr. Stetkar, I had asked CJ from our Division of Risk Assessment to come down in support of any questions you may have on the risk assessment that I discussed earlier, the wind PRA that was supported in the EGM.

CHAIRMAN STETKAR: You know, Mo, as interested as I am personally to hear that, I suspect a vast majority of our members are not all that interested. And given the time we have a lot of other

things that we need to address. So, thanks, and I apologize, but thanks.

MR. SHAMS: Thank you.

MR. SEBROSKY: So, the next discussion is snow loads. Again, the reason that we were evaluating snow loads is because of guidance that was recently promulgated in the form of an ISG DCCOL design certification, the combined license interim staff guidance on extreme winter precipitation loads on roofs.

So, that was issued in 2009. Obviously the majority of the current operating fleet did not have this guidance at the time they were licensed.

It provides a process for calculating 100-year ground and roof snow load, and then also calculating an extreme ground and roof snow load.

The extreme ground and roof snow load is based on a combination of 100-year snow load, and a 48-hour probable maximum winter precipitation event.

And the fundamental presumption is that the snow is on the roof. A precipitation event comes along typically in the form of water, and the snow acts like a sponge and does not allow any of the water to drain off the roof. That=s how you come up with

the extreme snow load.

The preliminary assessment. When we looked at the licensing basis for the majority of operating plants the ISG guidance is consistent with the 1975 version in the SRP and the branch technical position that went along with it, but there were additional clarifications that were in the ISG.

The 100-year roof snow load event is typically bounded by a plant design, or a structural margin associated with the design.

We=ll see a plot here in a little bit, but many plants in the north have snow loads in their FSAR that are loads above and beyond the normal loads that you would have on the roof, in the 50 pounds per square foot range.

And what we saw is when we calculated the 100-year snow loads the vast majority of the sites had FSAR descriptions where those snow loads were bounded.

We performed -- it=s the extreme snow loads that you don=t always find that=s the case.

So we performed a deterministic screening evaluation of 65 sites. The reason that the sites are different is you have dual unit sites like Nine Mile Point 1 and 2 that have significantly different

licensing basis when it comes to snow loads because of the generation of unit 1 compared to unit 2.

So, when we saw a site that was essentially identical from a licensing basis we combined it. If we had different licensing bases at the same time at the same site we split it. That=s how we end up with 65.

We immediately screened out those sites. We didn=t even calculate extreme snow load for if a site -- and these are Florida sites as an example, their 100-year roof snow load is zero based on ASCE-7. So, 10 southern and 2 western sites were removed from further evaluation based on that screening criteria.

This next bullet is a little bit -- there=s a little more background on this. We screened out sites whose 48-hour PMP in inches of water was greater than snow in inches. And it talks about 12 additional southern sites.

I need to explain this bullet a little better. What you see is for some of the southern sites you would have as an example a 100-year roof snow load from 10 inches of snow.

And then the 48-hour PMP in water was 30 inches. Ten inches of snow is not going to be able to

trap 30 inches of water.

What we ended up doing for the extreme snow load is we capped the water at the height of the snow. So we converted 10 inches of water, which when you convert it to roof load is significantly higher than 10 inches of snow because of the density.

And we came up with an extreme snow load value for those 12 southern sites. And it turns out that when we looked at it we weren=t worried about those sites.

So, you have 22 sites that were screened out for one of those two criteria.

MEMBER SKILLMAN: Joe, flat roofs made no difference?

MR. SEBROSKY: We assumed, and we=ll talk about the structural assessment. One of the things that you see in the licensing basis for plants, and it doesn=t matter if you=re talking about tornadoes, hurricanes, or snow, is different licensing basis for the different structures.

If you have a dome containment, for example, it can take -- and it will say right in the licensing basis that it can really handle snow.

And then the next sentence, it says oh by

the way, it=s domed, the snow is going to slide off it. So, you see kind of a dichotomy, but you also have a spectrum of different buildings like the aux building, diesel generator building and servicewater structures that have different roof thicknesses and different snow loads.

It=s not always consistent. For later generation plants it is, but for the early generation plants it=s kind of all over the map.

So, what we were trying to do is determine if we had, again, a basis for additional regulatory action. And what you=ll see in the next slide is we calculated, we compared the extreme roof snow load to double the dead load of a representative roof.

This gets back to the structural margins that Mo had talked about earlier.

And based on the assessment we identified that there were five northern sites that were of interest to us that we asked the utilities for their procedures.

So, this is the slide that I was talking about. The purple slide is -- it=s a 9-inch thick representative concrete roof, the typical thickness that you would see on a flat roof, or an aux building.

And it turns out that the dead load weight for that type of roof is 112 pounds per square foot. There=s typically a factor of safety just from the dead load of 2. That=s this line, 225 pounds per square foot.

So that=s what we were just, again, this is a structural margins discussion. We were just trying to compare this to the extreme snow loads that we were calculating to see if we had a basis for pursuing it.

CHAIRMAN STETKAR: So, if each of those sites had a roof that was designed according to your representative roof they would follow the purple line, right?

MR. SHAMS: That=s correct.

CHAIRMAN STETKAR: Presuming the factor of 2.

MR. SHAMS: Yes.

CHAIRMAN STETKAR: Okay.

MR. SHAMS: That=s correct.

MR. SEBROSKY: For dead load. Just for dead load.

CHAIRMAN STETKAR: For dead load.

MR. SHAMS: We=re trying to capture what

do we think the margin in a roof design would be. And there were a number of arguments and a number of ways that we looked at it. This was by far --

CHAIRMAN STETKAR: And we don=t actually know the roof thicknesses at those sites? Is that correct?

MR. SHAMS: That=s a great question. As we started looking at this effort, this might have been an important point to make early on.

We didn=t want to go site by site and do like a 50.54(f) letter in terms of knowing every site=s dimensions.

The idea was to go through a screening process based on a simplified effort. And if we start running into trouble with sites that don=t appear to be having the right margin then we would have gone into that next level of knowing exactly the configuration for that site.

I mean, one can argue well, you know, different buildings have different designs within the same site. So you can quickly get overwhelmed by the level of details you=re going to get to.

And we were willing to get there if we needed to. So, the idea was to just use simplified

screening approach. And that=s why we picked what we thought would be a fairly conservative assumption of what a roof thickness would be. They=re generally more than 9 inches. We just picked that number out of convenience.

And the factor of 2 was again out of our appreciation for the margin built in.

The roofs are designed for seismic in addition to dead load. So that by itself in my opinion would just give you the difference in -- the factor of 2 just in seismic alone.

But there are other nuances associated with that so we preferred just to kind of keep it simple and associate it with twice the dead load and use that argument instead.

MR. SEBROSKY: So what this slide represents, these are staff-calculated values. We used the guidance, and for every site we plotted the 100-year snow load.

You don=t see the southern sites that are zero on this slide, that have a zero snow load. We screened that out.

And this is sorted from lowest to highest when it comes to the 100-year snow load. These sites

over here are the lake effects sites. When I say lake effects that=s Nine Mile, FitzPatrick, Ginna, those types of sites.

So, what I think I told you, many sites have a 50 pound per square foot snow load in their design basis.

Some of the later generation sites and even Nine Mile Point 1 has a discussion that they have a 90 pound per square foot snow load that the plant is designed against.

So, what this goes back to is the earlier slide that when you=re looking at a 100-year snow load, and if you just look at the design basis for the plant many, but not all sites, their FSAR licensing basis bounds the 100-year snow load event.

And again, what Mo was talking about was this graph, what we attempted to show was the structural margin associated with some of the sites.

What this blue line represents is, again, a staff-calculated value. And it is the extreme snow load plus the dead load.

So, I think I told you, you start off with 112 pounds per square foot. So none of this blue line is going to be below 112 pounds per square foot.

You then add the 100-year snow load, and then you add the water load from the 48-hour PMP event, assuming that it=s all retained by the snow.

And we calculated that and came up with this blue line.

What we took from this is, again, the dead load is just one component. I hesitate to say all, but when we found discussions in the FSAR licensing basis you saw earthquake loads on the roofs. You also saw in addition to snow loads construction loads and other live loads that were part of the design basis.

So, this gave us comfort that if you had a 9-inch roof you were okay. That=s their takeaway from that, and that presumes you had a 9-inch thick concrete roof, representative roof.

So, this slide talks about the staff=s preliminary conclusion. And the staff=s preliminary conclusion is that we didn=t have a basis for additional regulatory action, partly based on the deterministic evaluation that shows extreme roof snow loads either are not applicable, or there=s sufficient structural margin such that there=s low likelihood of failure of the roof due to the extreme snow load calculated using the new guidance.

For some northern sites where structural margin is not as high the staff reviewed procedures to confirm that licensees take action to address severe snow-related events.

The five sites that we talk about in the application -- or in the evaluation are FitzPatrick, Nine Mile Point 1 -- Nine Mile Point 2 isn=t discussed because it has a more robust licensing basis -- Point Beach, Prairie Island and Susquehanna. Susquehanna is a later generation plant, but where it sits, it=s not along a Great Lake. It sits in a valley that has a high calculated 100-year snow load.

MEMBER SKILLMAN: Joe, why did not you consider Perry and Davis-Besse?

MR. SEBROSKY: The reason that those screened out is one of the determinations we looked at, what was in their design basis compared to what the extreme snow load.

And there wasn=t enough of a delta to cause us concern.

MEMBER SKILLMAN: Thank you.

MR. SEBROSKY: And that=s the same thing with Ginna. So, Ginna is a lake effect site, but it has a robust snow load design basis.

The other thing, and Mo alluded to this and the discussion alluded to it. Not every -- especially when you look at containments, the generation of plan, the aux building, the diesel generator building, servicewater structures, not every one of those roofs is 9 inches thick.

You can look at Mark 1 and Mark 2 containments which we talk about in the paper and fundamentally you=re dealing with a structure that is not a concrete roof that=s above the operating deck.

That reactor building design when you look at a vertical missile design basis for those types of containments what you see is they don=t rely on that roof.

What they rely on is a lot of water in the spent fuel pool to mitigate any kind of damage from a vertical missile, or from the roof collapsing.

And then you see missile shields, and thick concrete floors that do the same thing.

So, that next bullet was a structural failure. The reason that we looked at that is what if you don=t have a 9-inch roof. And the additional criteria that we evaluated was -- or considered is that a structural failure of a roof does not

necessarily lead to a loss of cooling to the spent fuel pool or the core.

And a qualitative discussion then, it was unlikely a roof collapse would disable multiple trains at different physical locations of safety-related systems.

So it wasn=t one criteria that our conclusion is based on, it=s several.

So that ends the presentation on snow loads.

CHAIRMAN STETKAR: Good. Any more questions? We=re going to shift gears here quite a bit. Any other questions on high winds, snow and ice loads for the staff?

As a final comment, Mo, Joe, Andy, my personal recommendation would be go back and reread your evaluations if you can as a disinterested engineer and see whether or not the -- whether they flow to support the conclusion, let me put it that way.

Be particularly sensitive to some of the things that I was at least questioning and that is perhaps over-reliance on numerical results from IPEEEs, or assertions about what is or what is not

considered in the IPEEEs.

Reliance on FLEX mitigation strategies where the guidance for FLEX may be anchored to the current plant design basis and not what I call the reevaluated hazard, you=re trying to address here whether it=s reevaluated winds, or whether it=s reevaluated wind loading and missiles, snow, whatever.

And what I heard here orally quite a bit, and what seems to be the overall conclusion, but to me it didn=t come out of the text was, look, these are infrequent events, and they don=t raise to the safety goal screening criteria that would be applied for a regulatory decision.

And that argument I think was in there in a couple of places, but it seemed to be kind of hidden.

Any types of detailed analyses you=re doing like the blue versus red curves, trying to put a lot of detail to demonstrate what you did is good.

But if that detail raises questions it=s maybe not so good.

So, those would be kind of my final comments that perhaps a repackaging in some sense of the evaluations might be somewhat more compelling than

at least what I came away with.

Anybody else? Okay. Let=s shift gears.

MR. SEBROSKY: So, for the next portion of the presentation there=s two people, Marty and Selim if you can come to the front.

And Kevin, if you don=t mind going to the side table.

CHAIRMAN STETKAR: These, for members= benefits we=re now going to essentially revisit a few of the other natural hazards that were disposed of in the task 2 evaluations that were performed as the -- in the enclosure to the SECY paper. In other words the things that we were briefed on in a preceding subcommittee meeting.

We highlighted these in one of our letters that we wanted to go back and revisit those, so that=s what we=re up to here.

MR. SHAMS: Some were in the letter. Others were just the verbal comments that we=ve received --

CHAIRMAN STETKAR: Yes, that=s right.

MR. SHAMS: -- in both subcommittee and full committee meeting. And we have addressed them.

The presentation today is about what we=ve

done back in May when we sent the paper out to the Commission. So I just wanted to make sure that that=s reflected.

MR. SEBROSKY: So, again, this is Joe Sebrosky. What I=d like to do is start off the meeting if Selim and Marty could introduce themselves, and also Kevin.

MR. SANCAKTAR: Selim Sancaktar, Research.

MR. STUZKE: Marty Stuzke. I=m the senior level advisor for risk assessment, currently in the Office of New Reactors. That=s a new position for me, about two weeks.

MR. SEBROSKY: And then on the side table if Kevin and Dr. Jones could introduce themselves.

MR. COYNE: Kevin Coyne, acting deputy director, Division of Risk Analysis Research.

MR. JONES: I=m Dr. Henry Jones, Office of New Reactors.

MR. SEBROSKY: So, the reason these individuals are here is because of the interest that was expressed in some of the risk assessments that were done. That=s Marty, Selim and Kevin.

And Dr. Jones is here because he=s our staff expert on tsunami and seiches which is an area

that you indicated you=d like to have further discussion about.

So, the next slide, this just provides the background on why we=re having this discussion. I think in the earlier presentation I mentioned this SECY-16-0074 which was issued. And it provided the staff assessment of natural hazards other than seismic and flooding through task 2.

So this SECY paper articulated the staff=s basis for not requiring regulatory actions for all natural hazards and manmade hazards as we discussed earlier through task 2 other than for high winds and snow loads which is what the previous session was about.

Based on the agenda and the request that we got from the ACRS what we=re here to talk about are specific items that are of interest that are in that SECY-16-0074, the analysis of seiches and tsunamis.

