Official Transcript of Proceedings

NUCLEAR REGULATORY COMMISSION

Title: Advisory Committee on Reactor Safeguards

Docket Number: (n/a)

Location: teleconference

Date: Friday, October 9, 2020

Work Order No.: NRC-1142 Pages 1-81

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

DISCLAIMER

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

The contents of this transcript of the proceeding of the United States Nuclear Regulatory Commission Advisory Committee on Reactor Safeguards, as reported herein, is a record of the discussions recorded at the meeting.

This transcript has not been reviewed, corrected, and edited, and it may contain inaccuracies.

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

+ + + + +

679TH MEETING

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

+ + + + +

INFORMATION SESSION ON THE

EXTERNAL HAZARDS CENTER OF EXPERTISE

+ + + + +

FRIDAY

OCTOBER 9, 2020

+ + + + +

The Advisory Committee met via Video Teleconference, at 11:45 a.m. EDT, Matthew W. Sunseri, Chairman, presiding.

COMMITTEE MEMBERS:

MATTHEW W. SUNSERI, Chairman

JOY L. REMPE, Vice Chairman

WALTER L. KIRCHNER, Member-at-large

RONALD G. BALLINGER, Member

DENNIS BLEY, Member

CHARLES H. BROWN, JR. Member

VESNA B. DIMITRIJEVIC, Member

JOSE MARCH-LEUBA, Member

DAVID A. PETTI, Member

PETER RICCARDELLA, Member

DESIGNATED FEDERAL OFFICIAL:

DEREK WIDMAYER

ALSO PRESENT:

LAUREL BAUER, NRR

LUISSETTE CANDELARIO, NRR

BARBARA HAYES, NRR

DAVID HEESZEL, NRR

MICHAEL LEE, NRR

SCOTT MOORE, NRC

KEVIN QUINLAN, NRR

MICHELE SAMPSON, NRR

KENNETH SEE, NRR

WEIJUN WANG, NRR

CONTENTS

P R O C E E D I N G S

11:45 a.m.

CHAIRMAN SUNSERI: This is Matt Sunseri. It's 11:45 Eastern Time. We will reconvene the session.

I'll start with the roll call.

Ron Ballinger?

MEMBER BALLINGER: Here.

CHAIRMAN SUNSERI: Dennis Bley?

MEMBER BLEY: Here.

CHAIRMAN SUNSERI: Charles Brown?

MEMBER BROWN: Here.

CHAIRMAN SUNSERI: Vesna Dimitrijevic?

MEMBER DIMITRIJEVIC: Here.

CHAIRMAN SUNSERI: Jose March-Leuba?

MEMBER MARCH-LEUBA: Here.

CHAIRMAN SUNSERI: Walt Kirchner?

MEMBER KIRCHNER: Here.

CHAIRMAN SUNSERI: Dave Petti?

(No response.)

Joy Rempe?

VICE CHAIRMAN REMPE: Here.

CHAIRMAN SUNSERI: Pete Riccardella?

MEMBER RICCARDELLA: Here.

CHAIRMAN SUNSERI: And myself.

So, we have a quorum. I'm sure Dave will join us when he's available.

At this point in time, we are going to start our session, our information session, on External Hazards Center of Expertise. And I'll ask Dennis Bley if he has any opening comments.

MEMBER BLEY: Yes. Thank you very much, Matt.

I'd like to welcome the folks from the External Hazards Center of Expertise. We have been looking forward to your presentation and learning more about how the Center is organized and all the things you do.

Barbara, when you go through your talk, and the others as well, I would like it if you can relate your role to how you interact with NRR for reviews and, in particular, if you've started your reviews on the SHINE operating license application.

And also, ahead of time, I'd like to welcome Mike Lee back. He was with us for many, many years, and a few of us were here when Mike was with us.

Barbara, I turn it over to you at this time.

MS. SAMPSON: Hi. Good morning. This is

Michele Sampson. I'm the Acting Director for NRR's Division of Engineering and External Hazards, and I'll just make a few brief remarks before turning it over to Barbara.

The Division of Engineering and External Hazards leads the review of natural and external manmade hazards, including their potential impacts on new and operating reactors. In support of our licensing reviews, the staff has developed guidance documents to facilitate the staff's review and to assist applicants in developing their submittals consistent with our principles of good regulation, including openness, reliability, and efficiency.

We appreciate the opportunity to provide a presentation on the External Hazards Center of Expertise, or, as we refer to it, EHCOE. Today's presentation will focus on the organizational structure of EHCOE and highlight our programmatic areas, rather than any specific safety review or issue. We will provide a brief overview of EHCOE and, then, focus in for a few minutes on each of our technical areas. You will hear about the status of our programs and the changes that we are embracing as we become a more modern, risk-informed regulator.

With that, I'd like to thank you again for

the opportunity to make the presentation and turn the discussion over to Barbara.

DR. HAYES: Thank you, Michele.

And good morning, everyone. I'm Barbara Hayes, the Chief of the External Hazards Branch in the Office of Nuclear Reactor Regulation. I joined NRC in 2013 as a hydrologist. I have been the Branch Chief for the External Hazards Branch in NRR for almost a year now.

Next slide, please.

Thank you for the invitation today to come and talk to you about the External Hazards Center of Expertise. I understand you've had a very busy year and that resulted in this presentation being pushed back by quite a few months, and we're very glad to finally have this opportunity.

I'll be starting by providing information on the main focus of our talk today, EHCOE, who we are, what we do and who we do it with, how we are structured and why. I'll, then, pass the lead over to several speakers from EHCOE who will briefly provide information on their areas of technical expertise, as well as the Process for Ongoing Assessment of Natural Hazard Information and, also, information on the Dam Safety Program. Those two programs are both led out

of EHCOE.

Our speakers today, other than me, will be Mike Lee from EXHB, a senior hydrologist who will be talking about hydrology; Kenneth See, EXHB, who is a senior hydrologist also, and he is the technical lead for the external manmade hazards technical team. And he'll be discussing the manmade hazards reviews that we do.

Kevin Quinlan, meteorologist in EXHB, also the NRC point of contact for the National Weather Service. Kevin is the informal or de facto technical lead of the meteorological group, and he'll be discussing work of the meteorologists in EHCOE.

Then, that will be passed to David Heeszel, EXHB, a geophysicist and, also, serving as the liaison for geology and seismology within EXHB. And he'll be discussing the geological and seismologic reviews and work that we have.

Finally, in terms of areas of expertise, Weijun Wang, a geotechnical engineer in the Structural, Civil, and Geotechnical Engineering Branch of NRR, will be discussing geotechnical engineering work.

We'll, then, go to Laurel Bauer in EXHB, a geologist, and she is the lead of the Process for

Ongoing Assessment of Natural Hazard Information.

And we'll close out with a brief discussion by Kenneth See, who is our NRC Dam Safety Officer, and he'll be talking about the Dam Safety Program.

MEMBER BLEY: Barbara?

DR. HAYES: Yes?

MEMBER BLEY: This is Dennis Bley.

Two things. One, I'm not conversant with all the acronyms in your organization. I can guess at the ones you said, but, from now on, if you could tell us what they mean, I'd appreciate it.

And two, when were you chartered. It seems as if the people in your Branch now have come from many different places. Are you going to tell us some of that? And if not, if you could give us a short summary, that would be nice.

DR. HAYES: Yes, Dennis, actually, that really is the focal point of my presentation, is how we are set up and how we function. And my apologies, EXHB I'll probably say again because that's the External Hazards Branch within NRR. I will try to avoid using acronyms as much as possible.

So, next slide, please.

So, the ACRS, you know us already, but not

necessarily how we are organized. You're, no doubt, familiar with some of the speakers today due to previous technical presentations that we have made.

Some of our previous activities: combined licenses, early site permits, design certifications is probably the bulk of our interactions with ACRS. Our post-Fukushima work is essentially closed out now, and that really represents a change in our workflow to a certain extent and our focus.

Right now, for current activities, we provide a lot of support to operating reactors. We provide support to the other business lines of NRR. But what is a significant new is that we're providing growing support to NMSS on a number of reviews.

Just in terms of how we do what we do, both for those reviews that are under your purview as well as other reviews, NRC staff reviews documented safety evaluations and inspection reports. When necessary, they receive a thorough review by this Committee and the Commission prior to an adequate protection regulatory finding.

Each licensee or applicant is responsible for preparing their analysis of external hazards based on their unique circumstances and presenting it to the staff. The staff, then, conducts an independent,

thorough safety review of the submittal of the material to ensure that reasonable assumptions have been made, sound analyses have been performed commensurate with potential hazards that may exist at a site. When the staff identifies deficiencies in the assumptions or analysis that could preclude a reasonable assurance finding, the staff requires the licensee or applicant to correct the deficiency.

Next slide, please.

So, Dennis, you had asked for a brief history. One of the things that's key here is that the staff that's in EHCOE share a history. In 2015 is when SECY-15-0143, Project AIM and Centers for Expertise, recommended the creation of a Center of Expertise for external hazards evaluations. In September 2016, staff issued a memorandum to the EDO which documented EHCOE as a limited-scope COE, and it provided the charter, the rules of engagement, and several other documents such as a communication plan and business case.

We were chartered as a limited-scope because we were providing service primarily to NRO and to NRR at the time. That is one of the things that has changed, in that we are providing more review support to NMSS for some of their activities.

So, since it's formation in 2016, EHCOE has changed substantially. And we recently drafted revisions of our charter and for the rules of engagement. The revised documents reflect current organizational structure, the current principles and practices, as well as the expansion of the workload to cover activities in NMSS. It also reflects EHCOE's movement towards NRC's transformation vision of becoming a modern, risk-informed regulator.

The revised draft charter and the engagement plan is consistent with the OEDO Procedure 0940, "Guidance for Identifying, Evaluating, and Implementing a Center of Expertise." And both of these documents are currently still considered draft, but we are in the process of preparing to share them with the EDO. Both of those documents are available on our SharePoint site, which is not publicly available, but is accessible to the ACRS.

So, we are a matrix organization. So, it's worth spending a little bit of time talking about what that means. A matrix organization is defined as one that's got dual or multiple managerial accountability and responsibility. Typically, there's two chains of command, one along functional lines and one along project lines. So, it's a hybrid

organizational structure that combines two chains of command, typically. Usually, there's a line manager or a functional manager, such as a Branch Chief, taking care of routine tasks, and there are also Project Managers that work separately. Such an approach allows the balancing of employees' time and knowledge between routine tasks and project work.

In terms of matrix organizations, there's a scale over which the level of matrixing can be described. And the way that we are structured, we would be considered a weak matrix in that we basically have strong functionality and supervision along your traditional Branch Chief, first-line supervisor approaches.