The ultimate heat sink water quality, the concern about evaluation of introduction of large amounts of debris, intake air quality for ventilation and combustion air systems, the Columbia analysis that=s discussed in a SECY paper on the effects of volcanic ash, and then downstream dam failures.

The downstream dam failure analysis specifically that was used to support the resolution of a generic issue. That=s what Marty, Kevin and Selim will be talking to.

And Henry is the backup if we have any questions about the tsunami and seiche evaluation.

There=s a recognition that when you talk about the downstream dam failures, when we get to that, it=s based on a pre-generic issue that is documented in a March 11, 2016 evaluation.

There are five enclosures in that document that NRC employees have access to. Three of the five are publicly available, two are non-publicly available. And those are the detailed risk assessments that Marty and Selim did.

There is nothing in the slides that we=re going to present that provide an overview of those risk assessments that we consider safety-related SUNSI.

So, nothing in this slide presentation -- I=ll leave it up to the ACRS to determine when and if they want to close the meeting, but there=s nothing in the presentation that is a security-related SUNSI. Having said that we=ll go to the next slide.

So, this is the timeline for SECY-16-0074. We mentioned briefly in the introductions that SECY-15-0137 described all the open Fukushima tier 2 andf tier 3 items that existed at the time and grouped them into three different groups.

And the other natural hazards were in group 3.

This goes back to the Commission directing us to complete the task 2 assessment by June which we talked about this morning.

So, the timeline, you see November 4, the SECY is issued. We get an SRM saying that they want task 2 provided to them by June.

What we did to meet that is we met with the Fukushima subcommittee meeting on the technical content of the SECY paper in an April 21 meeting with the subcommittee.

We had provided the subcommittee a draft white paper in the March time frame to support the April 21 discussion.

There was on May 5 a full committee meeting. On May 17 an ACRS letter. And then June 2 was the date that the SECY was issued.

What this next bullet indicates is

Appendix D of SECY-16-0074 is an appendix that provides all the comments that we got through stakeholder interactions, both public and industry, and also from the ACRS, including the letter.

So, if you look in Appendix D it lists all of them. The last item in there is the items from the May 17 ACRS letter.

And it provides a disposition of those comments.

So, the first topic of discussion is low water conditions due to seiches or tsunamis. If you go to SECY-16-0074 the meat of this discussion is in Appendix B where we evaluated the low water level conditions.

Originally the discussion in there was limited to seiches. We added low water level conditions due to tsunamis based on an ACRS member comment.

So, we addressed this issue, or it was identified as something that we should be looking at based on a March 18, 2015 Region III letter that identified it as a possible generic issue.

And both for seiches and tsunamis the concern is that a low water level event -- so, when

you look at the reevaluated flood hazard it looks at high water level conditions, and it assesses seiches and tsunamis from a high water level perspective. That=s something that is asked to be looked at.

The concern that the Region III folks identified is what about low water level conditions. And a concern that they discuss in their letter is you have a low water level condition due to a seiche, and it breaks the safety-related ultimate heat sink pumps. It either air binds them, or physically breaks the pumps so that they are not easily recoverable.

And the concern that the region identified was for a couple of sites in Region III that were on the Great Lakes.

We expanded that to areas that we thought in addition to the Great Lakes if there were other areas that may be susceptible to low water levels due to a seiche. So we expanded that to the Chesapeake Bay, sites other than the Great Lakes that we had a Calvert Cliff analysis in there. And then the Atlantic Coast sites.

There was a concern that the ACRS member identified that just because you have a coastal site doesn=t mean it might not be susceptible to low water

level conditions to a seiche. You can have an impoundment area, a bay type area that -- the Atlantic Ocean wouldn=t be susceptible to a seiche, but the impoundment bay that=s directly next to the site could be susceptible. The staff should look at that. So we did.

The staff evaluation of the sites that could be impacted. This bullet, the majority of the sites do not rely on ultimate heat sink for FLEX, or have at least a 24-hour water supply.

When you look at some of the coastal sites, Seabrook, for example, their normal heat sink is the Atlantic Ocean, but they have a backup safety-related -- mechanical draft safety-related ultimate heat sink if the Atlantic Ocean becomes unavailable.

And their design basis is based on they have tunnels. If the tunnels collapse going out to the Atlantic Ocean can you still remove decay heat.

So that=s what we mean when we say the majority of the sites do not rely on the large body of water for FLEX, or they have at least a 24-hour water supply that would outlast a seiche.

So, you see a table in Appendix B where we list all the sites, and then we look at the

capabilities on a site-by-site basis.

In those tables you will see that some sites do not have a 24-hour water supply to supply water to the turbine-driven aux feedwater pump, or to RCSI or whatever the supply is.

And we dispositioned that using a combination of the hazard and site-specific conditions, and that=s where Dr. Jones came in. He helped us evaluate the sites to determine if they were susceptible to seiche conditions, or low water level conditions due to a tsunami.

So, the conclusion in the SECY is that additional regulatory action to address seiches due to low water levels is not warranted.

CHAIRMAN STETKAR: Before we leave that, I really appreciate the effort that you put into developing that table in Appendix B. And I think that the information in that table for the majority of the sites is quite compelling.

There are four sites that were not to me as compelling, and those are D.C. Cook, Davis-Besse, Ginna and Calvert Cliffs for seiche.

And because of the time I don=t know how much we want to go into the details, but my first

question on each of those sites was do you know whether a seiche will cause the operating servicewater pumps to lose suction.

And if the answer to that question is yes, they will, that means they will cavitate. And depending on the duration of the seiche it=s not clear whether the standby servicewater pumps, if they start up automatically, would also cavitate.

So I could have perhaps no servicewater.

Some of the arguments that are made then say, well, look, I have injection available for my charging pumps. Well, I don=t know whether those charging pumps are cooled by component cooling water which is cooled by servicewater. So it=s not clear whether you=d have the charging pumps.

So, for those particular four sites that you did the evaluations, would you lose servicewater suction?

Because in particular for a lot of the -- it=s the first thing I was looking for. For many of the others you said, well, the site did an evaluation and the minimum possible water level from a seiche, the drawdown still remains above the net positive suction head requirements for their servicewater

pumps.

So I was curious why that statement was not made for those four other plants. Since it wasn=t made perhaps they lose servicewater.

If they lose servicewater it makes them vulnerable to a lot of things that could possibly happen inside the plant because they=ll lose not only essential servicewater, but perhaps non-essential servicewater. And get into strange conditions like loss of heat to the inability to do feed and -- you name it. There are a lot of different risk assessment scenarios.

So, what do we know about those four sites?

MR. SEBROSKY: So, I=m a little confused about the question. If you go to Appendix B in the SECY paper and you look at D.C. Cook, for example, on page B-12 our evaluation for D.C. Cook is based on a 24-hour coping capability from FLEX.

So, similarly for Davis-Besse we talk about 14 hours.

CHAIRMAN STETKAR: Is that -- it says RCS inventory control is based on low leakage seals. RCS injection is from the boric acid storage tanks and/or

two RWSTs that are shared between the units.

MR. SEBROSKY: So these are FLEX strategies.

CHAIRMAN STETKAR: Those are FLEX strategies.

MR. SEBROSKY: FLEX strategies are based on the FLEX pumps.

MR. SHAMS: I would assume that we use servicewater, and at this point we=re responding to beyond design basis. Do they have the capabilities now to respond.

And the idea was whether or not we can draw now from that body of water to support FLEX or not. So we get into these types of scenarios.

CHAIRMAN STETKAR: Do you know what the time windows are for operator actions to line up and start that FLEX equipment under a condition where they have no servicewater? That=s different from the nominal FLEX basis where you have auxiliary feedwater and things like that.

MR. SHAMS: I=ll let Stu fill in.

MR. BAILEY: So this is Stewart Bailey with the JLD and I put together a lot of this.

In terms of the four plants that you=re

talking about I=d have to go through and review those individually again.

I would say that if we did not make the claim that they would not lose the ultimate heat sink or the normal servicewater we were not relying on that for our analysis.

We could potentially go back there and say that they would not lose normal access to the ultimate heat sink, but we did not pursue that.

Our whole structure here was to see whether they could survive 24 hours off the FLEX. We considered that a bounding situation for the reasons stated in the paper. Bounding is a good way to say that you don=t have a problem, but not always a good philosophy for saying that there is a problem.

So if they had the 24 hours of water we considered that sufficient to go on.

To answer your question on what we=re crediting here, we=re crediting the FLEX capability. In order to credit the FLEX capability that means that the phase I, that is the installed plant equipment does not have a reliance on the normal access to the ultimate heat sink. It does not have a reliance on the normal servicewater for, for example, seal

cooling, room cooling, things like that.

All those capabilities were looked at when we put together the mitigating strategies.

We also took a look at their ability to draw off stored water onsite, tanks, for example, for 24 hours. And again, the reason for that value is stated in the paper.

And we looked at that because most plants that we=re dealing with here, ultimately their credited water source if need be is actually that ultimate heat sink.

But as we discuss in the paper if they=re at a low water level they did not typically design FLEX for that extremely low water level. And so we did not give them credit for that. We required them to have the ability to draw from tanks onsite.

And perhaps we erred on the level of excess detail here if we=ve gone and discussed both aspects if you will of core heat removal, of getting water to the steam generators, and then also discussing how they manage inventory control.

Both of those are primarily functions that they=re looking for in FLEX strategies.

CHAIRMAN STETKAR: Let me push a little

more. FLEX as we have become familiar with it is no ac power and no access to the ultimate heat sink.

Now, the good thing about no ac power is the darn reactor coolant pumps aren=t running so I can rely, if I have low leakage seals and reactor pumps being stationary with low leakage seals.

If I just lose the ultimate heat sink reactor coolant pumps are still running. If I don=t cool the motor coolers, if I don=t cool the oil coolers for them, after awhile I get into trouble.

Operators typically have to trip those pumps manually based on something because they don=t trip automatically, or the seals fail. I=m not talking about the low leakage stationary seals, I=m talking about the normal seals.

So that loss of servicewater looks different from FLEX, ELAP and loss of ultimate heat sink.

And my questions for these four plants were focusing on how carefully did you think about those types of vulnerabilities in those plants.

Because as I read these things, if I look at Davis-Besse, for example, it=s focused on condensate storage tank makeup. Fine. And feed to

steam generators. Not so good on reactor coolant system makeup.

Reactor coolant system makeup is provided by the clean water receiver tank and/or the borated water storage tank, not tornado missile protected after which either of which can provide at least 24 hours of cooling water.

Fine if you=ve got pumps that can actually pump the water from point A to point B. If those pumps are cooled by component cooling water which is cooled by servicewater, not so good.

So I=m curious about how deeply you=ve thought about those particular plants.

MR. SEBROSKY: The fundamental presumption is if you lost the ultimate heat sink the plant is tripped. It=s not going to continue to operate.

CHAIRMAN STETKAR: I=m sorry, if I trip my plant my reactor coolant pumps still stay running. Yours stay running? Yes.

MR. SEBROSKY: So, the procedures, if you look at the procedures I don=t understand a scenario that would keep the reactor coolant pumps running knowing that you needed seal coolant. I don=t understand an operator doing that.

MR. BAILEY: So, without having gone through all of their procedures in great detail, the plants certainly have procedures to take actions upon loss of seal cooling, or other symptoms that you would see if you had the loss of the ultimate heat sink.

So, while this might result in some variations of the actual FLEX strategies and how you get into them, to answer your question about the ability to pump water, that=s all being done with FLEX pumps. That=s all being done with equipment that can be used independent of ultimate heat sink and offsite power.

CHAIRMAN STETKAR: FLEX equipment is not high-pressure injection pumps. They=re simply delivering water.

MR. BAILEY: That is not necessarily correct. For most of the PWRs there=s a FLEX pump that can be brought to bear to pump -- to inject into the RCS.

CHAIRMAN STETKAR: Okay. I=m trying to go through here and develop in my mind -- the reason I=m being the way I am is that I=m looking for compelling arguments on a case-by-case basis.

And I felt that there were compelling

arguments for every site except these four where when I started thinking about things it didn=t seem -- the words that I=m reading don=t necessarily seem to reflect the words that I hear you saying.

And if you know, for example, that Davis-Besse has seal injection, or you know that reactor coolant system inventory control at Davis-Besse -- and I just happen to be staring at that one in front of me here -- can be maintained by FLEX pumps, and indeed that the operators have sufficient guidance that they would trip the reactor coolant pumps. Fine, just say that. Because it doesn=t say that.

MEMBER SUNSERI: I think you=ll find that most of those plants, I=m not familiar with all of them, but there=s some coping, some built-in coping that the plant is capable of 6 hours, 12 hours or something before they have to even implement the FLEX, right?

So I think that=s what John is referring to. Acknowledge that, that buys you the time before you have to hook up the --

CHAIRMAN STETKAR: But, the coping times are based on loss of ac power which stops all of the pumps. That=s a different situation than having a

reactor coolant pump running with no motor cooling and with no oil cooling getting its bearings heated up and starting to vibrate which can cause mechanical damage to the seals depending on seal design.

MEMBER SUNSERI: Right, but the operators aren=t going to let that -- they=ll have criteria to shut them down.

CHAIRMAN STETKAR: Okay. That=s what you can say here. That=s what I=m asking did the staff look at those criteria.

Because I have seen plants where the operators don=t have criteria about when they=re supposed to trip the reactor coolant pumps.

MR. SEBROSKY: So one of the things I=m confused about is I understand you=re talking about the coping capability. Stu, what you were talking about is the phase I installed equipment which are typically the turbine-driven aux feedwater pump that is available that does not rely on safety-related servicewater nor does it rely on ac power.

That capability is instantaneous, essentially.

MR. BAILEY: For the installed equipment it is there. The entry condition is a little bit

different.

The point is valid that the sequence of events would be a little bit different if you take longer to trip off your large heat additions. It may cut into your 24 hours of capability. So that would be a fair point.

I guess the other point would be it may be that we=re just too close to mitigating strategies that take for granted some of the things that it brought to bear, the knowledge that all of this equipment can be run independent of the ultimate heat sinks, the normal access to ultimate heat sink and normal access to power.

So, I could understand where the write-up may not cover --

MR. SEBROSKY: The introduction to the table says with specificity, the following table provides a description of a plant=s capabilities to remove decay heat without reliance on a Great Lake or Chesapeake Bay for a water supply.

So that=s the fundamental going-in presumption. When we=re talking about the primary water inventory control it is not the coolant pumps that require servicewater system to cool them. It is

the FLEX pumps for inventory control.

CHAIRMAN STETKAR: Look, in the interest of time, again, as I read through these things as an interested, trying to be separate person who thinks about all of the things that could possibly happen I found those four particular sites not necessarily providing confidence of -- not the secondary heat removal, but in particular the primary inventory control, and in particular the primary inventory control under situations where I have a running reactor coolant pump with no cooling to the reactor coolant pump.

And don=t focus on no cooling to the reactor coolant pump seals. I meant no cooling to the reactor coolant pump which is possibly seal injection, thermal barrier cooling, motor bearing cooling and lube oil cooling.

If the pump is running without the motor bearing cooling and the lube oil cooling I might have all of the seal injection available, but if the seals start to wipe I=m going to get a seal LOCA.

And then if I don=t have cooling for my safety injection pumps I have a problem, despite the fact that I have secondary heat removal available.

So, take a look -- from my perspective take a look at those four and think about those types of conditions.

MR. SEBROSKY: So, the next slide, slide 5 is low water conditions due to a tsunami. This was added to Appendix B based on an ACRS comment that we received during a subcommittee meeting in April.

And the concern, we did not have an evaluation that looked at sites -- again, this is low water level, not high water level -- that=s addressed as part of the evaluation, flood hazard reevaluation.

The concern was that the tsunami trough would arrive before the peak wave. The tsunami trough would wipe out the safety-related servicewater pumps and could the plant cope with that.

So, we did an evaluation. We added a table to look at the Seco sites and look at the susceptibility of the plant to a low water condition due to a tsunami. We had a discussion about that. And also the FLEX capabilities that are provided that would help to mitigate that condition if it existed.

So, for this particular it was dispositioned as either not being applicable to the site. There are sites that may have a -- coastal

sites that have a safety-related heat sink that=s not a cooling pond -- that is a cooling pond that=s not susceptible to this mechanism. I think I mentioned Seabrook as one of those sites.

Or the safety-related ultimate heat sink pumps are not susceptible to damage from this mechanism. That=s how we dispositioned the majority of these issues for this particular concern.

CHAIRMAN STETKAR: Again, I appreciate you walking through that. That helped a lot with the tsunamis also. That gives us confidence that you looked at all the sites.

MR. SEBROSKY: Henry, is there anything I missed?

So, the next topic of discussion that is on the agenda is the ultimate heat sink water quality.

The issue here is that you lose the ultimate heat sink based on -- the mechanism isn=t defined, but you just have an issue with water quality.

Based on this concern we did add a discussion in Appendix A of the SECY. So, Appendix B, we got this comment in the letter, tells you what was done in general, and it refers you to Appendix A.

And Appendix A, we did add additional discussion for this particular topic.

And we evaluated scenarios involving the hypothetical loss of the heat sink. The heat sink is inundated with debris or biomass as an example versus the mitigating strategies assumption.

The discussion that we added included these three sub-bullets, that the licensee is obligated to maintain the ability to reject decay heat as described in Generic Letter 89-13.

What you see in this generic letter is a discussion of biofouling of equipment as an example. You don=t directly lose the ultimate heat sink, but you end up with problems with the safety-related heat sink because the long-term degradation of the heat sink. That=s what that generic letter spoke to.

There=s a general observation similar to what we did for low water levels due to tsunami and seiches that the FLEX equipment generally for plants rely on steam-driven systems and stored water sources for the first phase that provide additional mitigation capability.

And lastly, there was a Generic Safety Issue 153 on loss of essential servicewater in light

water reactors that looked at this specific concern. And it was resolved with no new requirements being established.

MEMBER BLEY: I=m a little confused by this one. And I haven=t studied it thoroughly.

You say undefined water quality issue. Well, if your water quality issue is such that you=re pumping water into the heat exchangers all around the plants that fouls them I=m not sure your mitigation works any longer.

Maybe you have a different scenario in mind so I=m just not completely sure about this one.

CHAIRMAN STETKAR: To kind of follow on on that I read this, and I went back and I looked at the generic letter and the generic safety issue that you refer to here.

The generic letter does address servicewater system problems affecting safety-related equipment. It focused mostly on zebra mussels and little clams, things like that, stuff that kind of grows over time and is sinister.

The Generic Safety Issue 153 focused a lot on reliability of the servicewater equipment itself, like pumps and pipes and valves.

The concern that we raised is neither of those. It is an episodic event like a landslide, like a severe storm that tears up tremendous amounts of aquatic vegetation, like stuff that delivers other fine particulates and I=ll use the term Agook@ into the ultimate heat sink which then is delivered into the plant until either heat exchangers can plug up, or are scoured, or things like that.

So we=re not talking about this slow buildup of degrading servicewater quality in the Generic Letter 89-13, and we=re not talking about pumps and pipes and valves failing as the generic safety issue.

FLEX equipment taking suction from a bunch of muck as Dennis mentioned and trying to pump through heat exchangers that are full of muck doesn=t help me an awful lot.

MR. SEBROSKY: That=s not what that second bullet is.

So, when you look at FLEX equipment similar to the discussion that we have on low water levels due to seiches or tsunamis it is the turbine-driven aux feedwater pump taking suction from tanks, or RCSI taking suction from tanks.

It is not taking suction from the ultimate heat sink as part of the first phase. That=s what we were trying to articulate.

CHAIRMAN STETKAR: Not part of the first phase. How do you get past the first phase when you start to need things like makeup for primary system leakage and things, or removal of heat from heat exchangers?

MR. SHAMS: Our assumption here is if we get a plant through the first 24 hours at this point we can ship things in. We have in place phase III. We have in place contracts to helicopter things in from three different organizations, FEMA being one -- I=m sorry, the Department of Defense, and other means.

So the focus was on can we get a plant through the first 24 hours.

MEMBER BLEY: I think for me -- maybe there=s an implicit assumption that this problem, whatever it is, in the heat sink causes the pumps that deliver that water through the plant to fail.

If that=s the case then, yes, your FLEX equipment will take care of you.

But if that isn=t the first thing that happens, and you pump stuff that=s plugged up a bunch

of heat exchangers and other things then you=ve got to do something a lot more than just hook up a new pump to it.

CHAIRMAN STETKAR: FLEX, and I=ve read the guidance a few times, explicitly presumes that you=re taking suction with the FLEX pumps from a pristine water supply, that the water is indeed clean.

We=re asking about suppose that isn=t the case.

MR. SHAMS: Right, and that was the dialogue last time. And you certainly made that point to us is don=t count on the ultimate heat sink anymore, and we=re not.

At this point we=re counting more on water stored in tanks, and condensers onsite to just get us through the first 24 hours. Beyond that there should be things being shipped to the site.

That=s a different scenario than what FLEX is designed for. And we recognize it. And the tables kind of walk you through our logic for -- we=ve done it for a few sites, but our thinking is if we=re going to go do it site by site we=ll essentially end up at the same place.

They all can survive for about 24 hours

based on stored water in different tanks and in different locations, and then we can worry about what happens after that through phase III.

CHAIRMAN STETKAR: Everything that I=ve seen about shipping stuff in from offsite looks like pumps and hoses and generators and things like that.

It doesn=t look like thousands of gallons of clean water.

MR. SHAMS: There are bladders that have that ability to deliver fuel and I=m sure we can put water in them as well.

MR. BAILEY: So, this is Stewart Bailey again.

Also, at the response centers they do have water purification units and whatnot that are able to be used.

So, one of the things -- again, I guess we=re coming back to some fundamental assumptions, and what you=re talking about in terms of debris and whatnot being pumped throughout the system, that is correct.

But mitigating strategies are designed to not use anything off that system anymore, off the servicewater system.

So, we call it loss of ultimate heat sink, but generally speaking you=re bringing in all equipment that does not rely on heat exchangers cooling off that water system.

The portable equipment is self-contained so it does not require cooling water to run it.

These are general statements. There may be some things out there where they may be a dependency that=s not coming to mind at the moment, but generally speaking that=s what you=re looking at in FLEX.

CHAIRMAN STETKAR: Everything that I=ve seen from what you just said is accurate with the exception that if I design my FLEX strategies I can and absolutely shall presume that the water source that I can hook up to is clean.

It says that the ultimate heat sink does not disappear.

MR. BAILEY: So, if we wanted to take a look at an event that was really just an ultimate heat sink event, what all of the plants have out there is they have a prioritization of water sources, cleanest to dirty, because they=re into asset preservation just like the rest of us.

So, they know that they want to start with condensate storage tank, go to DI water storage tanks, move on to other tanks, cleanest to dirty.

All of those sources can be accessed, and they have that prioritized in their procedures already.

So, really they would need to go through all of those sources before they found themselves on the ultimate heat sink.

The plants that you see going immediately to the ultimate heat sink, that is the credited source because the other tanks may not be robust to all other external events.

CHAIRMAN STETKAR: Can we please for the moment stop talking about auxiliary feedwater flow to a steam generator, and start thinking about what happens at a plant if I have no cooling water to the plant.

And I=m talking about the whole plant, not auxiliary feedwater to a steam generator under a station blackout condition.

So I=m talking about ventilation for rooms that I need to hook up electric power to. I=m talking about cooling for the main control room. I=m talking

about loss of cooling to the plant, no cool water going to the plant.

That=s not turbine-driven auxiliary feedwater to a steam generator.

Everything I hear you say is focused on feedwater to a steam generator, or RCSI supply to the reactor vessel. It=s not focused on no cooling, no heat removal from the plant.

I=m talking about no heat removal from the plant. I don=t know what ventilation is required, I don=t know what chilled water is required, I don=t know what component cooling water is required, I don=t know what inventory makeup requires. I don=t know whether my electrical systems, especially if I start to have digital systems start to overheat if I lose room cooling. That=s what I=m talking about.

MR. BAILEY: I understand, I understand. That is all looked at. So a delta there to be fair would be that much more equipment is assumed to lose power.

(Simultaneous speaking)

CHAIRMAN STETKAR: Not lose power.

MR. BAILEY: As part of FLEX. All of the temperatures throughout the building and the

survivability of required equipment is looked at, and manual actions taken to establish ventilation. That is all part of the FLEX strategies.

MR. FRANOVICH: This is Mike Franovich, JLD. If I could add to that.

So, we=re talking about room heat-up calculations, if you have sensitive equipment in the room, electrical, electronics, that is evaluated.

Licensees are -- they have done modeling, they may use a GOTHIC code, they may use other means.

If they need to take an operator action to prop open the door that may be credited as well.

But all those critical areas to support the FLEX strategies have been assessed and looked at by our audit teams.

CHAIRMAN STETKAR: I get that, to make sure that you can get through the phase I coping time so that you can then mobilize the onsite FLEX equipment for phase II, and that onsite FLEX equipment by definition can take suction from a clean water supply and restore cooling to the heat exchangers that are cooling your chilled water system, the component cooling water and everything else.

If you=re claiming that the FLEX

strategies don=t presume that that water is available I=d like to see where they don=t. Because everything that I=ve seen says that as long as we can demonstrate that the rooms don=t heat up sufficiently within our phase I coping time, and that we can remove heat from the core, and that we don=t have a big enough seal leakage if it=s a pressurized water reactor, or other sources of leakage, then we have adequate time to mobilize our FLEX equipment.

And that FLEX equipment can then provide pumping capability to restore the cooling.

MR. BAILEY: So, the FLEX pumping equipment rarely goes back and gets you -- I=m not going to say never because there are a few unique reactor designs like a Mark 3 BWR that do go to get more cooling for different reasons.

But generally speaking, no, there is no credit taken for the room cooling other than opening doors and installing fans, et cetera.

The GOTHIC analysis on temperature and heat-up, et cetera, is taken out through phase II, well into phase III. Either done for indefinite or at least for several days, giving some credit to the emergency response organizations to be able to recover

from some of that.

The licensees going through and looking at what is the sensitive equipment in each of the rooms, and they have heat-up calculations for each of the rooms, they have proceduralized actions to maintain those rooms in a condition so that we have confidence the equipment will continue to function.

Earlier when I said, you know, it really is a loss of ultimate heat sink. Normal access for an extended period.

CHAIRMAN STETKAR: Okay. Part of our problems -- I understand what you=re saying, but part of our problems is we=ve seen precisely zero of the FLEX strategies.

So, the only thing that I have to go on is what I read in guidance and what I=ve heard people say.

MR. BAILEY: That=s fair, that=s what -- we=re so close to it --

CHAIRMAN STETKAR: You are. And part of being close to it also is you get into certain FLEX design scenarios that I=m trying to pull you back from a little bit.

Because when you=re doing this type of

screening assessment -- pull us way back to what we=re doing.

We=re trying to do a screening assessment to say are there any other types of external hazards that could be of concern.

And you=re trying to make a determination, you told us at the last meeting, that no site has that type of vulnerability. And that=s a pretty high bar.

So, what I think we=re -- or me in particular anyway is trying to do is to probe how deeply you=ve thought about that screening, and what sort of basis do you have to reach the conclusions.

And that=s why I=m bringing up these scenarios. Like, have they thought about room cooling. Have they thought about fouling of heat exchangers such that any number of pumps aren=t going to deliver sufficient cooling water flow, given whatever environmental conditions are out there and where they=re trying to take suction from.

MR. SHAMS: When we tried to solve the problem as you presented to us last time around we were not thinking of some sort of an intermediate bounding condition where you have some power but not all power, you have some systems clogged up but not

all.

We just basically said I=m in a situation where I have to use FLEX, but by the way, my right arm is now tied behind me, it goes dead. The ultimate heat sink is not available so what are you going to do?

And we went through that for about 20 plants as you see in Appendix B. And at this point, again, that was predicated by the tsunami and the seiche, but nonetheless the ultimate point is the same.

And we felt that we were able to go through that and come up with a compelling argument that these sites can survive for 24 hours, and then at this point we can start relying on the phase III of the FLEX.

And from there you can see our statement is it is reasonable to assume that if we continue to do that for the remaining 40 sites we=ll get to the same place. Maybe, maybe not. Twenty sites is a good sample for what the fleet has to offer. Twenty sites is a reasonable sample.

CHAIRMAN STETKAR: Okay. We need to keep going, because believe me, I have a lot of questions

on the downstream dam failures. I=d really like to finish absolutely no later than 7 o=clock, hopefully by 6:30.

MR. SEBROSKY: The next issue that was identified in the agenda and the ACRS letter is intake air quality.