So, one of the things that also makes us a matrixed approach is that we have what the EDO has recently referred to as double-hatting. Staff, when they go on rotations, which they have recently, have been maintaining certain key EHCOE roles. We also have staff that support particular initiatives that are outside of external hazards analysis, and we also have the Project Manager for the Dam Safety Program, who is in a completely different Division and interacts solely as his role as the Project Manager providing support that one EHCOE program.

Next slide, please.

So, who we are. EHCOE is matrixed within NRR, but all 14 members and myself are considered full-time members of EHCOE. We cover four of the five disciplines that are covered by EHCOE, and we are responsible for the Process for Ongoing Assessment of Natural Hazard Information, as well as the Dam Safety Program.

We also have the Project Manager Luissette Candelario, who is actually moving the slides for us today. We are also the point of contact for various projects and relationships, such as with the National Weather Service.

Next slide, please.

The other key Branch that's currently involved right now would be the Structural, Civil, and Geotechnical Engineering Branch. Joe Colaccino is the Chief, and three of those members are actually working as part of EHCOE doing geotechnical engineering, our fifth discipline. We also have one staff member in Joe's Branch that supports the manmade hazards activities. So that we have a team of three people.

It's probably worth mentioning, the way that BC concurrence responsibilities are is, when that staff member in Joe's Branch actually has a review,

I'm the one who's responsible because manmade hazards is part of EXHB's, my Branch's, responsibility.

So, the concurrence process goes along with the actual technical area that's covered in EHCOE. However, all of the usual supervision processes are traditional Branch Chief, first-line supervisor, you know, reviewing time and assigning work.

What this does is this structure allows staff to work together naturally at the technical interfaces between different groups and to stay integrated, regardless of what the structural changes might be within Branches, which gets us to why.

Our matrix approach supports adequate bench strength and preservation of critical skills and knowledge management. Workloads have changed substantially, and so do the organizational structures associated with the Divisions and the Branches. NRC has had a great deal of movement in recent years in preparation and implementation of the merger between the Office of New Reactors and NRR, and also, the creation of the Environmental COE over in NMSS.

And what is really the driver of our successes and our vision? It's really the staff. Our staff has highly specialized skills and those

represent a productive nexus that supports forward-thinking action, uses of lessons learned, preservation of critical skills, and adequate bench strength. By maintaining this nexus, we support NRC's principles of good regulation -- independence, openness, efficiency, clarity, and reliability.

Next slide, please.

We share a vision that supports the agency mission and its visions of being a modern, risk-informed regulator. How we support this vision?

We're committed to optimizing the service that we provide to all partners by ensuring access to specialized skills needed to support NRC's public health and safety mission.

We are committed to modernizing practices by selectively adopting best practices from the public and private sectors; evaluating and right-sizing activities; considering the benefits and costs, risk implications, both in terms of safety risk and enterprise risk.

We ensure adequate bench strength through a combination of internal and external resources.

We preserve skill sets critical to supporting the agency's mission through knowledge management activities and through sponsorship of in-

house training opportunities.

And we tailor safety reviews and preparation of guidance documents to align with NRC's risk-informed approach to regulation.

Next slide, please.

We share a process of change that supports the agency mission and the agency vision of becoming a modern, risk-informed regulator. This particular slide represents how EHCOE aligns with the agencywide transformation measures in SECY-20-0049.

Within these different areas, much of this is a matter of cultural change, collaborative work towards this culture change that we have been engaged in in this last year that's reflected in our draft engagement plan and our draft revised charter.

One of the key examples or areas where we have worked together is related to the SharePoint platform. We had a new version of SharePoint come out that was issued a few months before the merger. This is our primary collaborative IT platform, and we had relied heavily on it for our collaborative work. The functionality of the new platform was very problematic. The structure, the architecture is quite different, and finding files, et cetera, became quite challenging.

We developed as a group a common organizational structure for these five technical areas, and we have a complete new IT platform that's amenable for better workflow and transparency, new functionality that supports information-sharing on our capabilities, and also, vets viable staff-generated ideas.

Next slide, please.

So, I've only been with, in terms of our focus on risk significance, I've only been with EHCOE for less than a year. And actual reviews that I've been involved in generally have not been made public yet. But what I have personally experienced working with staff is that staff's evaluation of risk significance has generally enabled them to get to reasonable assurance of adequate protection with less RAIs and with quicker turnarounds with producing our inputs for SERs.

How are we doing this? A lot of it is actually discussions during Branch meetings and really a focus on the principles of good regulation. In terms of training as well, we've taken advantages of classes that reflect this transformation related to risk-informed regulation, data-driven decisionmaking, and PRA. We'll have some examples that are discussed

a little bit later.

Next slide, please.

So, the basis for our reviews. We provide technical reviews for LARs and for the operating fleet and for license renewals. We're tapped for our expertise by the Regions on emergent issues that arise at the nuclear power plants, and we continue to support licensing reviews related to conventional large light water reactor.

We have an increased level of support to NMSS, to the Division of Fuel Management of the Division of Decommissioning, Uranium Recovery, and Waste Programs Branches.

We are reviewing two major projects related to consolidated interim spent fuel facilities.

We've had some recent work related to the probable maximum precipitation for Church Rock, as well as a manmade hazards review for the Trojan Spent Fuel Facility.

In terms of advanced reactors, our work in this area has been relatively low because of the reduced source term and where they are in their process. Our current contribution right now is focused on dose assessment, the RAMP, Radiation Protection Computer Code Analysis and Maintenance

Program, as well as the Advanced Reactor Content of Application Project, ARCAP, where we're providing support to that in terms of the Chapter 2 content for applications.

We have reviews related to the Kairos Power Mechanistic Source Term Draft Topical Report and, also, the Oklo Aurora Combined License Review.

MEMBER BLEY: Can you tell us more about (telephonic interference)?

DR. HAYES: Excuse me?

MEMBER BLEY: Can you tell us a little bit more about what you just said about Kairos and Oklo?

DR. HAYES: So, perhaps Kevin can speak a little bit more about the Kairos. But, right now, there's a Power Mechanistic Source Term Topical Report that is under review. And I think there's been initial meetings right now, but it's quite early.

The Oklo application for their Aurora combined license has been reviewed. We did a review of the license as it came in with a focus on seismic issues. And at this point, we've done the acceptance review and we will be having some later questions regarding -- our analysis is going to occur a little bit later on. They have a stepped approach, and I think David Heeszel, who's involved in that, could

probably shed some light on it.

MEMBER BLEY: Okay. That sounds good.

On the Kairos one, I guess I haven't quite connected in my had how you're involved with the mechanistic source term. How does that fit within your help on the reviews?

DR. HAYES: Well, first, I'm not sure that we've actually received the application or if we're still in pre-application space. But the area of our interest is the ability to support dispersion --

MEMBER BLEY: Oh, okay.

DR. HAYES: -- of source term. And that's one of the key areas that my meteorologists work in, not just the hazards of precipitation and hurricane, but also those dispersion of potential radionuclides.

MEMBER BLEY: Well, that's kind of interesting. I can see why those people would end up in this group. So, it doesn't really sound like it's part of your charter, except you have the people now who can do that.

DR. HAYES: That's right, and there are some folks who -- I was just going to say that there's also staff that are outside that we still interact with because of the historic nature of what we've done before. So, we still tap and have conversations with

folks, even if they're not directly part of EHCOE, because of that sort of collaborative work. It is multidisciplinary.

MEMBER BLEY: Okay. Thanks, Barbara. Go ahead.

DR. HAYES: Next slide, please.

So, this is simply a list of the areas that we actively work in.

Next slide, please.

So, this lays out what we do. We've got the NRR business lines, sort of our traditional large light water reactors, both new applications and LARs and support for the operating fleet.

Advanced reactors, we're doing, as I described, some guidance work, as well as actual licensing reviews, and then, we're responsible for the Process for Ongoing Assessment of Natural Hazard Information, also under the operating reactor business line.

For NMSS, we're doing work related to the spent fuel storage reviews, decommissioning actions, mill tailing inspections.

With our interactions, our partnering with RES, we have a close partnership with them in terms of the probabilistic evaluation of seismic and hydrologic

hazards.

Currently, we're quite active with computer code development related to HABIT and RADTRAN.

I think, Dennis, you had asked about how we support or how we interact with them on specific reviews. In general, our relationship is more of a collaborative, forward-looking relationship in terms of developing products that are going to support future reviews.

In terms of actually assistance on any of the reviews, that's pretty unique. And so, we have had some of that. A lot of that has been because we had somebody migrate from NRR or NRO over to RES and having some special skill set that's going to support that. In general, we do not regularly tap RES staff for reviews.

We, however, collaborate very closely in terms of reviewing documents that are under their programs. For example, the Probabilistic Flood Hazard Analysis, generally, all of those reports come to us that are being generated and processed through that program for our input. Those reports, typically, also go to the Branches that are responsible in NRR for PRA reviews.

MEMBER BLEY: Let's pick one, just so I understand this a little better. I wasn't aware quite of your support in developing the tools. And I think that's really interesting.

But we're about to pick up the review of the SHINE facility. And when they come in, I don't know if that comes through NRR or through NMSS, but they would, then, request to do, say, the manmade hazards part of their review?

DR. HAYES: That's correct, and actually, that application has been received. We have gone through acceptance review. We have draft RAIs, and there are other portions of that process that I'm not familiar with because it's outside of external hazards.

In terms of, yes, it's definitely housed within NRR. It's a non-power reactor. So, it's definitely under our authority for the review.

And we do not have anybody within RES or in NMSS that are directly supporting EHCOE reviews of basically Chapter 2 and Chapter 3 related to primarily the siting issues.

MEMBER BLEY: I didn't understand that one. You do not have anyone?

DR. HAYES: No, to the best of my

knowledge, within EXHB, we are not using anyone from RES, and typically, we would not do that. That's, as I said before, very unique and unusual. And I did check with Weijun before this, and there's no particular support that's coming from RES for that particular review. So, it's completely within NRR, unless there's something else that's going on related to fire protection or something that's outside of the scope for EHCOE.

MEMBER BLEY: Okay. Well, I misunderstood that from some interactions we had in the past. I thought your folks did those reviews for NRR. But NRR is doing it themselves?

DR. HAYES: Well, we are NRR. We are housed in NRR. We are all part of NRR. And our relationship with RES is more related to areas where there's research that's ongoing for future implementations, future changes.

MEMBER BLEY: So, within NRR, your folks are participating, and just for that specific example, for the review of SHINE?

DR. HAYES: Yes, absolutely.

MEMBER BLEY: Okay. I misunderstood you. I apologize.