We added a discussion in Appendix A based on a comment. And what we said is we did additional searches of the operational experience databases to see if we could find examples of intake air quality causing problems at nuclear power plants.

We did find multiple examples of component failures, mostly breakers that were due to dirt, grime and dust buildup on contact surfaces. And the root cause was ineffective maintenance.

We did not find any cases where the malfunction of the component was caused by an extreme environmental condition, a dust storm coming through or something of that nature.

And similar to the argument that we used for the ultimate heat sink we added a discussion that mitigation strategies capability does provide additional considerations.

It=s the same argument that we just talked

about, and I understand there=s concerns with that argument.

The volcanic ash, this was an issue that was requested that we brief you on. It was identified in the letter that goes with SECY-16-0074.

We added a discussion in Appendix A based on the comment. We reviewed -- the staff=s review focused on volcanic ash based on the proximity to the volcano to the site at Columbia.

There=s other concerns with volcanos, including things like toxic gas, that kind of -- mud slides, that kind of stuff, those kinds of results.

But the site, Columbia, is 165 kilometers east of the nearest active volcano. And what we determined is that we weren=t worried about toxic gases because of that, but we were concerned about ash fall.

So, the final safety analysis report does describe a design basis ash fall. It talks about the emergency diesel generators, the safety-related emergency diesel generators having pre-filters.

There was a recent inspection report that=s referenced in Appendix A that notes the design basis for the site including those pre-filters and

identified an issue that the licensee was not storing those pre-filters and sourcing those pre-filters correctly.

We also added a discussion about the results of this review of the procedure. And the procedures referenced in the document. It is titled Ash Fall.

And it is a broad procedure that incorporates design basis considerations and beyond design basis considerations. It=s been updated to reflect FLEX equipment.

What that procedure directs or has a goal is that the plant is shut down before the ash fall reaches the site, or as soon as possible thereafter.

It talks about warnings that the site expects to receive in the event of a volcanic event near the site.

The diesel building, servicewater building and reactor building -- this is all part of the design basis -- have filters and HVAC alignments to ensure that the supported systems required to attain and maintain cold shutdown remain available through the ash fall event.

So, what you see in the procedure is the

installation of the pre-filters if there=s a volcanic ash event. You see the servicewater building and reactor building going on internal circulation so that the HVAC system -- so they minimize the amount of air intake from outside, and minimize ash fall contamination inside those buildings. That=s part of the design basis.

That design basis was reviewed and updated as a result of a Mount St. Helens eruption. And there=s a discussion in licensee=s IPEEE on the changes that they made to the site to make it more robust to handle higher ash fall events that were -- than that that were originally assumed in the original design basis.

The next bullet is the FLEX diesels have provisions for the addition of oil bath pre-filters for protection against the ash fall events. And I=ll go to the next slide.

These pre-filters are -- what the ash fall event procedure has you do is protect the design basis equipment, the safety-related equipment by doing what I said, install pre-filters, put the buildings on internal recirculation.

And then it directs that the licensee also

go out and install these oil bath pre-filters on all the FLEX diesels, the two diesels, including a fire truck that is meant to be portable that=s at the site -- was at the site mainly for response to B.5.b requirements.

So, if there is a diesel for beyond design basis capabilities it does not normally have these oil bath pre-filters installed, but the procedure directs you to do that.

The oil bath pre-filters, the design is for diesel generators in high dust environments. And what this slide attempts to do is just show you a picture of what the pre-filter is.

So, the procedure would direct the licensees to install the pre-filter on the air intake. The air comes in from the top and exits from the side.

They install flexible hosing to attach it to the intake of the diesel generator. Air enters through the top, through centrifugal action. Dust is removed, and then it goes through an oil bath. There=s oil down here. Ten quarts of oil is what most of these pre-filters discuss.

The air entrains the oil and it goes

through this filter mechanism, and the debris that is entrained, the particulate that=s entrained in the oil falls back into this tub down here. So, dirty air enters, cleaner air exits.

The procedures also direct that the licensees change out the oil bath on a periodic basis, and increase that periodic basis if needed depending on the ash fall event.

They suggest in the calculations that it would take 15 seconds to change out the oil. What it involves is having a cup, this is a cup for lack of a better term, and it=s filled with 5W30 oil, up to 10 quarts.

So, you secure the diesel. You have a cup standing by with 10 quarts of clean oil. You break these connections here, take this cup out with the dirty oil with the volcanic ash in it and replace it with the clean oil.

So, the volcanic ash -- there=s a design basis for the volcanic ash. There is also a beyond design basis capability that is discussed in Appendix A.

And if you go back to the conclusion that additional actions beyond those associated with

mitigating strategies are not warranted for volcanic ash at Columbia, that was our conclusion.

CHAIRMAN STETKAR: Joe, the discussion of the filters helped me a heck of a lot.

The things that I stumbled on, quite honestly, at first, and they=re still in Appendix A. Appendix A doesn=t contain this level of information. It just says the diesels have filters. Okay.

Initially I stumbled across this notion of the presumed duration of the ash fall event -- and this is in Appendix A -- is 20 hours with 2 hours where offsite power is lost. And that led me to raise the initial question.

I now understand that those may be somehow design basis numbers, and I don=t particularly care how they were derived as long as I can actually -- as long as I can align those three buildings that you mentioned on internal ventilation recirculation flow and provide diesel generators with these types of filters such that they can keep running for an extended period of time, and I can change out those filters. And I have procedures and I know how to do that.

That to me is good documentation. So I

appreciate that.

I learned pretty much everything to support my conclusion today in the meeting. I didn=t learn it through what=s in Appendix A. So you may want to beef up especially the discussion.

The two compelling things to me were recirculation of the ventilation for the three buildings that you mentioned, and -- obviously I can recirc the main control room there also because everybody can -- and how indeed I can have assurance that the things that look like diesel generators, or gas turbines, or whatever they=re going to use can stay running, that indeed the filters are not just something that=s going to clog up in three hours because somebody has assumed two hours was long enough.

MR. SEBROSKY: So the oil bath pre-filters are on FLEX equipment.

CHAIRMAN STETKAR: Right.

MR. SEBROSKY: It is not -- there=s dirty filters on the diesel generators that need to be changed out in the ash procedure.

CHAIRMAN STETKAR: So indeed the onsite standard emergency diesel generators might choke and

fail. But that=s part of the design basis for FLEX and as long as I can have confidence that whatever the FLEX equipment is can get connected and will stay running I=m okay.

MR. SEBROSKY: Okay, so that=s the volcanic ash. And the next topic is downstream dam failure.

CHAIRMAN STETKAR: And before we do this, because I know that your slides are for public consumption. I know very quickly that my questions are going to tread on things that are in the restricted material.

I think it would be prudent to close the whole discussion of downstream dam failures. Because everything in your slides is indeed in the white paper, so we=re not discussing anything that isn=t there.

Before we do that though I do need to ask for public comments before we close the meeting, the portion of the meeting for downstream dam failures.

Actually, that=s a good point, Dennis. I don=t know whether you want to jump to your final, final slide, number 19 on the public record.

I=m just concerned that once we get into

the downstream dams it=s going to be so difficult to have the discussion that it would be easier to just close that whole portion.

But if you do want to make the conclusion, and you=re right, we can go around the table.

MR. SHAMS: Okay, I guess it=s me. So this was just our slide, you know, considering that we=ve gone through the different questions that you had asked us.

I think this was the Robinson slide.

MR. SEBROSKY: So, I=ll just interject real quick. I apologize.

CHAIRMAN STETKAR: I=m sorry to do this.

MR. SHAMS: I=m looking at the slide, it=s not that slide. So something happened between the slides and what=s on the screen.

MR. SEBROSKY: So what happened is we added a conclusion slide. So, slide 18 is the downstream dam failure summary conclusion. That=s slide 18.

MR. SHAMS: Okay, I see.

MR. SEBROSKY: Slide 19 is an overall conclusion for the white paper. And it was thought at the end of the meeting we wanted to come back and

touch base, and basically indicate that we believe the white paper, the statement is the white paper provides the staff=s preliminary conclusion, provides the basis, that additional regulatory action to address natural hazards other than seismic and flooding is not warranted.

And it=s based on two parts. It=s based on the high wind and snow evaluation that=s in the white paper. And it points back to the SECY-16-0074 dispositioning all the other events.

The other parts of this meeting, we talked about the other remaining -- the two other remaining tier 2 and tier 3 activities. We proposed to resolve the periodic confirmation of natural hazards based on the process that=s outlined in the white paper, and that we believe our preliminary conclusion is there is not a basis for requiring realtime radiation monitoring onsite or within the EPZ.

The next two bullets just talk about the next steps in the process. The Commission directed us to provide our evaluation of all three of those topics by the end of the summer.

We=ve had public meetings on all three of those topics. We=ve incorporated comments for two out

of the three topics.

You heard Aida discuss that we=re still addressing comments on the periodic confirmation of natural hazards based on the September 28 meeting.

So, you have one enclosure that=s going to be updated to reflect public comments and industry comments from the September 28 meeting.

The other two enclosures would be -- the plan is to update those to address ACRS comments. We believe that the -- we=re tentatively scheduled to talk to the full committee in the December time frame to support issuance of the SECY paper by the end of December 2016. So, that=s the plan.

CHAIRMAN STETKAR: Okay. Let me just ask you in terms of planning, and that=s accurate to my understanding.

As a result of some of the discussions we=ve had today, especially regarding the justification for the high winds and snow loading I think we need to stay in contact to see if you may want -- if you plan to make any changes to that enclosure of the closeout.

If you don=t, that=s fine. If you do, then it depends on timing of when you want to come to

the full committee with it. Recognizing I know what your commitments are.

Now, two things that I need to do on the public record.

First of all, what I=d like to do is ask if there=s anyone in the room who would like to make a comment, come up to the microphone and do so.

We=re successfully outlasting anybody in the room.

We=ll make sure that the public line is open, and I hear that it is. So if there=s any member of the public on the line who would like to make a comment please identify yourself and do so.

MR. LEWIS: Marvin Lewis.

CHAIRMAN STETKAR: Hello, Marvin.

MR. LEWIS: Yes, I=ve been listening and I=m pleased that you=re talking about these many situations that can occur and may not have been fully addressed, or addressed at all.

However, there is a little problem that I=d like to point out. Unhappily I=m not that fully versed in it, and I=m not pointing it out as a member of Three Mile Island Alert which I am not.

But they seem to have had a problem much

the same as I have had. Namely, comments go into regulations.gov and disappear.

Specifically this is when they were requesting greater security on Three Mile Island, on the actual Three Mile Island approach.

And it wound up that not only did their comments disappear, but they were lost in a sort of big way, namely that there=s even less security now on the approach to Three Mile Island.

And that=s just my comment. What happens when we try to communicate with the NRC and it doesn=t get through?

When the public tries to communicate something to the NRC and it just doesn=t get through. What can we do?

CHAIRMAN STETKAR: Thank you, and sir, you know, we don=t answer anything and that question is not necessarily to the ACRS anyway. But you are certainly on the record for this meeting and I appreciate that.

Are there any other members of the public who would like to make a comment?

Hearing none, while we=re still on the public record is as we usually do go around the table

and get any final comments that any of the members may have.

Mike Corradini, hold on for just a second because Joy is trying to get out of the room. So, Joy, you can go first.

MEMBER REMPE: Thank you. I did have a question. You=ve mentioned updates, and earlier today we talked about updates that I believe the staff is already doing on periodic reporting. How do you say that word, periodicity? Periodicity. That=s what I=m trying to say.

And so if there=s an update coming out I=d like to see this as you provide us additional documentation. Thank you.

And thanks for everybody=s presentations and your hard work.

CHAIRMAN STETKAR: Thank you. Now, Dr. Corradini, so I don=t forget you.

MEMBER CORRADINI: That=s right. I know you think I=m forgettable. That=s fine.

CHAIRMAN STETKAR: No, no, no, no.

MEMBER CORRADINI: Okay. I don=t really -- John, you=ve been as usual quite comprehensive in your inquisition of the staff.

I want to get something clear about timing because it seems to me that given what you=re asking about clarification on explanation of their deterministic analysis that they may have to revise some pieces of the white paper.

And you have scheduled, again, the rulemaking subcommittee on November 16. Is the subject there a revisit of this if there=s changes?

CHAIRMAN STETKAR: No. For clarification the November 16 subcommittee meeting does not address, and anything that we=ve discussed this afternoon is completely irrelevant to that meeting.

November 16 is strictly the rule language itself, 10 CFR 51.55 and the three associated reg guides, 1.226, 1.227, 1.228. So anything this afternoon is not on that part of the agenda.

MEMBER CORRADINI: Okay. So back to the staff. I didn=t get a clear indication from the staff if they are prone to leave things stand as they are given our, your comments. Or are they thinking of some sort of rewrite that would require us to look at it again. And that=s to the staff.

I guess they can=t decide at the moment, but I=m curious what their feeling is.

MR. SHAMS: My personal opinion is I don=t believe that the comments we received are that challenging. I thought they were constructive and there is room for us to improve the paper and make certain updates of our red curve versus the blue curve. I don=t see that as very challenging to us.

MEMBER CORRADINI: So, being able to get things back to us to look at prior to the December full committee.

MR. SHAMS: We can make an effort to do that, yes.

MEMBER CORRADINI: Okay.

MR. SHAMS: At a minimum the paper itself, we can share with you the paper itself, or the update of the paper itself. And then we=ll decide if you want to meet with us again.

MEMBER CORRADINI: Okay. All right. That=s it, John. I don=t have anything else technical to ask.

But I again appreciate the staff taking the enormous amount of time trying to explain the details to us, to you.

CHAIRMAN STETKAR: Thank you. Walt?

MEMBER KIRCHNER: Just a question and

clarification of the staff. Are you going to then in the tornado and hurricane automobile missile evaluation drop the -- it=s the American Society of Civil Engineers 7 and the 5.9E-4.

Are you going to take that out of your analysis, or are you going to replace that with some other evaluation?

MR. SHAMS: My quick feel at this point is we=ll see what the NUREG/CR-7005 offers and if it=s simple enough we can swap them.

The point is still made at the end that there is margin built in there, and we=ll reemphasize the fact that these are rare events. We can go back with that.

CHAIRMAN STETKAR: Jose?

MEMBER MARCH-LEUBA: I don=t have any comments.

CHAIRMAN STETKAR: Dennis?

MEMBER BLEY: Only that this was a very helpful meeting for me and thanks to the staff. Nothing more.

CHAIRMAN STETKAR: Matt?

MEMBER SUNSERI: Thank you for the presentations. No other comments.

CHAIRMAN STETKAR: Dick?

MEMBER SKILLMAN: Thank you, gentlemen, for your presentations and for your extraordinary amount of work. This has not been easy so salute to what you have done.

MR. SHAMS: Thank you.

MEMBER SKILLMAN: Please let me assert my request that you reconsider in enclosure 2 of the white paper at page 7 reintroducing some -- Acommitment@ is too strong a word, but some addition that recognizes the original NTTF recommendation was for a periodic review.

I just urge that you consider retaining the spirit of that recommendation. Let me be quick to say a review at some frequency could be as simple as we have reviewed the underlying natural phenomenon and find no reason to update any of the information, period.

So, I=m not suggesting that this needs to be a painful or arduous task, but that there be some form of accountability, that the record shows that there has been a periodic review that is responsible and that some man or woman is accountable to do that. Thank you.

MR. SHAMS: Thanks for the comment.

MR. CAMPBELL: We appreciate that comment and we certainly will see how we=re going to -- given that it also came to us at a public meeting.

MEMBER SKILLMAN: Thank you.

MR. SHAMS: One item, and I know it was shared with you earlier today, but I=ll just reiterate it again.

There is a layer of additional guidance to the staff on how to carry forward that 2.2 recommendation. The white paper was the concept, and there has to be an implementation procedure to go with it.

So, certainly there=s room to consider your comments in that procedure for us.

MEMBER SKILLMAN: Thank you, Mohamed. Thank you.

CHAIRMAN STETKAR: Harold.

MEMBER RAY: Nothing more. Thank you.

CHAIRMAN STETKAR: Ron.

MEMBER BALLINGER: I=d like to reiterate what Dick was saying. There=s a big difference between knowing that there=s a little deadline that you have to meet and you have to produce a document,

and saying that you=re going to do an internal review. The way I operate, I need prodding. And so I think that putting something in writing that gives you a little prod. Maybe it=s a short document in this sense, but it forces somebody to actually engage.

MR. SHAMS: Thank you.

CHAIRMAN STETKAR: Thank you. And in closing, thanks a lot. You covered a heck of a lot of ground. We=re still going to go on this afternoon for a little while, but I really appreciate the effort that you=ve put together to present all of these topics. I learned some things this afternoon orally that I couldn=t divine from the words. And I do, despite how caustic and critical I might sound I really do appreciate the effort that you put in.

MR. SHAMS: We appreciate the feedback, certainly. And the dialogue in our opinion was very constructive and very beneficial. And that=s why we=ll take it back, we=ll look at where we can improve the paper further. But it was a massive undertaking for us to look at every plant for every potential hazard other than seismic and flooding. I mean, this man just -- he just kept on pushing the rock up the hill every day.

CHAIRMAN STETKAR: I mean, obviously there was a heck of a lot of effort put into that. And probably more than you expected when you first launched into it. So I really appreciate that.

With that, what we will do is we will go off the public record into closed session. I will ask if there is anyone in the room -- we need to close the outside line completely.

(Whereupon, the above-entitled matter went off the record at 6:00 p.m.)

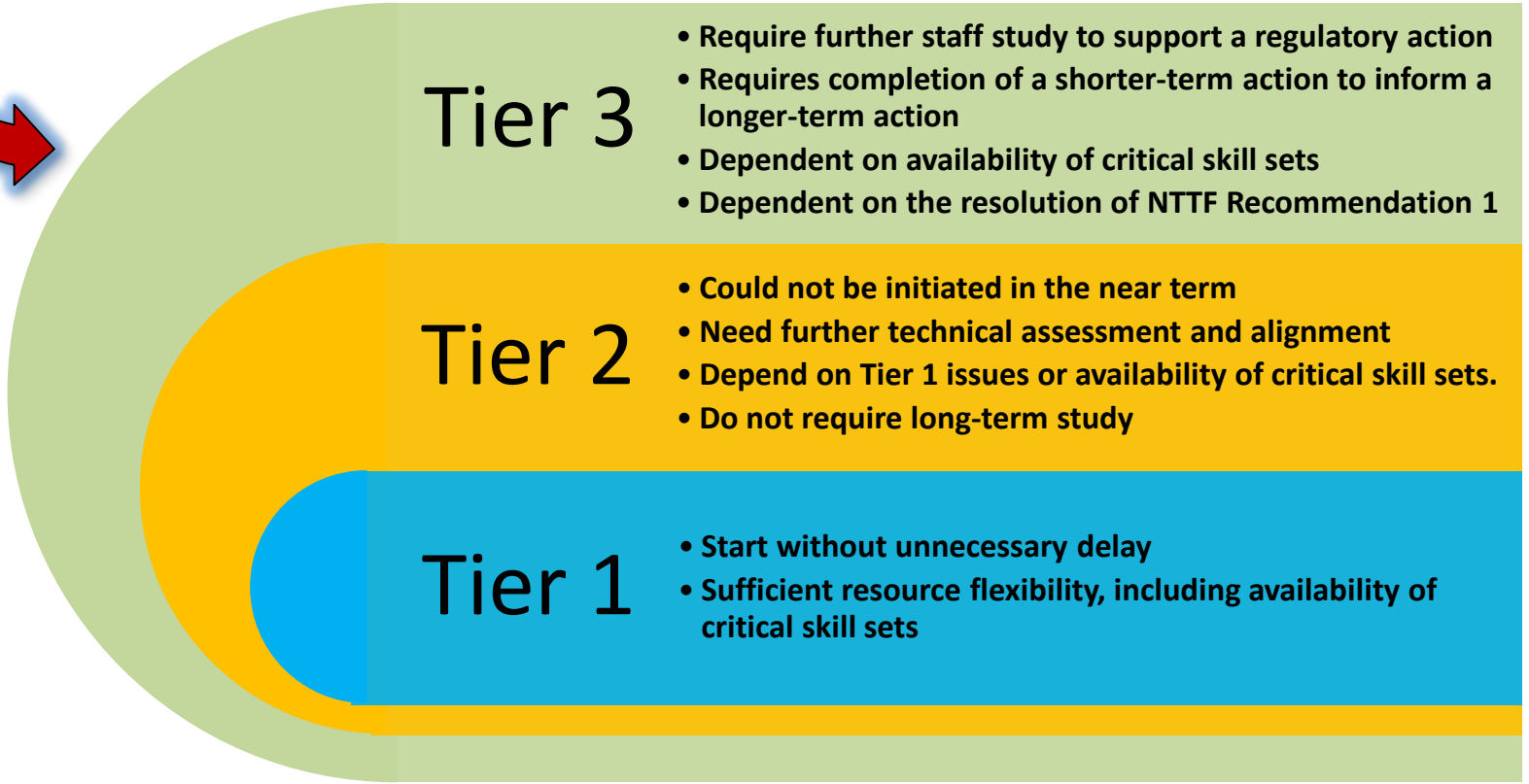
Resolution of Group 3 Tier 2&3 Recommendations

ACRS Fukushima Subcommittee Meeting
October 19, 2016

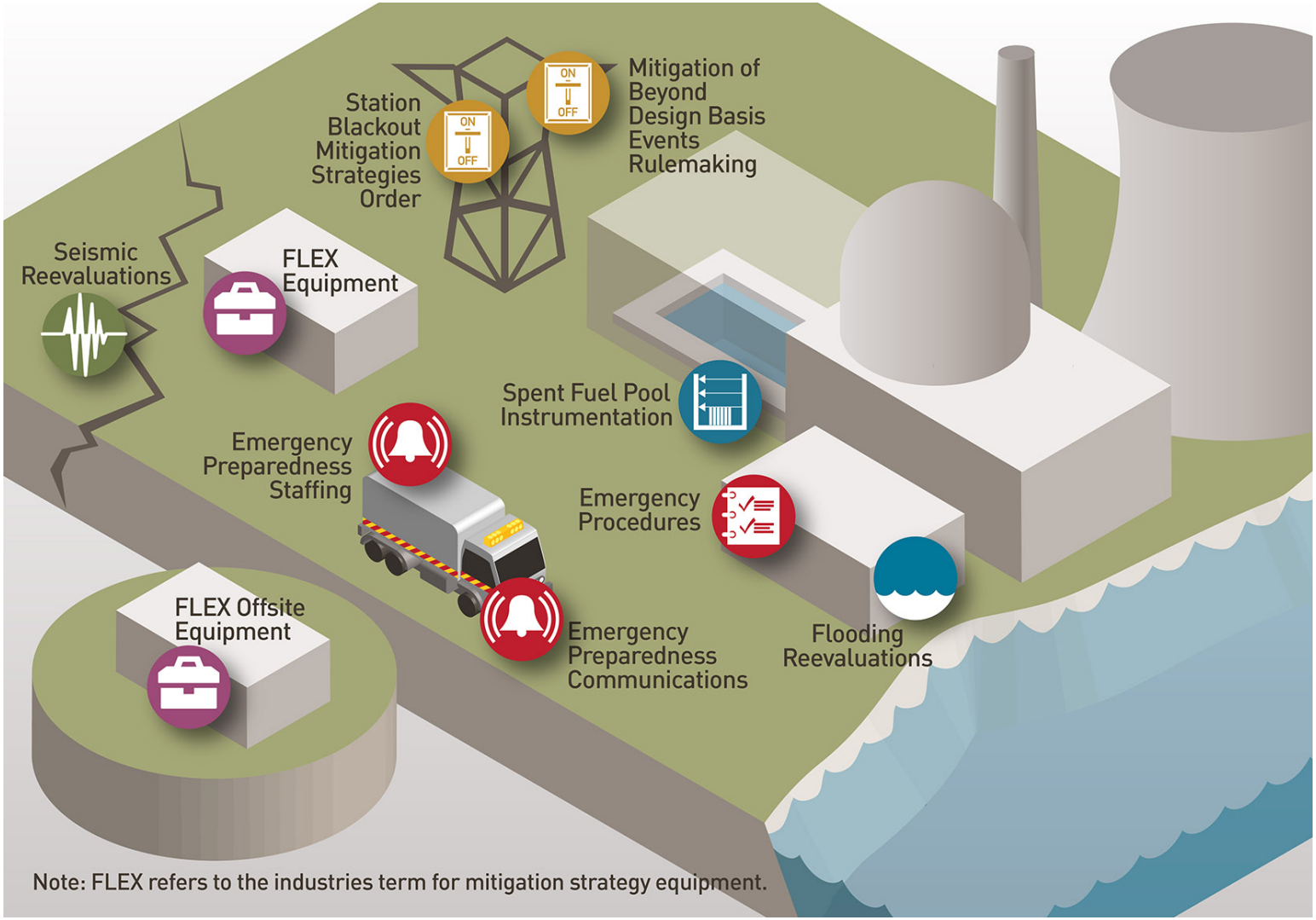
Mike Franovich – Japan Lessons Learned Division, NRR

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



A Comprehensive Approach

	Recommendation	Status
Ensuring Protection from External Events	2.1 – Reevaluation of seismic & flooding hazards	Ongoing
	2.2 – Periodic reconfirmation of hazards	Ongoing
	2.3 – Seismic & flooding hazard walkdowns	Resolved
	3 – Mitigate seismically-induced fires and floods	Resolved
	Other – Reevaluate other external hazards	Ongoing
Enhancing Mitigation of Beyond-Design-Basis Events	4.1 – Mitigation of beyond design basis events rulemaking*	Ongoing
	4.2 – Mitigation of beyond design basis events order	Ongoing
	5.1 – Severe accident capable hardened vents order	Ongoing
	5.2 – Vents for other containment designs	Resolved
	6 – Hydrogen control and mitigation	Resolved
	7.1 – Reliable spent fuel pool instrumentation	Ongoing
	7.2- 7.5 – Spent fuel pool water makeup capability*	Ongoing
Strengthening Emergency Preparedness for Multi-Unit Events	8.1-8.4 – Onsite emergency response capabilities*	Ongoing
	9.1-9.4 – Rulemaking to enhance emergency plans*	Ongoing
	10.1-10.2 – Analyze and evaluate other EP considerations*	Ongoing
	10.3 – Evaluate ERDS capabilities	Resolved
	11.2&11.4 – Decision-making and public education	Resolved
Regulatory Philosophy	1 – Reassess regulatory framework	Resolved
	12.1 – Include defense in depth requirements within ROP	Resolved
	12.2 – Enhance staff training on severe accidents & SAMGs	Resolved
Radiological Consequences	11.3 – Real time radiation monitoring within EPZ	Ongoing
	Other – Containment vent filters/filtering strategies	Resolved
	Other – Expand EPZ size beyond 10 miles	Resolved
	Other – Pre-stage KI to residents beyond 10 miles	Resolved
	Other – Expedited transfer of spent fuel to dry storage	Resolved

*Integrated into MBDBE rulemaking due by end of 2016

Remaining Tier 2 and 3 Items

- September 22, 2016, white paper issued with staff's preliminary assessment of remaining Tier 2 and 3 items (ADAMS Accession No. ML16230A384)
  - Periodic confirmation of natural hazards
  - Real time radiation monitoring
  - Assessment of natural hazards other than seismic and flooding
- Staff targeting issuing SECY paper by the end of December 2016

Resolution of Recommendation 2.2

Periodic Confirmation of Natural Hazards

Andy Campbell – Division of Site Safety and Environmental Analysis, NRO

Periodic Confirmation of Natural Hazards Background

In developing SECY-15-0137, staff considered three options to address NTTF R2.2:

1. Undertake rulemaking
2. Maintain status quo
3. Enhance existing processes to yield proactive approach [recommended/approved approach]

"Staff proposes to leverage and enhance existing NRC processes and programs to ensure that information related to external hazards is proactively and routinely evaluated in a systematic manner."