DR. HAYES: Yes, things have not changed

that much. It's just a matter of the organization. EHCOE, basically, is an umbrella structure that keeps the staff that do those sort of reviews together in a way that really has done a good job of going through the bumpy process of Branch changes, Division changes, mergers, in order to have some continuity for the folks who actually do the geotechnical reviews, who do the geology and seismology reviews, and keep it as a more cohesive, integrated group of reviewers within the Branches.

MEMBER BLEY: Okay. Good.

DR. HAYES: And so, we are supporting and our staff are the ones who supported all of those COLs and ESPs in the past under different Branch names, essentially. The Branch names have changed quite frequently over the past three years, as we got ready for the merger. And so, that's part of the story really.

MEMBER BLEY: Okay. Well, that makes sense, and that is what I understood before. So, go ahead.

DR. HAYES: And we also do a fair amount of international support activity. For, for example, for NEA, the Working Group on External Events has had us provide input on the high wind and tornado

questionnaire; also, right now, the Survey on Combined External Hazards.

IAEA documents as well. We've had two that we've reviewed this particular year. Again, we're not the lead on these document reviews, but we are definitely tapped for our expertise and provide some pretty important background.

We also have folks who are responsible, either as a point of contact, a member, or in some cases the lead of some of the ANS and the ANSI standards. Let's see, 216, 21, 34, so a lot of the Chapter 2 for modeling design basis accidental releases for nuclear facilities, criteria of assessment of atmospheric effects on the ultimate heat sink. I have a fairly long list of these.

We also have ongoing interactions with the USGS related to the Earthquake Hazard Reduction Program. One of our staff members recently provided grant proposal review for them.

We also have interagency partnering activities. For example, the NRC Dam Safety Program, which Ken See will be talking about later. In addition to managing our regulatory authority for the dams under our purview, there's an important interagency component of that activity in terms of

reporting out on status and, also, interacting with other organizations like FEMA and USBR, Bureau of Reclamation, that have responsibility for dams.

And also, another area where we have a lot of interagency partnership activity relates to training that we work with to produce sometimes and participate in other times. So, for example, the Probabilistic Flood Hazard Analysis Annual Workshop, generally, we're a key sponsor. We recently had training that was offered by USGS and NRC together related to, I think, groundwater issues. So, these interfaces are actually quite important and they are an important part of our workload and maintaining those critical skills.

That's about it. I'm going to hand it off to Mike Lee right now. Are there any questions before I do so?

MEMBER BLEY: No, I think you're fine to go ahead.

DR. HAYES: Okay. Next slide.

Mike Lee.

DR. LEE: Okay. Hi. I'm Mike; I'm me. I'm here today to talk briefly about the hydrology-related reviews recently performed by the EHCOE staff.

And before I proceed, I want to thank

Dennis for his kind introductory remarks, and I hope I'm happy to be back.

(Laughter.)

I mean, it's like we're a team, please.

Go to the next slide. It looks like a slide was dropped. All right.

Anyway, the staff's recent review activities in the area of hydrology have been driven in large measure by two recent regulatory actions. They include the ESP COLA reviews, for which there was some earlier interactions with the Committee, as well as the 50.54(f) Flood Hazard Reevaluation Reviews performed in connection with the 2011 Near-Term Task Force Recommendation 2.1.

From the staff's perspective, one of the key takeaways from both sets of reviews is that not all flood-causing mechanisms described in the SRP were found to be significant for the purposes of flood-related decisionmaking. Based on the ESP COLA and 50.54(f) reviews, the staff found that local intense precipitation, riverine-based floods, including dam failures in many cases, and storm surge were important or consequential to defining the external flood hazard at the reactor sites evaluated.

Other flood-causing mechanisms listed in

the SRP, such as tsunamis, seiche, channel migration, and flooding due to ice jams were, by and large, found to be inconsequential to defining the external flood hazard at the site.

MEMBER BLEY: Mike?

DR. LEE: Yes?

MEMBER BLEY: I don't think you're presenting that as a general conclusion. It's for the plants that you looked at, right?

DR. LEE: That's correct.

MEMBER BLEY: Okay.

DR. LEE: That's for the cohort of 60 sites that we looked at.

MEMBER BLEY: Is that all the sites?

DR. LEE: Well, for the 50.54(f) reviews, there were 60 sites and I forget how many units exactly, but yes.

MEMBER BLEY: That's all of them? I'm kid of surprised about the ice dams for a couple of the plants, but that didn't turn up, huh?

DR. LEE: No. I mean, I can go back and confirm, but my recollection is the short answer is no.

MEMBER BLEY: Yes. The others make sense to me. That one does surprise me because a few plants

up in the Midwest, way up north, had problems. Maybe they're not there anymore.

We did receive the slide you're missing. That slide just had a list of things you look at.

DR. LEE: Yes, yes.

That was just intended as background. Those are the eight flood-causing mechanisms that are listed in the SRP that EHCOE's generally, you know, focused on.

MEMBER BLEY: Okay. Go ahead.

DR. LEE: All right. So, if I can go to slide -- if I can go to the next slide, please?

(Dogs barking.)

All right. So, I am sorry, but, you know, Peter's Principle: anything that can go wrong will go wrong. Let me just ask for your indulgence for one minute, please.

All right. So, you just heard me refer to the term consequential. As noted in slide 16, the concept evolved in connection with the staff's reviews of the Flood Hazard Reevaluation Report submitted in connection with Near-Term Task Force Recommendation 2.1.

For the purposes of those reviews, licensees were to identify those flood-causing

mechanisms that might exceed a site's current design basis, based on an approved flood hazard analysis, methods, and data. Moreover, upon review, it was found that many of the operating sites were designed to address one specific flood-causing mechanism.

That being said, what was learned from the reviews is that not all flood-causing mechanisms were equal by virtue of not only higher reported water surface elevation, but also longer inundation durations and flood recession times. To differentiate between those flood-causing mechanisms that were important to design decisionmaking, the staff used the term "consequential" to risk-informing the review process. So, as noted in this slide, we believe that the consequential flood concept comports with the Commission's views on risk-informed, performance-based regulations.

Upon further study, we also found that the consequential flood concept had some foundation in both Part 50's definitions found in 50.2 concerning the site-characteristic flood as well as the hydrology-related chapter of the SRP.

In 2018, the staff began to turn its attention to the update of the SRP. Then-Office-Director Fred Brown challenged us to think outside the

box and attempt to modernize the updating process. We believe that the introduction of the consequential flood concept to the SRP was the type of innovation or transformation Fred was looking for.

Consequently, the definition was formally introduced in a Federal Register notice issued for two of the first Chapter 2.4 SRP updates, those specifically bearing on channel migration and tsunami, which were made available for comment in September 2018 as part of the ongoing SRP update process.

Slide 17, please.

In closing, slide 17 displays the consequential flood definition that was proposed for the SRP updates as part of the 2018 Federal Register notice I just described. In the spirit of time management and my barking dogs, I don't intend to recite the definition we adopted, but I would note that no public comments were received on this proposal.

So, unless there are any questions I can answer, I'll now turn over the presentation to Mr. Ken See.

MEMBER BLEY: Mike?

DR. LEE: Yes?

MEMBER BLEY: Yes, before you leave --

DR. LEE: Sure.

MEMBER BLEY: -- your last slide, you didn't read the whole thing, but the last statement about "Consequential flooding may occur for events that are less severe" --

DR. LEE: Uh-hum.

MEMBER BLEY: -- can you say something about that? Was that a surprise?

DR. LEE: Well, yes, because, unlike in previous licensing reviews, I don't believe there was a great emphasis placed on examining inundation times that a site may be exposed to some kind of a flood. And what we found is that you could have like a -- I mean, this is just as a hypothetical -- for example, you could have a thunderstorm, if you will, that kind of blows over a site in the form of local intense precipitation which may dump a lot of rain on the power plant footprint and, then, quickly move off. So, you don't have very high water surface elevations accumulating onsite.

Whereas, you could have some riverine-based flood, for example, attributed to like a spring thaw of snow and ice that may raise the water level to levels higher than the design basis, and the inundation time may be longer than you might expect

for that type of an event. Events that might be more transient or like a tsunami, for example, hypothetically, will dump a lot of water on a site, but the amount of standing water that remains is there for a shorter period of time.

So, I would kind of liken this to, in optimization studies you have multiple solutions to a problem on a response surface. So, you can kind of imagine that, for each of the different flood-causing mechanisms, you may have a different not only water surface elevation, but inundation time and recession time. And the consequential flood definition, if you will, is the attempt to kind of capture the maxima of the maxima. Does that make sense?

MEMBER BLEY: Yes. Did Prairie Island have much to do with this evolution?

DR. LEE: No, frankly, it wasn't any particular site. The concept, frankly, evolved from the fact that the staff, after they did their 50.54(f) reviews, had to write these letters back to the licensees. We, more or less, reached closure on what the appropriate or the new or the reevaluated flood elevations might be.

And in the spirit of simplicity, it became clear to us that not all flood-causing mechanisms were

driving the design decisionmaking. So, what we attempted to do was try to encapsulate what we learned from a particular site review and express it in terms of the consequential flood.

MEMBER BLEY: Okay. Well, thank you very much. This is something I don't think we've heard much about. So, I appreciate it.

Go ahead.

DR. LEE: And again, I apologize for the beasts.

(Laughter.)

Thank you.

Ken?

MR. SEE: Okay. Thanks, Mike.

I'm Ken See. I'm a Senior Hydrologist in the External Hazards Branch, and I'll be talking about manmade hazard reviews that are going on in EHCOE.

Next slide, please.

All right. I don't have any dogs here, so it should be quiet.

At a high level, the review from manmade hazards covers the following areas, and these are outlined in the Standard Review Plan. Typically, our review would include verifying information provided by the licensee in the areas of locations and distances

to the following: typically, transportation facilities and routes, such as airports and airways; roadways; railways; pipelines, and navigable bodies of water. Also, the presence of military and industrial facilities such as fixed manufacturing processing, storage facilities, such as facilities that store compressed gases, liquid hydrogen, liquid oxygen, and propane, for example.

Once the location of these facilities has been identified, we consider the following hazards and their effects: toxic vapors or gases and their potential for incapacitating personnel; overpressure resulting from explosions or detonations involving materials such as munitions, industrial explosives, and explosive vapor clouds resulting from atmospheric release of gases. And then, missile effects from mechanical impacts such as aircraft, explosion debris, and impacts from waterborne items such as a barge.

Next slide, please.

Okay. Currently, I believe the Committee is up-to-speed on this. It started with you guys. We are currently updating Reg Guide 1.91. Based upon the expert evaluation team's report, which is on the slide here, it was determined that the NRC needs to improve several processes and practices in the area of

inspections, processing petitions, coordinating with other agencies, and updating the pipeline analyses.