Periodic Confirmation of Natural Hazards Key Messages

- Complements existing processes for evaluating new information
  - Proactive
  - Systematic
  - Timely/efficient
  - Predictable
- Leverages existing agency capabilities
  - External hazards center of expertise
  - RES external coordination activities
  - Knowledge base (e.g., info from R2.1 and new reactor reviews)
- Seeks, aggregates, and interprets new information related to external hazards
- Assesses the potential effect of new information on plants and defines issues requiring further action
  - Generic Issues Program
  - Research Activities
    - Hazard-Specific User Needs to RES
    - Research Program
  - Plant-specific action

Periodic Confirmation of Natural Hazards - Key Elements

Knowledge Base Activities

- Compiles and organizes existing info/tools (e.g., from R2.1 and new reactor reviews)
- Incorporates new info/tools (e.g., from R2.2 or other regulatory activities)

Active Technical Engagement and Coordination

- Periodic engagement with external organizations (e.g., federal partners, industry, international counterparts) as well as scientific and technical communities
- RES and COE coordinate to identify key focus areas and reflect in RES Plans

Assessment Activities

- Collects and integrates new information
- Assesses whether new/aggregated information has a meaningful effect on site hazard
- [If needed] Refers the issue and associated analyses to appropriate regulatory process
  - Transfer to program office for action
  - Transfer (well-defined) issue to GI Program
  - Additional study via hazard-specific User Needs to RES

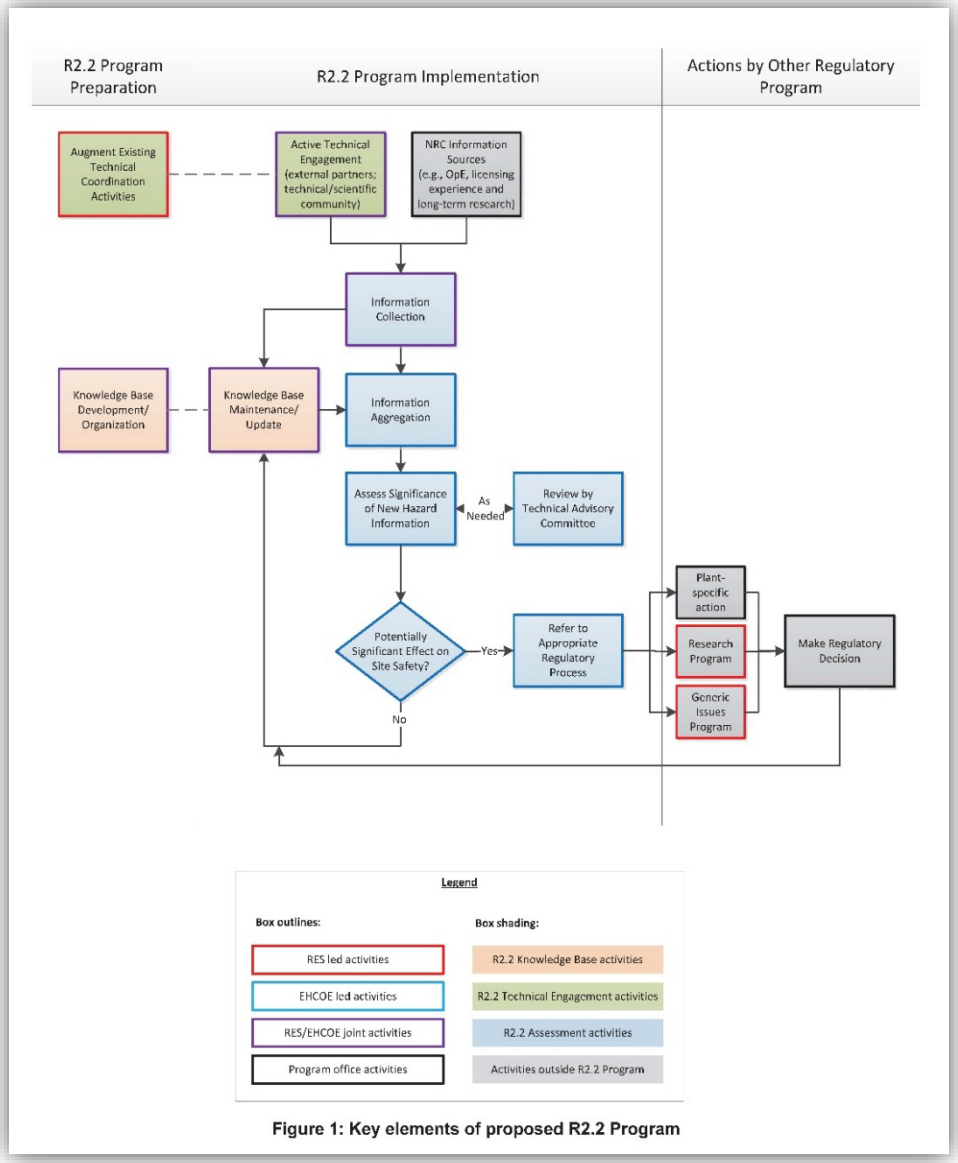


Figure 1: Key elements of proposed R2.2 Program

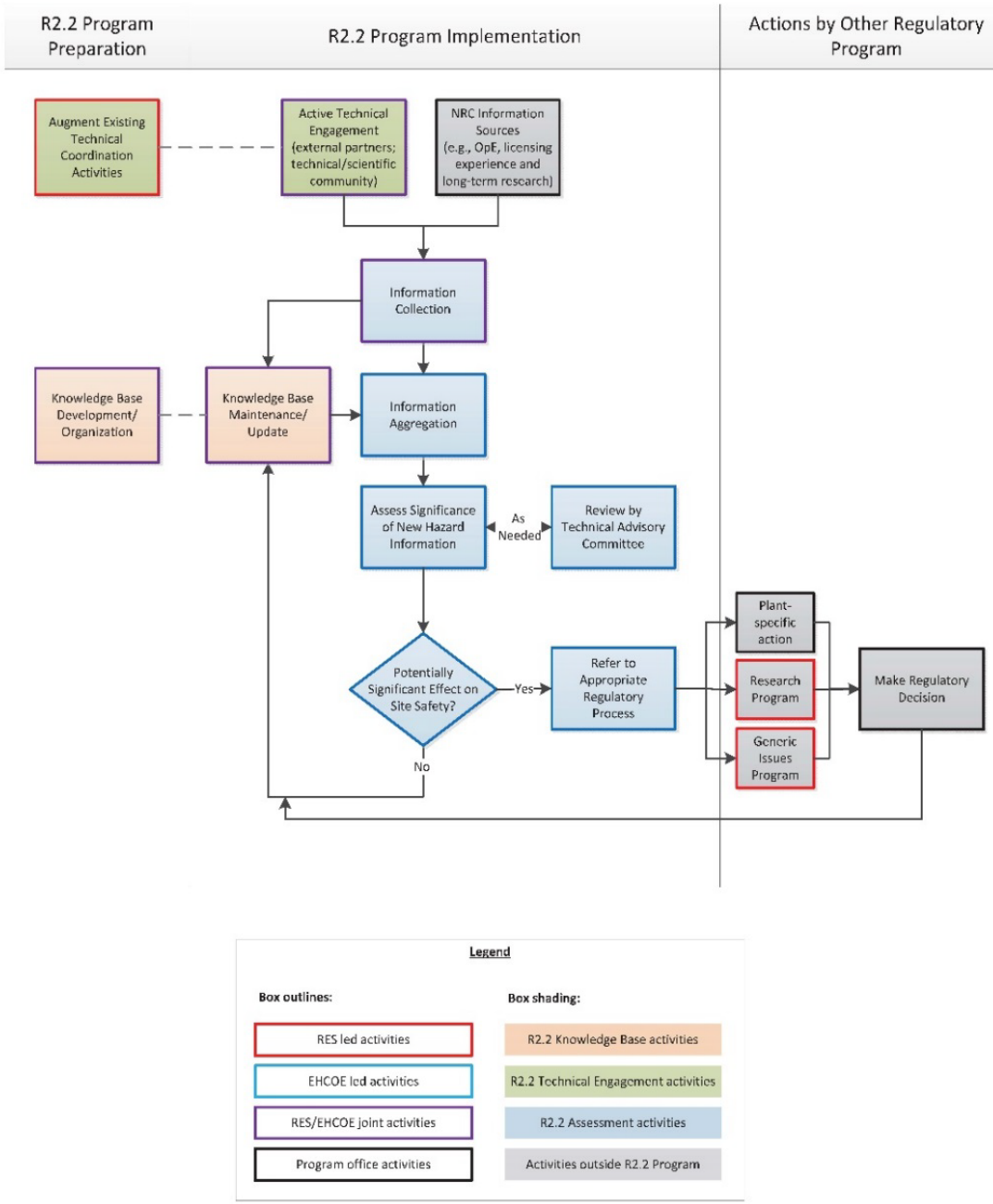


Figure 1: Key elements of proposed R2.2 Program

Periodic Confirmation of Natural Hazards Summary

- **Key Messages**
  - Complements existing processes for evaluating new information
  - Leverages existing agency capabilities
  - Proactive, predictable, and stable process
  - Remove unnecessary burden on licensees

Backup Slide

Status Summary of Tier 2 and 3 Recommendations

Resolved

3	Enhanced capability to prevent/mitigate seismically-induced fires & floods
5.2	Reliable hardened vents for other containment designs
6	Hydrogen control and mitigation inside containment or in other buildings
9.3	ERDS capability throughout accident (partial)
10	Additional EP topics for prolonged SBO and multiunit events (partial)
11	EP topics for decision-making, radiation monitoring, and public education (partial)
12.1	Reactor Oversight Process modifications to reflect Defense in Depth framework
12.2	Staff training on severe accidents and resident inspector training on SAMGs
-	Expedited transfer of spent fuel to dry cask storage
-	Revisit emergency planning zone size & pre-stage potassium iodide beyond 10 miles
-	Reactor and containment instrumentation
7.2 – 7.5	Spent fuel pool makeup capability
9.1/9.2	EP enhancements for prolonged SBO and multiunit events
9.3	Emergency preparedness (partial)
9.4	Improve ERDS capability
10	Additional EP topics for prolonged SBO and multiunit events (partial)
11	EP topics for decision-making, radiation monitoring, and public education (partial)
-	Reevaluation of external hazards other than seismic and flooding
2.2	Periodic confirmation of external hazards
11	EP topics for decision-making, radiation monitoring, and public education (partial)

Closed | Subsumed in Tier 1 | Further Assessment

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

NRC Staff Preliminary Assessment of Real Time Radiation Monitoring

ACRS Fukushima Subcommittee Meeting
October 19, 2016

Steve Lavie
Senior Emergency Preparedness Specialist
Office of Nuclear Security and Incident Response

NTTF Recommendation 11.3

Study the efficacy of real-time radiation monitoring onsite and within the EPZs (including consideration of AC independence and real-time availability on the Internet)

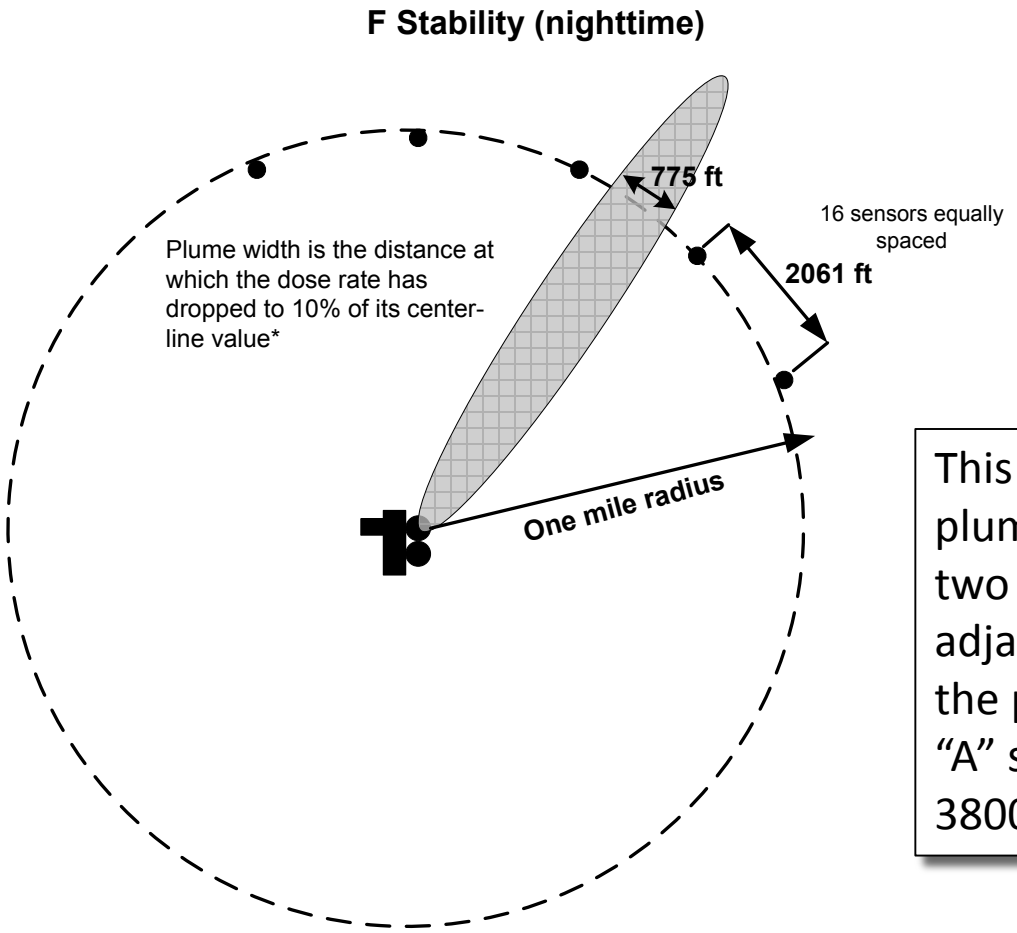
FSEM = Fixed Station Environmental Monitors

Study Focus

- Currently available post-accident radiological monitoring capabilities
- General regulatory overview and relevant emergency preparedness regulations
- Regulatory actions on radiation monitoring post-TMI
- The 1982 assessment of FSEMs
- Review of a sampling of FSEM installations
- Fixed station environmental monitoring in Japan
- Public protective action recommendations in the United States
- Protective action recommendations in Japan

Study Conclusions

- The existing means of radiological monitoring and assessment are adequate to support protective action recommendation (PAR) decisions.
- FSEMs are unable to provide reliable indications of the dose under all conditions.
- Making FSEM data public will not enhance the ability of public officials to implement effective public protective actions.
- Of the licensee, and State and local officials maintaining existing FSEM systems at a total of ten sites, none makes the data publically available on a real-time basis.
- The absence of FSEMs would not preclude issuance of protective action recommendations, since in U.S., initial PARs are based on plant condition rather than radiological assessments.
- No substantial increase in the protection of public health by requiring FSEMs



This diagram shows how a plume could transit between two FSEMs and for both of the adjacent monitor not to indicate the plume centerline value. For "A" stability, the plume width is 3800' ft.