NRC staff outside of EHCOE are working to implement these recommendations. Within EHCOE, we have been given the task to update the Reg Guide 1.91. So, it is being updated to address the issues that have been identified in these documents.

Approaches to evaluating explosion hazards have been updated from new research and methodologies. The revision of this Guide will address the shortcomings of the TNT equivalent methodology and will also bring the guidance into agreement with current industry practices.

There were six specific recommended changes that I will briefly go through.

One is to provide clear guidance for determining the mass release, including what assumptions and methods are valid in determining the values used.

The second, provide clear expectations for detailed calculations that would be conducted if the safe distance criteria is not met.

No. 3, address heat flux, which, according to some experts, may be the controlling issue for potential nuclear power plant impacts.

No. 4, provide specific values for energy equivalents for different chemicals and include additional information on different classes of chemicals.

Revert back to the value of 4500 kilojoules per kilogram as the heat of detonation for TNT.

And then, incorporate some minor changes that are in the equations, which is related to No. 5 as well.

So, as part of this update, if the timeline permits, the staff may also add additional methodologies to model the consequences from vapor cloud explosions.

And some specific milestones for the update are on this slide.

So, with that, if there are any questions, I'll be happy to take them.

MEMBER BLEY: Okay. Ken, thanks very much. You won't be surprised we're pleased to see this and look forward to seeing the draft when it's ready.

MR. SEE: Yes, sir.

MEMBER RICCARDELLA: Ken, this is Pete Riccardella. I have a question.

All of the changes you just went through appear to be addressing the consequences of such a failure. Is there any consideration of addressing the frequency or the probability of such failure?

MR. SEE: Everything's on the table. The staff who are currently working on this are open to -- you know, there's great debate going back and forth. I've gone through a recent review where the probabilistic alternative was used. We may add emphasis and try to clarify.

I think No. 6, you know, it says, "Incorporate minor changes to equations." What we're really to aim there is, basically, to provide a clearer technical basis for the equations and methods that are in the document. And that may include the methods that are currently discussed regarding probabilistic methods.

MEMBER RICCARDELLA: Okay.

MR. SEE: For example, like the frequency of transportation of hazardous materials on a river, or something like that, you know.

MEMBER RICCARDELLA: Yes.

MR. SEE: Yes, but one thing I would just want to point out overall is that this is a guidance document. And in this area -- and you know this --

there's a whole lot of equations and methods and documents out there that licensees and applicants could use.

MEMBER RICCARDELLA: Yes.

MR. SEE: I mean, they're free. But this update is clearly needed.

MEMBER RICCARDELLA: Yes.

MR. SEE: But we may run into an issue like this in the future where they've come in with something that's out of the blue.

MEMBER RICCARDELLA: Yes. Well, you refer on this slide to the Indian Point review in April of 2020. As I recall, a big focus of that review -- in fact, the main result -- was based on frequency, not based on consequences.

MR. SEE: Well, we supported that inspection, and the main issue I recall there was the distance, and therefore, the time between the valve stations where you can turn the pipeline off.

MEMBER RICCARDELLA: Yes, yes. Well, that would -- yes.

MR. SEE: But that review, the updated analysis, the licensee showed that that wasn't really relevant to the safety finding. I would refer you to the Inspection Report, which is public.

MEMBER BLEY: Yes, Pete, there were at least two things here. There was a first quick response report from the staff that leaned in the direction you're talking, and then, there was a much more thorough report later in the Inspection --

MEMBER RICCARDELLA: Yes, yes, I was part of that report.

MR. SEE: Because this was an ACRS report. I'm sorry, I wasn't involved in it. I don't believe I've seen that. The updates that we're pursuing are based upon the expert evaluation team report and, then, the periodic review.

MEMBER RICCARDELLA: As I said, I participated in the expert evaluation team report.

MEMBER BLEY: The staff's report, you're talking about?

MEMBER RICCARDELLA: Yes.

MR. SEE: Okay.

MEMBER BLEY: Go ahead.

MR. SEE: Any other questions?

(No response.)

Okay. With that, I'm going to hand this off to Kevin Quinlan, who is a meteorologist in the External Hazards Branch as well.

Kevin, take over.

MR. QUINLAN: Thank you, Ken.

Thank you for letting us discuss all these issues today.

My name, as stated, is Kevin Quinlan, and I am a meteorologist in the External Hazards Branch.

Next slide, please.

Meteorological assessments for new and operating reactors generally include a review of the regional climatology and the local meteorology. For new reactor reviews, this includes precipitation, wind speeds, and associated missiles from hurricanes and tornados, as well as extreme temperature and humidity statistics.

The Onsite Meteorological Measurements Program is used to collect data as part of the licensing of the plant for atmospheric dispersion and transport purposes. It is also used for operating plants as part of the Emergency Preparedness Program. Guidance for how to set up and maintain an onsite meteorological measurements program is provided in Regulatory Guide 1.23.

Recently, small modular reactors and advanced reactor applicants have proposed alternatives to the existing guidance on onsite meteorological measurements programs. These alternatives include

proposals to use data from local/national weather service or Department of Energy meteorological towers. Other advanced reactor design centers are considering not having an onsite meteorological monitoring system at all since they are not expected to have any potential for atmospheric releases. SMR and advanced reactor designs will present a new area of challenge for NRC meteorological staff as the industry trends continue to change.

Atmospheric dispersion focuses on accident releases and routine releases to the exclusionary boundary, low-population zone, the control room, and any special receptors going out 50 miles from the site. Generally, the atmospheric dispersion uses at least two complete years of onsite meteorological data from the monitoring program.

Next slide, please.

NRC meteorologists have been, and continue to be, involved in applications for advanced reactor and SMR applications. Staff recently completed a Topical Report related to the exclusionary boundary and low-population zone dispersion characteristics for the NuScale SMR design, rather than using the PAVAN model, to determine the EAB and LPZ x/Q models. NuScale will develop the proprietary model that

implements the dispersion algorithm adjustments provided in Reg Guide 1.194, which are generally used for control room habitability.

Due to the smaller potential source term associated with SMRs, the Clinch River early site permit application employed a smaller EAB and site boundary than us typical for a large light water reactor.

EXHB meteorologists continue to work on and support the reviews of any license amendment requests, operating reactor licensing actions, and alternative source term applications. EXHB meteorologists have also been working to support other program officers such as NMSS and Research. Some of this work has included technical analysis of extreme precipitation as part of the Church Rock probable maximum precipitation evaluation and atmospheric dispersion input into the GEIS for advanced reactors currently under development.

We are also actively working with the RAMP program on a major update to the atmospheric dispersion codes used for licensing actions. This will include the consolidation of three codes, changes how the meteorological data is input to the programs, and includes an updated user-friendly interface.

That's it for my portion of the presentation. If there are no questions, I'll turn it over to Dr. David Heeszel.

MEMBER BLEY: Thank you.

I think we can go ahead. David?

DR. HEESZEL: Thank you, Kevin.

My name is David Heeszel. I'm a geophysicist in the External Hazards Branch.

Next slide, please.

The geology and seismology staff in EHCOE focus their review on geologic and seismological hazards at proposed nuclear facilities. Staff in the group use a graded approach to their evaluations, focusing on risk-significant hazards at the level of detail in our reviews increasing with the decreasing distance from the facility.

On a regional scale, the staff reviews geologic and seismological information relevant to defining the PSHA inputs, Probabilistic Seismic Hazard Analysis inputs, including regional seismic source characterization and ground motion models.

At a local scale, staff reviews the geologic information related to the potential for surface or near-surface deformation. Staff also reviews the local seismic sources to ensure that they

are appropriately included in a PSHA. In addition, staff reviews the site response used in determining the site-specific safe shutdown earthquake, or SSE.

Next slide, please.

In addition to the geology and seismology group's ongoing licensing activities, the staff are involved in collaborative projects with the Office of Research, the Process for Ongoing Assessment of Natural Hazard Information of a new ground motion model, and the development of a Volcanic Hazards Regulatory Guide.

EHCOE staff are engaging with RES and the United State Geological Survey in a five-year interagency agreement to support Regulatory Guide updates and, more broadly, the Process for Ongoing Assessment of Natural Hazard Information efforts. The interagency agreement has multiple elements, but is broadly focused on all three elements of a PSHA -- the seismic sources, the ground motion models, and the site response. The research products that result from this effort will inform future Regulatory Guide updates.

The cooperative agreement also provides EHCOE staff with access to hazard experts outside of the agency that are able to assist in our ongoing

assessment of new information.

EHCOE staff, in collaboration with the Office of Research, are reviewing the Next Generation Attenuation East, or NGA-East, ground motion model for approval for use in licensing applications. NGA-East is a new ground motion model developed for Central and Eastern North America. Staff is currently developing an acceptance letter, and the Office of Research published Research Information Letter 2020-11 that provides a technical assessment of the model. Under the agency's POANHI process, EHCOE staff are comparing hazard results using the updated ground motion model with those developed during the agency's Fukushima response to ensure the staff has an up-to-date understanding of hazard at regulated facilities.

Finally, EHCOE staff are in the process of addressing public comments on the Volcanic Hazards Regulatory Guide, which I believe you've been briefed on. The Draft Reg Guide is focused on a risk-informed process for assessing potential volcanic hazards at a site. To this end, the Draft Guide provides a number of off-ramps to potential applicants to ensure that an assessment of potential volcanic hazards is not overly burdensome, but is informed by the geologic and tectonic setting and the Quaternary, which is the last

2.6 million years, volcanic history of the site.

If there are no questions, I will now turn it off to Dr. Weijun Wang.

MEMBER BLEY: Dave, just a minute.

DR. HEESZEL: Sure.

MEMBER BLEY: Dennis Bley.

When do you expect -- I guess it still remains a draft -- the final draft of that Reg Guide to be finished, No. 1. And No. 2, have you got any hints of any applications coming that are going to require opinions?

DR. HEESZEL: Just one moment. Jenise is getting me the answer.

Scheduled discussions for the release are ongoing, but a revision will be available in three to six months. In terms of applicability, as with any guidance document, it's up to the applicant to determine whether or not they're going to use it. Volcanic hazards are more prevalent in regions of the United States with volcanos. Sites at Idaho National Lab are potential users of the Reg Guide.

MEMBER BLEY: Okay. Thanks.

Go ahead.

DR. WANG: Okay. Thank you, Dr. Heeszel.

Good afternoon. My name is Weijun Wang,

Senior Geotechnical Engineer at the NRC with 40 years of working experience, including 14 years at the NRC.

I will give a very high-level briefing on the role of geotechnical engineering in the external hazards expertise.