* eq. 3-35.6 "Meteorology and Atomic Energy"

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Protecting People and the Environment

Resolution of Group 3 Tier 2&3 Recommendations Other Natural Hazards Task 3 and 4 Activities – High Winds and Snow Loads

ACRS Fukushima Subcommittee Meeting
October 19, 2016

Mohamed Shams – Deputy Director, Japan Lesson-Learned Division, NRR
Joe Sebrosky – Japan Lessons Learned Division, NRR

Japan Lessons Learned

U.S.NRC
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Protecting People and the Environment

Resolution of Group 3 Tier 2&3 Recommendations
Other Natural Hazards - Task 1 and 2 Activities
ACRS Fukushima Subcommittee Meeting
October 19, 2016

Mohamed Shams – Deputy Director, Japan Lessons-Learned Division, NRR
Joe Sebrosky – Japan Lessons-Learned Division, NRR
Martin Stutzke – Senior Technical Advisor – Probabilistic Risk Assessment, NRO/DSRA
Selim Sancaktar – Probabilistic Risk Assessment Branch, RES

Background

- SECY-16-0074 provided staff assessment of natural hazards other than seismic and flooding
  - Provided results through task 2
  - Items to be discussed
    - Analyses of seiches and tsunamis
    - Ultimate heat sink water quality - introduction of large amounts of debris
    - Intake air quality for ventilation and combustion air systems
    - Columbia analysis of the effects from volcanic ash
    - Downstream dam failures - analyses performed to support resolution of the proposed Generic Issue
  - Slides do not contain security-related sensitive unclassified non-safeguards information (SR-SUNSI)
    - Portions of the Columbia and downstream dam failure analysis discussion maybe closed based on ACRS questions

Background

- Other natural hazards assessment timeline
  - November 4, 2015, SECY-15-0137 issued (ADAMS Accession No. ML15254A006)
  - April 21, 2016, staff met with ACRS Fukushima Subcommittee to discuss content of white paper on other natural hazards
  - May 5, 2016, ACRS Full Committee meeting
  - May 17, 2016, ACRS letter (ADAMS Accession No. ML16130A254)
  - June 2, 2016, SECY-16-0074 issued (ADAMS Accession No. ML16102A297)
    - Appendix D provides disposition of comments including those found in May 17, 2016, ACRS letter

Low Water Conditions due to Seiches or Tsunamis

Low water conditions due to a seiche

- Staff addressed 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, Chesapeake Bay, and Atlantic Coast 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
- SECY-16-0074 Conclusion
  - Additional regulatory action to address seiche not warranted

Low Water Conditions due to Seiches or Tsunamis

Low water conditions due to a tsunami

- Evaluation added for low-water level conditions due to tsunami added to Appendix B of SECY-16-0074
- Assumes tsunami trough arrives before peak wave
- Low water level conditions due to tsunami evaluated for each coastal site
  - Dispostioned as either
    - not being applicable to the site (e.g., safety related heat sink is a cooling pond not susceptible to mechanism)
    - Safety related ultimate heat sink pumps not susceptible to damage from this mechanism

Ultimate Heat Sink Water Quality

- Added discussion in Appendix A of SECY-16-0074 based on comments
- Staff evaluated scenarios involving the hypothetical loss of the heat sink (e.g., inundated with debris or biomass) versus mitigating strategies assumptions
  - Licensee's obligated to maintain the ability to reject decay heat as described in Generic letter 89-13, "Service Water System Problems Affecting Safety-Related Equipment"
  - Mitigation strategies FLEX equipment generally rely on steam driven systems and stored water sources for the first phase
  - Generic Safety Issues 153: "Loss of Essential Service Water in LWRs [light water reactors]," resolved with no new requirements being established
- SECY-16-0074 Conclusion
  - Additional regulatory action to address ultimate heat sink water quality concerns not warranted

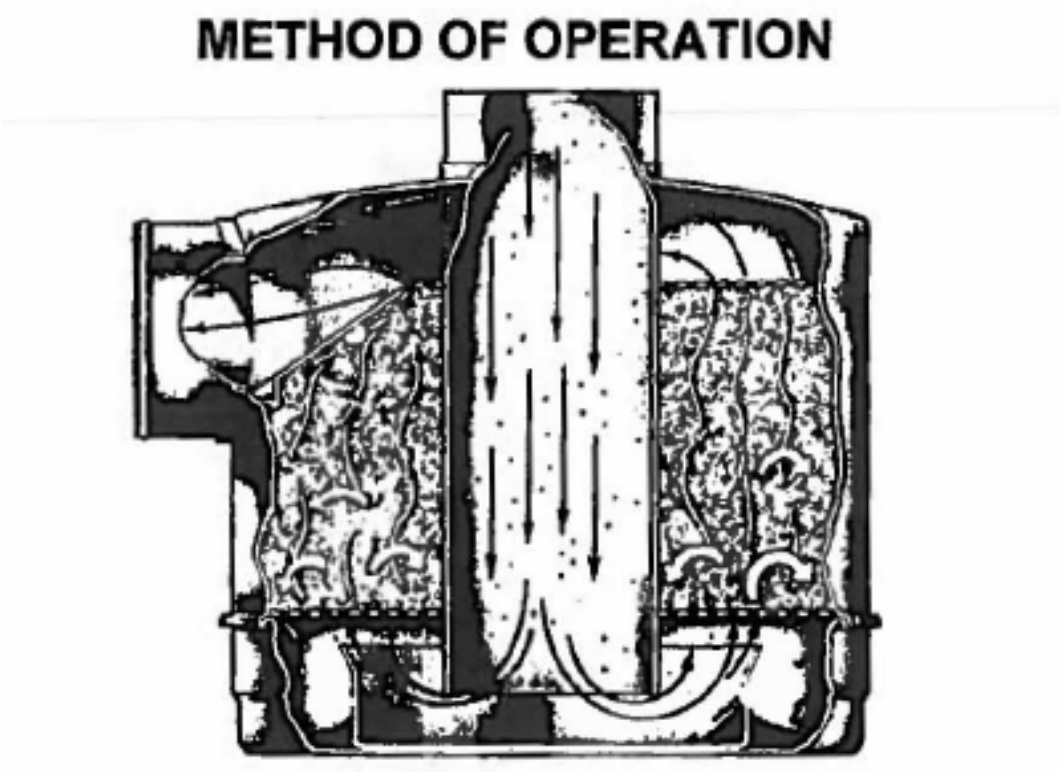
Intake Air Quality

- Added discussion in Appendix A of SECY-16-0074 based on comments
- Additional searches of operational experience databases performed
  - Staff found multiple examples of component failures (mostly breakers) due to dirt/grime/dust buildup on contact surfaces
    - Buildup due to ineffective maintenance
  - No cases found where the malfunction of the component was caused by extreme environmental conditions
- Mitigation strategies provides additional capabilities
- SECY-16-0074 Conclusion
  - Additional regulatory action to address intake air quality concerns not warranted

Volcanic Ash – Columbia Analysis

- Added discussion in Appendix A of SECY-16-0074 based on comments
- Staff's review focused on volcanic ash based on proximity of volcanoes to site (i.e., nearest volcano is Mount Adams 165 kms to the east of the site)
- Final Safety analysis report describes design basis ashfall
  - Emergency diesel generators have prefilters (recent inspection report notes design basis and recently identified issues with prefilters
  - Procedure ABN-ASH, "Ash Fall," directs licensee actions
    - Goal is to shutdown the plant before ashfll reaches the site, or as soon thereafter as possible
    - Diesel Building, Service Water Building, and Reactor Building –
      - Use of filters and HVAC alignments to ensure that supported systems required to attain and maintain cold shutdown remain available throughout the ash fall event.
- FLEX diesels have provisions for addition of oil bath prefilters for protection against ashfall events (see next slide)
- SECY-16-0074 Conclusion
  - Additional actions, beyond those associated with mitigation strategies order, are not warranted

Volcanic Ash – Columbia Analysis



- Air flows into air cleaner from the top- centrifuge action removes heavier particles
- Air flows through filter element (steel mesh) carrying with it oil from the oil reservoir
- Clean air passes through filter – dust laden oil drains back into reservoir
- Procedures in place to replace oil and oil cup on a continuous basis

Conclusion

- September 22, 2016, white paper provides staff's preliminary conclusion that the remaining Fukushima Tier 2 and 3 should be closed:
  - Additional regulatory action to address natural hazards other than seismic and flooding is not warranted
    - Based on assessment found in SECY-16-0074 and September 22, 2016 white paper
  - Periodic confirmation of natural hazards proposed to be resolved based on process outlined in white paper
  - Requirement to include real time radiation monitoring onsite and within the emergency planning zones is not warranted
- Next steps are to address ACRS comments
- SECY paper scheduled to be issued by end of December 2016

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

- SECY-16-0074 provided staff assessment of natural hazards other than seismic and flooding
  - Addressed comments from May 17, 2016, Advisory Committee on Reactor Safeguards letter (to be discussed in later session)
  - Four step process to assess hazards
    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
  - Provided results through Task 2
  - Screened out natural hazards other than high winds and snow loads

Background

- SECY-16-0074 (continued)
  - Provided results through Task 2
  - Screened out natural hazards other than high winds and snow loads
- White paper issued on September 22, 2016 (ML16230A384)
  - Provides staff's preliminary assessment of remaining Tier 2 and 3 items
  - Enclosure 1 provides evaluation of natural hazards other than seismic and flooding
    - Includes evaluation of high winds and snow loads in accordance with Task 3 of the process outlined in SECY-15-0137 and SECY-16-0074

High Winds

- 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

High Winds

- 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

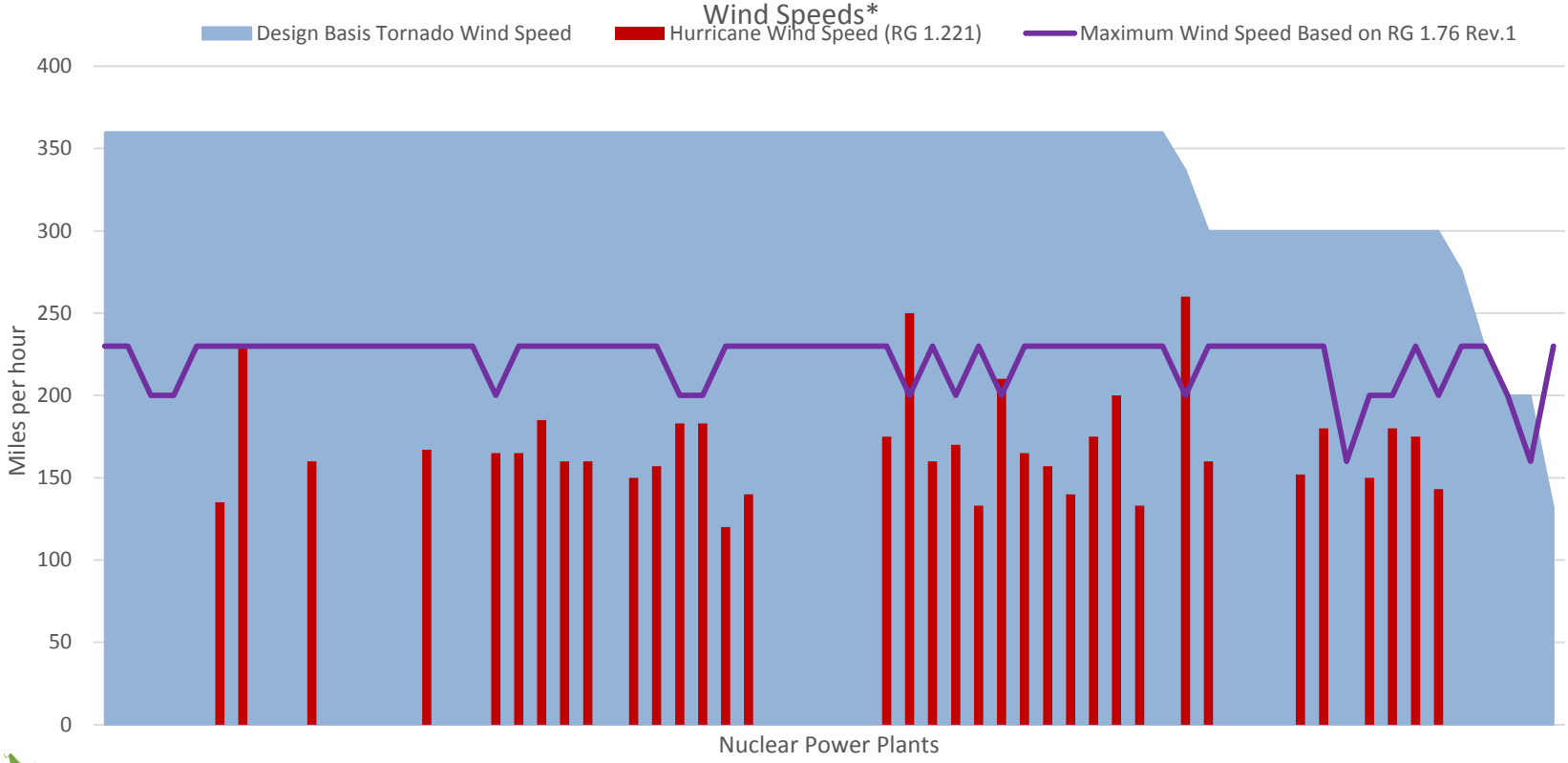
High Winds

- 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

High Winds

- New wind load guidance for majority of sites generally bound by current plant's design basis

Figure 2.1.4-1 Comparison of Current Design Basis Wind Speeds vs Updated Tornado and Hurricane Wind Speeds*