Next slide, please.

The geotechnical engineering provides an important link between the Site Suitability Evaluation and the safety of the structure foundation design and the construction for a nuclear facility.

First is to ensure a phased site investigation is performed to meet the need of a specific application for a specific site characterization. The key here is specific site because every site is different. That way, we will make sure that the soil and rock engineering properties are determined based on field and laboratory testing.

Finally, we will make sure that the proper soil-rock properties, including the site soil profiles, are used in site seismic response and the soil-structure interaction analysis.

Geotechnical engineers also evaluate the foundation and the slope embankment suitability with consideration of all anticipated loading conditions,

including seismic loading and the potential of liquefaction caused by an earthquake, to ensure that there is no adverse effect on the safety-related structure because of the failure of the foundation or slopes.

In addition, geotechnical engineering reviews, also, to include the license amendment requests and the site-specific inspection testing analysis and acceptance criteria, as we have done for the Vogel combined license application.

Next slide, please.

Okay. Now I will talk about some ongoing activities in the geotechnical engineering area. We are currently working on the development of the SRP modernization for Section 2.5.4, "Suitability of Subsurface Materials and Foundations," and 2.5.5, "Slope Suitability."

Throughout this SRP, we provide guidance for staff to focus on safety significance and reasonable assurance when conducting application reviews. We also provide the usual technical consultation to the Defense Nuclear Facilities Safety Board regarding the suitability of a micropyro foundation and the reliability of liquefaction assessment for DOE facilities, based on the MOU

between the NRC and the Board.

In addition, we are also working on review of the SHINE Medical Facility operation license application and the consolidated interim facility for spent fuel applications.

So, last in my presentation, if there's no questions, I will turn it over to our geologist, Laurel Bauer.

Thank you.

MS. BAUER: Thank you, Weijun.

And good afternoon.

I'm Laurel Bauer, and I'm a geologist in the External Hazards Branch in NRR. I joined the NRC in 2007 as a geologist in the Office of New Reactors. I am presently the lead for the NRC's Process for Ongoing Assessment of Natural Hazard Information, or POANHI, a risk-informed approach to ensuring the ongoing assessment of new information related to natural hazards in the United States.

Today, I'm going to walk through the NRC's implementation of POANHI. I'll provide you with some background on the development and implementation of the process and give you some information on the framework and the key attributes.

Next slide, please.

Following the 2011 accident at Fukushima Daiichi, the NRC's post-Fukushima Near Term Task Force in Recommendation 2.2 recommended that the NRC initiate a rulemaking to require that licensees confirm seismic and flooding hazards every 10 years. It specifically recommended that licensees address any new and significant information and, if necessary, take actions that could include updating the design basis for structures, systems, and components important to safety to protect against the updated hazards.

The staff assessed the recommendations and concluded that the NRC can meet the intent of Recommendation 2.2 using an approach other than rulemaking. In developing SECY-15-0137, dated October 29th, 2015, the staff found that current practices to assess new external hazard information are generally effective, but identified a number of ways to enhance existing processes. The staff also recognized that there was no dedicated NRC process that systematically identifies available new hazard information and assesses its risk significance in a timely manner. As a result, in SECY-15-0137, the staff proposed to enhance its existing processes and develop associated staff procedures.

In Closure 2 to SECY-16-0144, dated December 29th, 2016, it provided the Commission with a comprehensive plan for developing and implementing the enhanced process to ensure ongoing assessment of new information and reconfirmation of natural hazards consistent with Recommendation 2.2. The staff briefed the ACRS in October 2016 on the staff recommendations provided in Enclosure 2 to SECY-16-0144, and the Commission approved the staff's implementation of the enhanced assessment process.

Next slide, please.

MEMBER BLEY: Laurel?

MS. BAUER: Yes?

MEMBER BLEY: Dennis Bley.

I remember discussions some time ago --

MS. BAUER: Uh-hum.

MEMBER BLEY: -- where people thought you really had to go through rulemaking to deal with this; there was no way for staff to examine these things. Can you summarize the arguments that got us out of that knot?

MS. BAUER: So, there was quite a bit that went into evaluating whether or not it was more beneficial or not to go through the rulemaking process. And in the end, the staff did determine, and

the Commission agreed, that we could do this. We felt like we already had processes in place where we were evaluating information, new information. We just didn't have set guidelines for how to do that, how to document it. And so, in weighing the burden of going through rulemaking versus enhancing the processes that we already had in place, we felt that the enhancement process would be sufficient.

MEMBER KIRCHNER: Laurel, this is Walt Kirchner.

A follow-on question to Dennis': in your bullet there, every 10 years, if I remember correctly from presentations by your colleagues, a lot of that has already taken place, a reassessment, right, of the seismic and flooding hazards?

MS. BAUER: For seismic and flooding.

MEMBER KIRCHNER: Has any plant had to backfit to accommodate, has any plant had to change its safe shutdown earthquake design limits or backfit as a result of that assessment every 10 years?

MS. BAUER: I'm not aware of any backfit that's been done, but I would ask Dr. David Heeszel. I know he's been involved with some of the follow-on seismic reviews.

DR. HEESZEL: Yes, this is David Heeszel.

No plant has backfitted as a result of the 50.54(f) review.

MEMBER KIRCHNER: Yes. For flooding, either? Have plants implemented changes to counter flooding hazards since you embarked on this?

DR. LEE: Yes. This is Mike Lee. Yes.

Well, in the flooding area, there were mitigating strategies that were proposed and reviewed by the staff consistent with several guidance documents put together by NEI. So, to address the flood hazard reevaluation or the flood hazard, the reevaluated flood hazard elevations and associated events, the licensees performed assessments subsequent to what the staff reviewed. And there was a lot of dialog on that.

MEMBER KIRCHNER: Yes.

DR. LEE: And most of that dialog, though, was performed by the Licensing Branch and not EHCOE.

MEMBER KIRCHNER: Yes, I can think of one plant -- and I won't name it -- where I thought they did adopt or adapt some mitigating measures for floods. But I just wanted to check and see if anyone had been impacted by reevaluation of seismic, and then, had to actually make changes, physical changes, to the plant.

DR. HEESZEL: So, this is David Heeszel.

While the NRC did not pursue backfit for any of the plants that were reviewed in the seismic area, several plants did undertake voluntary changes to improve their seismic readiness.

MEMBER RICCARDELLA: This is Pete Riccardella.

Weren't there a number of seismic margin analyses and seismic PRAs that were done in response to the new spectra?

DR. HEESZEL: Yes, there were 15 seismic PRAs performed.

MEMBER RICCARDELLA: So, Walt, I think the answer to your question is they didn't make changes to their design basis, but they did look at the revised spectra in seismic margins or PRAs.

MEMBER KIRCHNER: Yes.

MS. BAUER: Okay? Are you ready to move on?

MEMBER BLEY: Yes.

MS. BAUER: Okay. Thank you.

So, this slide provides a timeline of the staff activities to fully implement POANHI. The staff, both staff in NRR and in Research, contracted with the Idaho National Laboratories to develop a

Natural Hazards Information Digest, or NHID that I'll refer to.

In January 2019, the Digest was rolled out to the technical staff supporting POANHI in NRO and Research. The staff held a public meeting in April 2019 to discuss POANHI and the NRC's implementation. And in November 2019, the staff and NRR issued an Office Instruction LIC-208, "Process for Ongoing Assessment of Natural Hazards Information," and issued a Final Commissioners' Assistant Note confirming the full implementation of POANHI in response to SRM-16-0144.

Next slide, please.

MEMBER BLEY: Laurel?

MS. BAUER: Yes?

MEMBER BLEY: Another question. I'm guessing that it really helps in dealing with this, having set up this Center of Expertise, that you're tracking kind of large-scale things that could reflect down on plants in these areas.

MS. BAUER: Uh-hum.

MEMBER BLEY: It seems possible that local information could come up and the inspectors at the plant could send back information that, hey, there's something new that's evolved here --

MS. BAUER: Absolutely.

MEMBER BLEY: -- before the 10 years is up.

MS. BAUER: Uh-hum,

MEMBER BLEY: Is there some organized way that you deal with that?

MS. BAUER: So, this is actually one of the areas that we looked at when we were evaluating the benefit of doing an every 10 years versus enhancing the process that we already had in place to look at hazards on an ongoing basis. It is that these things do come up over time, and they may be every 10 years or every 20 years you might have something that comes up, obviously, in the next month or so. And so, this gives us a little more flexibility to deal with those issues that would come up, maybe in inspection space or some other licensing space.

And so, we do have interactions back and forth with the inspection staff. And when we were going through the process of developing our Office Instruction, we worked with the inspection staff on how those interactions would take place.

Does that help to answer a little bit?

MEMBER BLEY: It does. Thank you.

MS. BAUER: Okay. Right. So, they know

that we're here. And so, yes, something could come up where they would see it first and it would come to us, and it works the other way as well, once we've assessed new information.

MR. SEE: Hey, Laurel?

MS. BAUER: Yes?

MR. SEE: This is Ken. I just want to speak specifically.

I mean, that has happened recently.

MS. BAUER: Right.

MR. SEE: For over the last two years, Resident Inspectors have reached out and had conversations with those concerning issues that they have identified, because they do have local knowledge, and that's very valuable.

MS. BAUER: Uh-hum. Absolutely.

MEMBER BLEY: That's great. Glad to hear it.

MS. BAUER: Thank you, Ken.

Okay. The framework for addressing new natural hazards information consists of three primary components. We have knowledge-base activities, active technical engagement and coordination, and assessment activities.

The knowledge-base activities really

provide the foundation for the POANHI framework. And this includes the Natural Hazards Information Digest that I spoke of in the previous slide. The NHID provides a digital infrastructure for use by the NRC staff involved with natural hazard assessments to compile and store natural hazards information related to nuclear power plant sites. It organizes completed licensing reviews and documented hazard assessments in a clear, consistent, and logical manner. The Digest is organized into five primary hazard areas, including flooding hazards; seismic hazards; high winds, to include tornado and hurricane; snow ice loads, and extreme temperatures and humidity.

The NHID includes existing information related to natural hazards that have been submitted by licensees or developed by the staff as part of the Recommendation 2.1 and 2.3 activities, new reactor reviews, and the results from other regulatory activities, such as individual plant examination of external events or IPEEE.

The information contained in the Digest provides staff with a baseline for considering new natural hazards information and the potential effects on licensed sites, so that new information is not being evaluated in isolation.

The staff will document the results of all assessments and provide updates to the cumulative information records contained in the NHID. These updates will include a short summary of the new hazard information and the staff's conclusions regarding significance of the new hazard information from a plant safety perspective.

In addition to supporting the activities associated with the proposed framework, the Digest also ensures that information is available and can be used to support other agency activities in a timely manner, including assisting the agency in responding to emergent events associated with natural hazards by promptly providing relevant information; engaging external stakeholders, including responding to allegations and petitions; evaluating natural hazard-related inspection findings under the NRC's significance determination process for power reactors; formulating and implementing research plans associated with natural hazards, and updating regulatory and staff guidance.

The second key component of the POANHI framework is active technical engagement and coordination. This involves leveraging and enhancing ongoing interactions with a variety of stakeholders,

including internal and external organizations. Internal and external stakeholders include the public; industry; licensees and prospective applicants; partner federal agencies; professional, technical, and scientific organizations; academic research institutions, and international counterparts.

The ongoing technical engagement and coordination activities facilitate the identification of new natural hazard information. The staff will periodically coordinate and document the outcomes of meetings during which NRC and its stakeholders will review and discuss the evolution and knowledge, example changes, and data models and methods related to natural hazards.

The staff will continue to remain engaged in the broader technical and scientific community, which will ensure the staff are aware of, and are contributors to, advances in data models and methods, including opportunities for leveraging more sophisticated models and refinements that may have an impact on nuclear power plant sites.

Some examples of the coordination activities that the staff is responsible for include the NRC-DOE Natural Phenomena Hazards Meeting and the Annual Probabilistic Flood Hazard Assessment Research

Workshop.

The Natural Phenomena Hazards Meeting is held every couple of years and provides a unique opportunity for the NRC staff to engage in dialog with DOE and industry regarding developments and natural hazards information and its use in regulatory activities.

In addition, the NRC hosts the Annual Probabilistic Flood Hazard Assessment Research Workshop at the NRC Headquarters. The Workshop is open to the public and brings together NRC staff, federal agencies, industry, and other external organizations involved in flood hazard assessment, flood risk assessment, and flood protection and mitigation research.

The NRC also actively participates in the Advisory Committee on Water Information, and the staff continues to support interagency agreements with partner agencies, such as the U.S. Geological Survey, to address issues related to natural hazards in the United States.

The third component of the POANHI framework is the staff assessment activities. The overall objective of the assessment of hazard significance is to determine if new information

related to natural hazards has the potential to significantly affect the safety at a U.S. nuclear power plant. The assessment of hazard information includes the collection and aggregation of new hazard information; a significance assessment; documentation; referral to the appropriate regulatory program, as necessary, and continued stakeholder interactions.

The assessment activities are intended to require limited resources and use information contained within the knowledge base as a starting point to perform a limited-scope, quantitative or qualitative assessment to determine if the new information results in a change in hazard that is potentially significant. The assessment will be performed by subject matter experts in the External Hazards Center of Expertise, augmented, as needed, by staff from the Office of Research or other NRC organizations.

The Division Director responsible for the External Hazards Center of Expertise may, as needed, convene a technical advisory committee to assess hazard significance and to recommend appropriate next steps to address the issue.

New hazard information determined to be significant will, then, be referred to the appropriate

regulatory program office, and the staff will document the results of the assessment in updates to the cumulative information record within the Natural Hazards Information Digest and in periodic reports to be made publicly available.

Next slide, please.

So, this slide just provides a summary of some of the key features of the POANHI process. The POANHI activities are being led by a cross-agency team from EHCOE, as well as from the Office of Research. As part of its activities, the staff will collect new information from the ongoing technical coordination and engagement activities, as well as from other NRC sources, operating experience, licensing experience, and research activities.

When the staff identifies new hazard information, it will assess that new information for potential significance using a risk-informed approach and in the context of previously accumulated hazard information and past precedent of significance, rather than in isolation. This assessment will evaluate the change in the hazard represented by the aggregated information and consider available risk insights to determine whether the change in the hazard has a potentially significant effect on plant safety. And

to the extent possible, POANHI will leverage existing regulatory processes, existing research programs, and cooperation with other federal agencies to achieve its objectives in an effective and efficient manner.

Next slide.

And I won't go into a lot on this. Dr. Heeszel previously spoke to the NRC's review of the Next Generation Attenuation for Central and Eastern North America Project, or NGA-East. And that is currently the big review that we're doing using the POANHI staff in both NRR and in Research.

Thank you. And if there are no questions, I will turn the presentation back over to Dr. Kenneth See to discuss the NRC's Dam Safety Program.

MR. SEE: Okay. Thank you, Laurel. Thank you for promoting me to "doctor". I am not, unless you want to five me an honorary.

MS. BAUER: I'm not, either. So, okay.

(Laughter.)

MR. SEE: An honorary degree, you know, just email me a certificate. Thank you.

(Laughter.)

MEMBER BLEY: Hey, Ken?

MR. SEE: Yes, sir?

MEMBER BLEY: Before you get started, we

have about 20 minutes left of the allotted time, but we started late. So, if we need to go a little longer, it's okay, but I think we'll probably finish up.

But, before you get into all your information, can you say anything about the Prairie Island flood and things you learned about that? And does that affect the other things we're sitting here -- I think I recall, and I might not be right on this, that there was some kind of issue. I don't know who was controlling the upstream dam, but they were thinking they had to dump a lot more water when Prairie Island was kind of in extremis. Can you say anything about how those interactions worked between agencies when such issues come up? That would be appreciated?

MR. SEE: I'm not familiar with the Prairie Island incident off the top of my head. Maybe you can --

MEMBER BLEY: Never mind then. Go ahead.

MR. SEE: I will look that up. Let me take a little note here.

CHAIRMAN SUNSERI: Dennis, was it Fort Calhoun that you're thinking about?

MEMBER BLEY: You're probably right. I

don't know why Prairie Island stuck in my head. Yes, it was Fort Calhoun.

MEMBER KIRCHNER: It was Fort Calhoun.

MEMBER BLEY: Yes. Okay. Yes.

DR. LEE: This is Mike Lee.

I mean, I don't have any specific recollection of the issue. We could certainly take that as a takeaway from the meeting.

MR. SEE: Well, I can speak a bit to Fort Calhoun. I was involved in that review. The big picture, in the beginning of the Fukushima effort, licensees went out and hired contractors, engineering firms who could do flood analysis. And to get information on the dams, they would go to the nearest or appropriate Army Corps of Engineers District.

And they got kind of an inconsistent response. Some Districts would cooperate and provide the information on their dams and their riverine system; whereas, others were adamant that the information was sensitive and non-public.

So, this information, you know, the licensees came back to the agency and said, "Hey, we're not getting coordination across the board. Can you reach out and help?" So, the agency reached out to the Corps and got a better understanding of their

position.

The Corps, then, I believe it was the Omaha District which was given the national program lead, and they wanted to be consistent across the Corps. So, it was decided, for those Districts that had not given information, that they would work with the Omaha District. So, in the end, the Army Corps of Engineers did the analysis and provided the information to the NRC. And then, we would provide non-sensitive information to the licensee for them to perhaps, you know, to further refine the modeling. And Fort Calhoun was one of those stations.

The original analysis was not good for Fort Calhoun, and we went around several times iterating on modifying the program, doing different sorts of analysis. But, at the end, they made a business decision to close down. So, Fort Calhoun is closed. So, that's my take on Fort Calhoun.

Any other questions?

MEMBER BLEY: All right. Go ahead.

MR. SEE: Okay. Next slide, please.

All right. Let me start with a little history here. In 1972, Congress enacted the National Dam Safety Act. This legislation required the Army Corps to inspect certain non-federal dams based on

their size and storage. The legislation required the Corps to report the inspection results to the states and notify of any actions needed to ensure dam safety. It also established a National Inventory of Dams.

In 1976, a report on these activities and some proposed legislation to implement a Federal Dam Safety Program were transmitted to Congress. However, a lack of funding prevented execution of detailed dam inspections.

In 1976, Teton Dam fails during the initial filling. Blame on the collapse was on the soil conditions and the soil used in the core and cracking in the foundation that allowed water to seep under and through the dam, which led to internal erosion called "piping," and eventually caused the dam to collapse.

This failure revitalized both government and public concerns over dam safety. New legislation for dam safety was also introduced.

In 1979, which is on this slide, President Carter established a Federal Dam Safety Program when he issued memorandum titled, "Federal Guidelines for Dam Safety". The memorandum directed that each federal agency having responsibility for design, construction, operation, or regulation of dams

establish a Dam Safety Program.

The NRC began to develop its Dam Safety Program. During this process, staff identified the following legal authorities for the program. So, the big one, the 1954 Atomic Energy Act, which I think you've heard of; the Energy Reorganization Act of 1974, and the Uranium Mill Tailings Radiation Control Act of 1978.

At the time, the general regulatory provisions of 10 CFR 30, Part 40, 50, and 70, were thought to provide sufficient authority over radiologically safety-related dams. 10 CFR, Part 40, Appendix A, provides statutory authority over mill tailing dams.

Next slide, please.

In 1991, the NRC established the NRC Dam Safety Program in SECY-91-193, which outlines the roles and responsibilities of the NRC Dam Safety Officer and presents a program to the Commission to implement and meet the federal guidelines on dam safety.

In 1997, SECY-97-110 provided an update to the Commission, informing them of the NRC's belief that the agency full meets the federal guidelines. In SRM-97-100, the Commission approved the Dam Safety

Program.

In 2006, the Dam Safety Act was amended. This amended legislation requires the Corps to maintain and update information on the National Inventory of Dams in the United States, commonly referred to as the NID, N-I-D. The National Inventory of Dams is used to track information on U.S. water control infrastructure, land use management, flood plain management, and emergency action planning.

The NRC provides updates to the Corps on an annual basis. This information is used by the Corps to update the National Inventory of Dams and to support FEMA's Biennial Report on Dam Safety to Congress.

The Act also requires the Strategic Plan for Dam Safety to be prepared by the Director of FEMA. The NRC provides input to this Strategic Plan approximately every five years. It's not every five years. It kind of comes and goes.

Next slide, please.

All right. Based on analysis from OGC, the NRC has regulatory authority over dams that, should they fail, have radiological hazards or mill tailing dams. That is, again, Part 40 where the statutory authority exists.

Excluded from NRC consideration are those dams that may be onsite and associated with a licensed facility, but not related to radiological safety.

In 2016, the NRC's then-Dam-Safety-Officer asked attorneys in the Office of General Counsel whether NRC's authority to regulate dams had changed since the last legal analysis, which was in 1991. The OGC's conclusion was that the legal analysis from 1991 remained valid.

Next slide, please.

As discussed in SECY-91-193, the NRC entered into a Memorandum of Understanding with the Federal Energy Regulatory Commission, or FERC, to provide technical assistance in developing this Dam Safety Program. Today, FERC provides the staff to carry out inspections of NRC-regulated dams. For mostly budgetary reasons, and some technical reasons, the NRC decided to use FERC in this role in lieu of developing its own set of staff to carry out the inspections.