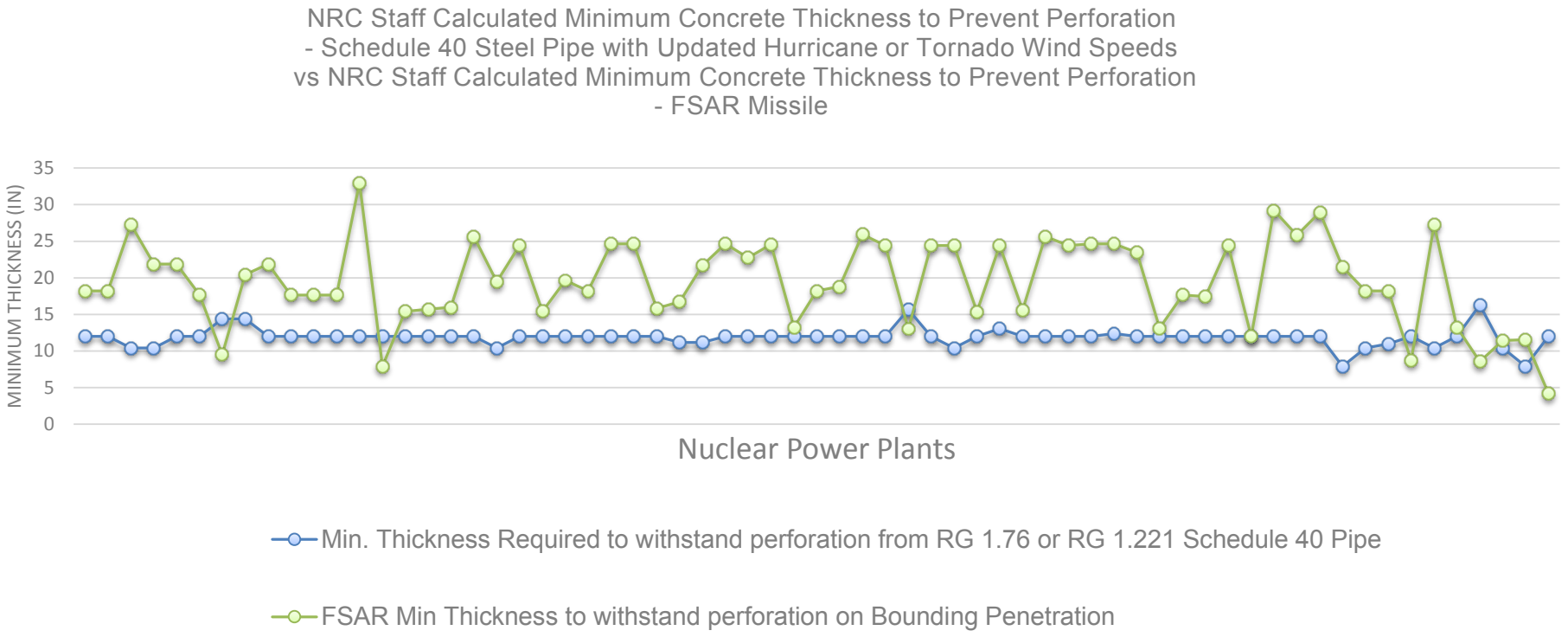
*Note that not every plant has a hurricane wind speed associated with it. For example, plants that are located away from the coast do not have a hurricane wind speed value.

High Winds

- 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-borne missiles
  - Ability of wind-borne missiles to penetrate concrete
    - Majority of sites have design-basis missile characteristics that bound missile characteristics found in latest regulatory guidance

High Winds

- Missile penetration depth for majority of sites generally bound by current plants design basis



High Winds

- Tornado and hurricane impact loads
  - Automobile missile's speed in current guidance for tornadoes and hurricanes higher than that found in current plant updated final safety analysis reports for some sites
  - Automobile tornado impact assessment
    - High-level assessment of representative concrete walls to withstand new missile spectrum:

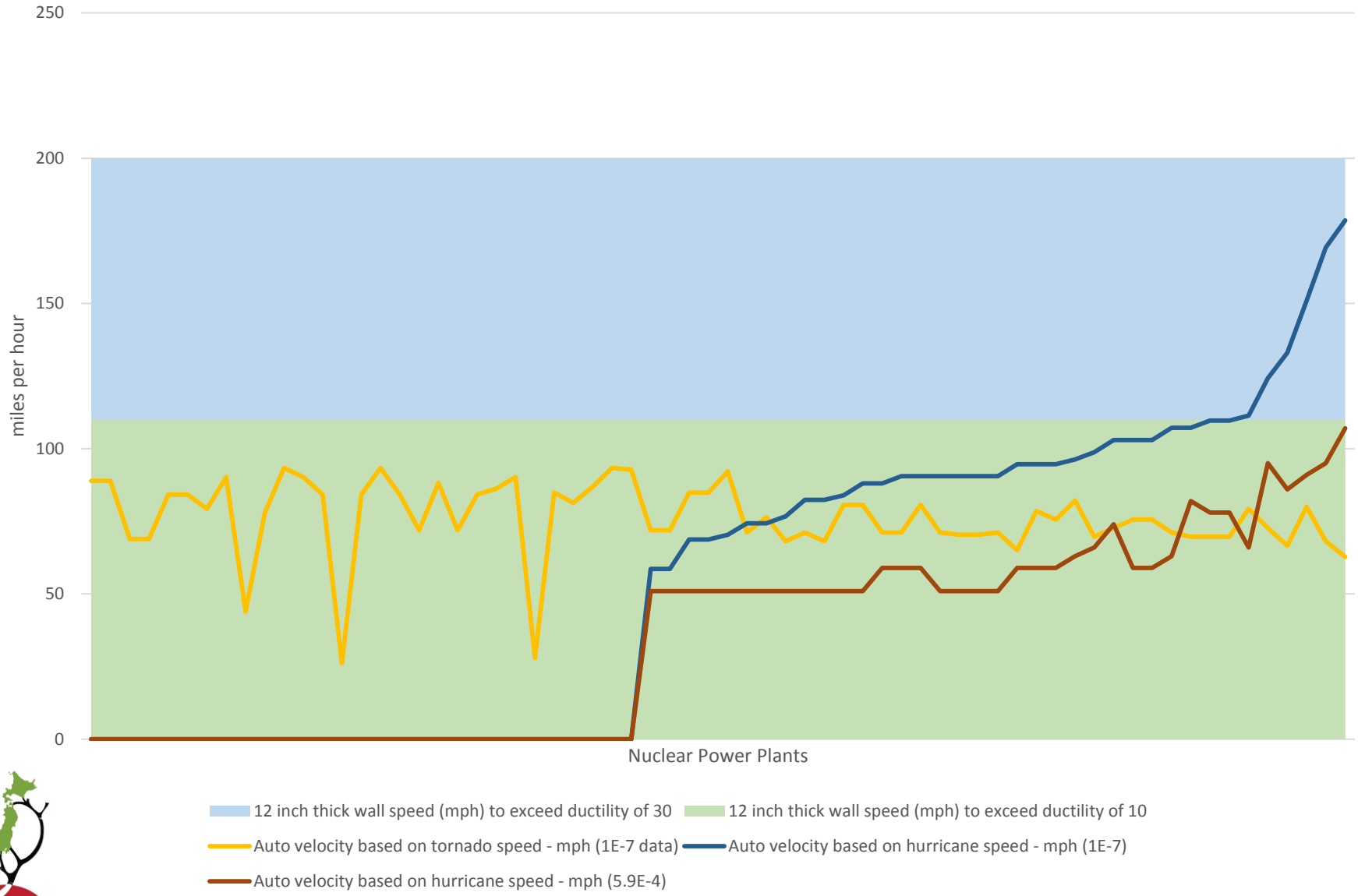
Thickness of Representative Concrete Wall	Automobile Impact Speed to Exceed Ductility of 10	Automobile Impact Speed to Exceed Ductility of 30
12 inches	110 mph	200 mph
18 inches	180 mph	275 mph
24 inches	240 mph	360 mph

- 12 inch representative wall can withstand all of the 1E-7 tornado and 6E-4 hurricane driven automobile missiles
- 12 inch representative wall can withstand the majority of the 1E-7 hurricane driven automobile missiles assuming a ductility factor of 10 and all of the hurricane driven automobile missiles assuming a ductility factor of 30

High Winds

- Tornado and hurricane impact loads
  - Dominant risk contributors are not from 1E-7 tornadoes but rather from lower frequency tornadoes
    - Risk profile driven by loss of offsite power and random failures of key systems and components
  - Staff reviewed the hurricane preparation procedures for four sites
    - Severe weather procedures direct the operators to shutdown the plant prior to hurricane force winds arriving onsite
    - Procedures direct staff personnel to perform walkdowns to look for and address potential hurricane induced missiles and to ensure emergency diesel generators have adequate fuel supplies and have been recently tested
    - Staff concludes that based on warning time licensee actions reduce the risk of core damage from hurricane events

Figure 2.1.4-3 Automobile Missile Speeds



High Winds

- Staff's preliminary conclusion is that additional regulatory action is not needed based on:
  - Conservatism in design
  - Risk insights
  - Warning time associated with hurricane events
  - Additional capabilities to address these events based on compliance with the mitigation strategies Order EA-12-049
  - Lessons learned from past events incorporated into licensees' and NRC actions

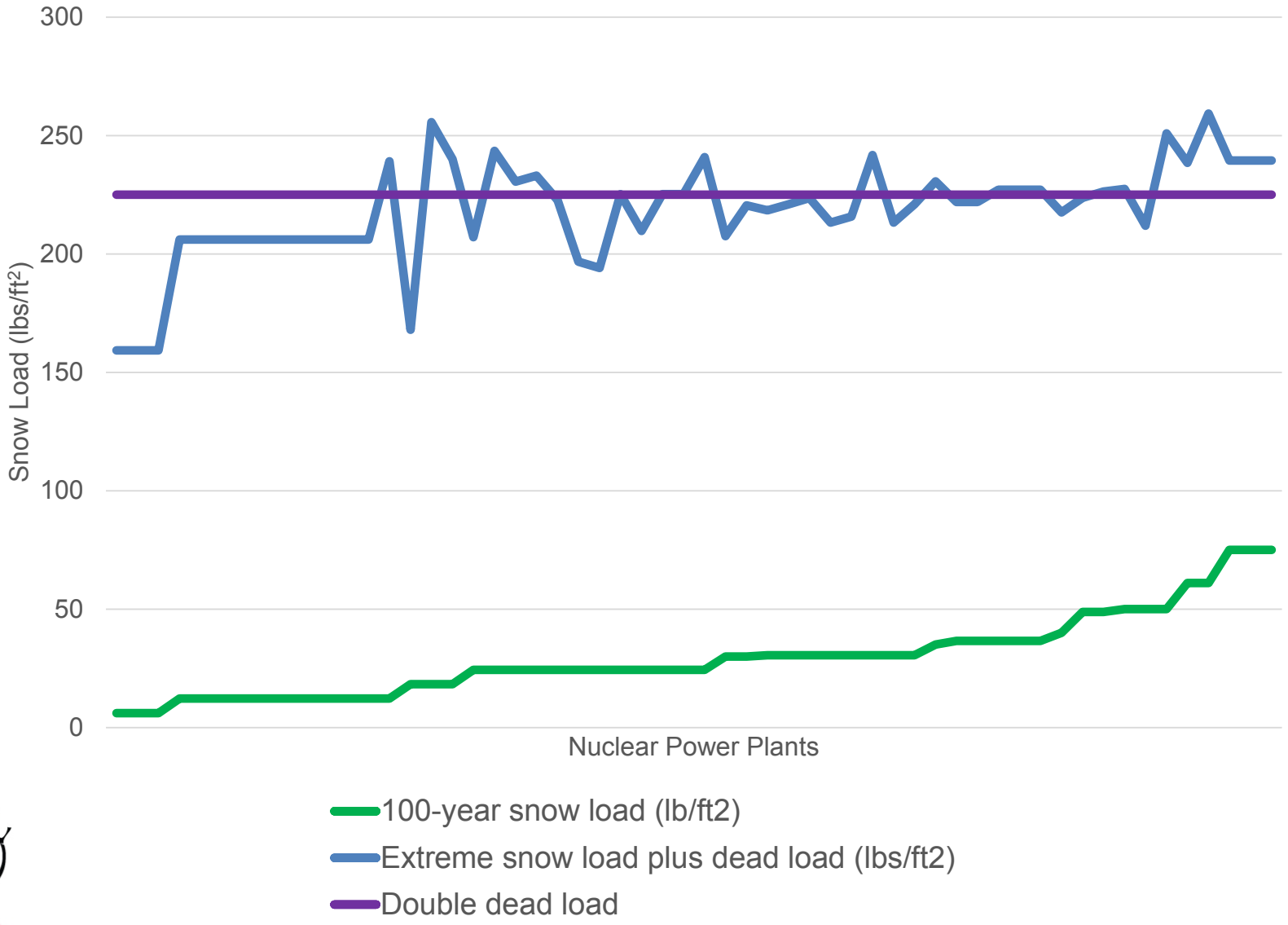
Snow Loads

- 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, among other things, guidance for:
  - Calculating 100 year ground and roof snow loads
  - Calculating extreme ground and roof snow loads
    - Combination of 100 year snow load and 48 hour probable maximum winter precipitation (PMWP) event

Snow Loads

- Preliminary Assessment
  - DC/COL ISG-007 guidance consistent with 1975 version of the SRP and branch technical position with additional clarifications
  - 100 year roof snow load typically bounded by plant design or structural margin associated with design
  - Staff performed a deterministic screening evaluation of 65 sites (some dual unit sites split if licensing basis is different (e.g., Nine Mile Point 1 and 2)
    - Screened out sites whose 100 year roof snow load is zero inches based on ASCE-7 (10 southern and western sites)
    - Screened out sites whose 48 hour PMWP in inches of water was greater than snow in inches (12 additional southern sites)
    - Performed structural assessment
      - Compared extreme roof snow load to double dead load of representative roof
      - Staff identified five northern sites for additional screening

Snow Loads


300
250
200
150
100
50
0
Snow Load (lbs/ft²)
Nuclear Power Plants
100-year snow load (lb/ft2)
Extreme snow load plus dead load (lbs/ft2)
Double dead load

Snow Loads

- Staff's preliminary conclusion is that additional regulatory action is not needed based on:
  - Deterministic evaluation shows extreme roof snow loads either not applicable, or there is sufficient structural margin such that there is low likelihood of failure of roof due to extreme roof snow loads
  - For some northern sites where structural margin is not as high staff reviewed procedures to confirm that licensees take action to address severe snow related events
  - A structural failure of a roof does not necessarily lead to loss of cooling to spent fuel pool or the core
  - Unlikely that a roof collapse would disable multiple trains (at different physical locations) of safety related systems