Dams at the nuclear power plants under NRC jurisdiction are inspected by NRC and FERC every two years, and dams at uranium tail milling sites are inspected every three years. These inspections are in addition to those conducted by the licensee.

These inspections are the primary method to demonstrate continued compliance with the federal guidelines. These inspections are coordinated with the proper Doral PM for the plant; FERC, the Federal Energy Regulatory Commission, and the licensee. Prior to each inspection, the licensee is requested to provide information such as the results of any inspections performed by them; maintenance work and surveillances performed since the last NRC inspection. This may include instrumentation, monitoring, settlement surveys, et cetera. The inspections typically take four to five hours to complete. This is the FERC inspector and the NRC staff go out and walk down the structures.

Observations and recommendations that have typically been reported are vegetation that's found along the slopes of the dam -- obviously, a geotechnical dam, not a concrete dam. If there's any varmints and dens, recommend their removal. Continuing monitoring any wet areas, which would indicate minor seepage, and monitor and repair any minor erosions.

I will say that the FERC inspectors speak often about how impressed they are with the condition of the NRC-regulated dams.

Next slide, please.

So, this is a list of the dams that are currently under NRC regulation. Seven out of eight are power reactors. So, we're basically at eight dams total. However, we started out with 65 dams at the beginning of the program. This was quickly reduced to 34, based upon review by OGC. But recent closures of several uranium mill tailing impoundments, and with the addition of the State of Wyoming as an Agreement Statement, the number of dams was reduced to eight.

That concludes my talk. If you have any questions, I will be glad to answer them.

MEMBER BLEY: Yes, Ken, this is Dennis Bley again.

Do you have any idea how many power plants have upstream dams that are not NRC-regulated? And for those cases -- well, none of them are NRC-operated, I guess, either. In cases where there becomes an issue between the operator of the dam or the regulator of the dam wanting to dump water, and the plant's needs for it to be controlled more, how are those conflicts resolved?

MR. SEE: That's an interesting question. During the review of Fukushima, we put out an Interim Staff Guidance document. I think it's JLD-ISG-2013-1.

That's currently being -- it's going to be turned into a Reg Guide. We're going to be working on that this upcoming year.

There are thousands of dams upstream from nuclear power plants. Most of them are very small. You know, I'm talking like HOA impoundments. They pose no threat to the nuclear facilities.

The big dams, the ones that we typically are concerned with, are operated in accordance to Congress' direction.

I know for Fort Calhoun there was increased communication between the licensee and the Army Corps of Engineers. The licensee was provided access to the emergency action plans, and I believe the Corps committed to notifying Fort Calhoun that they were going to be releasing water. And they had calculated how much water. I mean, they could flood Fort Calhoun just by opening the gates wide open. The dam did not have to fail. So, there was an emphasis on communication.

But, as far as other sites, most of the reviews showed that the sites could deal with the flood. Cooper, which is downstream from Fort Calhoun, has put in some mitigation and some flex and have made commitments. I believe they're one of the sites that

has made commitments.

But the outcome of the Fukushima reviews was that most of these sites could accommodate a beyond-design-basis flood.

I hope that answers your question. I would suggest you read that ISG. I think that would be very informative.

MEMBER BLEY: Yes. Well, we've got it on the transcript. So, could you say the numbers again, so we make sure they're right in the transcript?

MR. SEE: Yes. That's JLD, which is Japanese Lessons Learned Directorate, then -ISG-2013-1.

And if you have any issues -- I wish I had the ML number with me now, but it's a publicly-available document.

MEMBER BLEY: Okay. Great. Thanks, Ken. We'll look at that. And I appreciate it. Thanks very much for your presentation.

Any questions from other members?

(No response.)

MR. SEE: Okay. With that, I'm going to turn it back over to Dr. Hayes, the Branch Chief.

MEMBER BLEY: Okay. Thank you.

MR. SEE: All right.

DR. HAYES: Thank you very much, Ken.

For more information, I would go to our SharePoint site. Again, it's not publicly-available, but it is accessible to ACRS members. It shows our areas of expertise and guidance related to reactor reviews. There's a number of EHCOE briefs up there that might be of interest to you on multi-hazard siting reviews; knowledge management from the post-Fukushima work that we've done; EHCOE transformation; external manmade hazards, POANHI, the Standard Review Plan for changes associated with hydrology, and also, the Dam Safety Program.

And the SharePoint, that also includes our draft revised charter and our draft engagement plan.

In summary, our matrix structure today and the transition that's underway towards a regulator are reflected by the facts that we rely on past operational experience. We focus on risk insights. We ensure that reviews are risk-informed and performance-based, and we embrace process improvements and optimize regulatory reviews that way.

We also leverage technology and collaborations. We utilize existing federal data and databases. We have continued participation in consensus standard development, engagement

internationally, and maintaining knowledgeable, agile staff. And we also participate in knowledge management transfer. These are the processes that we have underway.

I would like to thank the Committee for its time today, and EHCOE, our staff will, no doubt, be interacting with you in terms of future reviews.

And now, are there any additional questions on EHCOE?

MEMBER BLEY: Anything from other members?

(No response.)

Barbara, thank you so much. It was a great overview of what all is in EHCOE, a really fascinating organization right now. And the presenters were all very fine, and we appreciate the talks. And we do look forward to interacting with the folks from EHCOE as we continue our reviews in various license applications.

Thank you so much.

At this time, I'll turn it back to our Chairman, Matt.

And thank you, Matt, for bailing me out on the flood. My brain went belly-up.

(Laughter.)

CHAIRMAN SUNSERI: No problem. I was in

Kansas at the time. So, it was quite familiar to me as well.

I couldn't say it any better than what Dennis said on how much we appreciate the thoroughness and the quality of the presentation. It was excellent and I learned so much about what you're doing. It's quite impressive. So, we thank you very much for that.

Okay. Committee, at this time, it is almost 1:30. So, we were going to recess for lunch at this time. We will take a break until 2:30 p.m., Eastern Time, at which time we will continue with report preparation. And at that time, we'll take up the report from Member March-Leuba and we'll look at our response to the staff's response to the Arbonne distribution letter. So, we'll have presentations on that.

And I'll conclude now, and we'll see you at 2:30.

Thank you.

(Whereupon, at 1:30 p.m., the session recessed until 2:30 p.m. the same day.)

External Hazards Center of Expertise

Barbara D. Hayes, PhD, PE

Branch Chief
External Hazards Branch
Division of Engineering and External Hazards
Office of Nuclear Reactor Regulation

Barbara.Hayes@nrc.gov

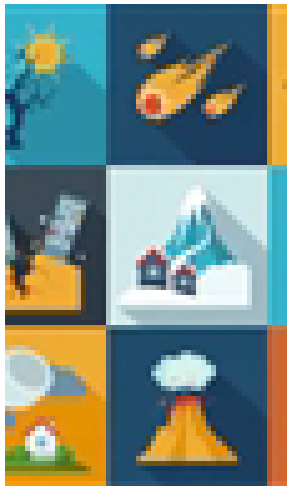
Presentation to the ACRS
October 9, 2020

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

Agenda

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

- **ECHOE**
- **Areas of Expertise**
  - Hydrology
  - Man-Made Hazards
  - Meteorology
  - Geology/Seismology
  - Geotechnical Engineering
- **Process for Ongoing Assessment of Natural Hazards Information**
- **Dam Safety Program**
- **Closing Thoughts**



Previous Activities

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

COL and ESP Applications

- Completed 8 COL and 6 ESP Reviews
  - Most recently Clinch River ESP

Design Certification Applications

- NuScale
- KHNP APR 1400

Fukushima-Related § 50.54(f) Responses

- 63 Site-specific Seismic Hazard Reviews and 15 SPRA reviews
- Flood Hazard Reevaluation Reports

Current Activities

Office of Nuclear Reactor Regulation

- LAR Reviews
- Shine Medical Isotope Facility OL Review
- Support for OKLO Aurora Review at INL
- Pre-Application Support for Potential UAMPS Application

Office of Nuclear Materials Safety and Safeguards

- ISP/WCS CISF Application Review
- Holtec CISF Application Review

EHCOE – History

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

Formed in NRO as limited scope COE following SECY-15-0143, "Project Aim and Centers of Expertise"

Executive responsibility with the director of the Division of Engineering and External Hazards (DEX)

Click to add text

Matrixed organization within NRR

Recent new Share Point site, draft revised charter, draft engagement plan

EHCOE – Who we are

- **External Hazards Branch (EXHB)**
  - Barbara Hayes, Chief
  - 14 staff covering meteorology, hydrology, seismology, geology and external man-made hazards
    - NRC Dam Safety Officer, Kenneth See
    - POANHI POC, Laurel Bauer
    - POCs for the National Weather Service and for the Office of the Federal Coordinator for Meteorology
    - EHCOE Project Manager, Luissette Candelario

EHCOE – Who we are *Continued*

- **Structural, Civil, and Geotech Engineering Branch (ESEB)**
  - Joe Colaccino, Chief
  - 3 ESEB staff members in EHCOE cover geotechnical engineering
  - 1 ESEB staff member supports external man-made hazards activities managed by EXHB
- **Senior Technical Advisor on Nuclear Power Plant Siting, Cliff Munson**
- **Dam Safety Project Manager - NRR/DANU/UARL**

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

Our Vision

Enhance the NRC's ability to shift resources or work assignments to meet the demands of a changing environment, increase organization capacity without an increase in resources, and achieve more effective knowledge management and maintenance of critical skill sets.

MODERNIZE REGULATORY REVIEW PRACTICES

ALIGN WITH NRC'S RISK-INFORMED APPROACH TO REGULATION

EVALUATE AND RIGHT-SIZE REVIEW ACTIVITIES

ENSURE ADEQUATE BENCH STRENGTH

PRESERVE CRITICAL SKILL SETS

EHCOE Transformation

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

Process Simplification

- Dedicating resources to modernize our processes and work tools
  - Collaborative culture change
  - Revised EHCOE Charter and Engagement Plan

Technology Adoption

- Facilitate document production, staff collaboration, and document sharing
  - Development and use of EHCOE Share Point site
  - Creation of new internal tools for workflow and staff generated opportunities

Career Enhancement

- Promoting staff rotations and training
- Promoting cross training and leadership opportunities

EHCOE Transformation Continued…

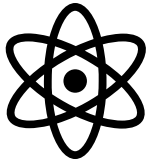
U.S.NRC
United States Nuclear Regulatory Commission
Protecting People and the Environment

Focus on Risk Significance

- Commitment to Commissions' Risk-Informed/Performance-Based Approach to Regulation
- Training by EHCOE Staff align with NRC's with transformation
- Transformative Examples
  - Hydrology: Introduction of *"Consequential flood" concept*
  - Geology: Focus primarily on geologic stability during quaternary period; avoid encyclopedic-based geology reviews

Regulatory Basis for EHCOE Reviews

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



Primary Focus on Conventional Power Reactors

Parts 50, 52, and 100

Support for Other NRC Programs

Decommissioning, Waste Management, Mill Tailings(Parts 61, 63, 70, and 72)

Support Advanced Reactor Siting

Partnering with DANU and NMSS

EHCOE's Focus

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

- Potential Climatology-driven Hazards (snow loads, tornado and hurricane wind loads, etc.)
- Atmospheric Dispersion of Radionuclides
- Local Intense Precipitation and Associated Site Drainage
- All Potential Flood-related Hazards (rivers, streams, dam failure, etc.)
- Evaluation of the Safety-related Water supply
- All Potential Coastal Hazards (storm surge, tsunami, etc.)
- Groundwater Flow and Radionuclide Transport
- Geologic Hazards (faulting, landslides, volcanism, Karst)
- Potential for Ground Shaking (i.e., seismology and geophysics)
- Stability of Subsurface Materials, Slopes, and Foundations (geotechnical engineering)
- Potential Explosions and Releases of Toxic Chemicals from Nearby Industrial Facilities or Transportation Systems
- Aircraft Crash Hazards
- Radionuclide Contaminant Fate Transport in the Environment
- Probabilistic Flood Hazard Analyses
- Probabilistic Seismic Hazard Analyses

EHCOE – What we do

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

Hydrology Review Activities within EHCOE

Michael P. Lee, PhD
Senior Hydrologist
External Hazards Branch
Division of Engineering and External Hazards
Office of Nuclear Reactor Regulation

Mike.Lee@nrc.gov

Presentation to the ACRS
October 9, 2020

Recent Lessons-Learned

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

Staff Reviews

- Part 52 Early Site Permits and Combined Operating License Applications
- 2012 § 50.54(f) Information Request (Fukushima Accident)

... Flood Hazard Re-Evaluations

Not All Flood-Causing Mechanisms are Consequential to Defining the Design Basis

- YES: LIP, Riverine/Dam Failure, Storm Surge
- NO: Tsunamis, Seiche, Channel Migration, and Ice Dams

Definition of Consequential Flood

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

- **Evolved from § 50.54(f) flood hazard re-evaluations**
- **Intent is to simplify staff reviews**
  - Focus only on flood-causing mechanisms defining flood threat
  - Inconsequential flooding mechanisms not relevant to
  - Comports with Commission's RI/PB regulatory approach
  - Consistent with definition of "site characteristic flood"
    - Part 50.2 ("Definitions")
    - Focus of SRP Chapter 2.4 reviews
- **Concept introduced as part of SRP update process**
  - September 28, 2018, *Federal Register Notice*
  - Channel migration & tsunami section updates

Consequential Flood Definition

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

- *.... For Construction Permits, Operating Licenses, and COL applications, a term used to identify conditions in which the flood severity exceeds the capability of protection features (if available), including considerations for flood level, duration and/or associated effects, such that SSCs important-to-safety may be impacted. For ESP applications, the flood severity is expected to be in reference to the site characteristic flood. Consequential flooding may occur for events that are less severe and with differing characteristics (e.g., shorter warning time) than the deterministically defined probable maximum events. (83 FR 49134)*

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

Man-Made Hazard Review Activities within EHCOE

Kenneth See, PE
Senior Hydrologist
External Hazards Branch
Division of Engineering and External Hazards
Office of Nuclear Reactor Regulation

Kenneth.See@nrc.gov

Presentation to the ACRS
October 9, 2020

Man-Made Hazards

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

- Aircraft Crash Hazards (Airport Operations, Inflight Operations)
- Transportation Accidents (Highway, Railway, Ship/Barge)
- Pipeline and Industrial Facility Accidents

Man-Made Hazards
Regulatory Guide 1.91:
Evaluations of Explosions Postulated To Occur on Transportation Routes Near Nuclear Power Plants

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

- **Periodic Review (ML20134J125)**
  - Changes based on "Report of the U.S. Nuclear Regulatory Commission Expert Evaluation Team on Concerns Pertaining to Gas Transmission Lines Near the Indian Point Nuclear Power Plant," April 8, 2020 (ML20100F635)

- **Revision Timetable**
  - Provide draft RG to RES for processing by March 2021
  - Issue Draft RG for Public Comment July 2021

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

Meteorology Review Activities within EHCOE

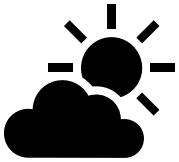
Kevin R. Quinlan
Meteorologist
External Hazards Branch
Division of Engineering and External Hazards
Office of Nuclear Reactor Regulation

Kevin.Quinlan@nrc.gov

Presentation to the ACRS
October 9, 2020

Meteorology Areas of Expertise

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



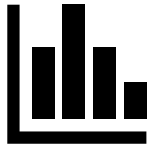
Regional Climatology and Local Meteorology

Rain, Snow, Hurricanes, Tornados, Thunderstorms, Temperature/Humidity Extremes

Onsite Meteorological Monitoring

Wind Speed, Wind Direction, Temperature, Precipitation

New considerations for SMR/Advanced Rx



Atmospheric Dispersion Estimates

Design-Basis Accidents, Routine Releases,

Control Room Habitability

Recent Support Activities

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

- **New Advanced and Operating Reactors**
  - Novel Approach to Dispersion Modeling by NuScale
  - Short EAB/Site Boundary by Clinch River ESP
  - LARs, Operating Reactor Applications, ASTs
- **NMSS**
  - Church Rock PMP Evaluation
  - Atmospheric Dispersion Input to GEIS for Advanced Reactors
- **Office of Research**
  - RAMP Dispersion Code Updates
  - NEA High Wind Survey

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

Geology/Seismology Review Activities within EHCOE

David Heeszel, PhD
Geophysicist & EXHB Geology/Seismology Liaison
External Hazards Branch
Division of Engineering and External Hazards
Office of Nuclear Reactor Regulation

David.Heeszel@nrc.gov

Presentation to the ACRS
October 9, 2020

Geology and Seismology Areas of Expertise

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

Regional and Local Geologic and Seismological Hazards

Geologic Characterization of Proposed Site/Regions

Regional Seismological Information Important to PSHA

- Regional seismic sources
- Regional ground motion models

Onsite Geologic and Seismic Hazards

Onsite Geologic Hazards

- Surface and near-surface deformation

Site-specific PSHA and SSE Determinations

- Seismic sources
- Ground motion model
- Site response

Geology and Seismology Ongoing Activities

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

- **Office of Nuclear Regulatory Research**
  - USGS/RES Interagency Agreement to support Regulatory Guide Updates and POANHI
  - Site Response SSHAC Level II Demonstration Project
  - Collaboration on POANHI Activities
- **Cross Cutting Issues**
  - NGA-East Review (new ground motion model for PSHA)
    - Currently under review for acceptance in licensing applications
    - RIL 2020-11 provides review of technical adequacy of model
    - Through POANHI staff is comparing NGA-East hazard with hazard determined currently accepted ground motion model
  - Volcanic Hazard Regulatory Guide

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

Geotechnical Engineering Review Activities within EHCOE

Weijun Wang, PhD, PE
Senior Geotechnical Engineer
Structural, Civil, and Geotech Engineering Branch
Division of Engineering and External Hazards
Office of Nuclear Reactor Regulation

Weijun.Wang@nrc.gov

Presentation to the ACRS
October 9, 2020

Geotechnical Engineering Areas of Expertise

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

- **Determination of Subsurface Material Engineering Properties**
  - Phased site investigation for site characterization
  - Necessary field and laboratory testing
  - Soil and rock material and engineering properties determination for site seismic response, soil-structure interaction, foundation and slope stability analyses
- **Foundation and Slope Stability Evaluations**
  - Evaluation of potential of liquefaction
  - Stability under all natural and man-made loading conditions

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

Geotechnical Engineering Ongoing Activities

SRP Modernization

- Incorporate Risk-Informed Concepts in SRP Updates to Sections 2.5.4 and 2.5.5

Technical Support to Other Agencies

- Provided initial technical consultation to DNFSB based on MOU between NRC and DNFSB

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

Process for Ongoing Assessment of Natural Hazards Information (POANHI)

Laurel Bauer
Geologist
External Hazards Branch
Division of Engineering and External Hazards
Office of Nuclear Reactor Regulation

Laurel.Bauer@nrc.gov

Presentation to the ACRS
October 9, 2020

POANHI Background

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

- **Post-Fukushima NTTF Recommendation 2.2**
  - Advised rulemaking requiring that nuclear power plant licensees confirm seismic and flooding hazards every 10 years
- **Staff Requirements Memorandum-SECY-15-0137**
  - Recommended an approach other than rulemaking to ensure staff proactively and routinely aggregates and assesses new natural hazards information
- **Staff Requirements Memorandum-SECY-16-0144**
  - Provided a comprehensive plan for developing and implementing POANHI that included development and issuance of an Office Instruction and development of the *Natural Hazards Information Digest (NHID)*

POANHI Implementation

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

- RES/NRR staff worked with Idaho National Laboratories (INL) to develop the NHID
- NHID Demonstrated to NRC staff for implementation – February 2019
- Public Meeting to discuss POANHI implementation – April 2019
- Office Instruction LIC-208 "Process for the Ongoing Assessment of Natural Hazards Information" issued – November 2019

POANHI Framework

Knowledge Base

Active Technical Engagement and Coordination

Ongoing Assessment Activities

POANHI Attributes

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

- Implementation by a cross-agency team
- Aggregation and evaluation of new natural hazards information
- Incorporation of risk insights into a determination of risk significance
- Documentation of independent staff assessments related to new natural hazards information
- Referral of potentially risk-significant issues to appropriate regulatory programs

POANHI Current Activities

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

Review of Next Generation Attenuation Models for central and eastern North America (NGA-East)

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

NRC's Dam Safety Program

Kenneth See, PE
NRC Dam Safety Officer
External Hazards Branch
Division of Engineering and External Hazards
Office of Nuclear Reactor Regulation

Kenneth.See@nrc.gov

Presentation to the ACRS
October 9, 2020

Regulatory Authority

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

- President Carter established the federal dam safety program when he issued an implementing memorandum for "Federal Guidelines for Dam Safety," on October 4, 1979
- The memorandum directed that each federal agency having responsibility for design, construction, operation, or regulation of dams establish a dam safety program
- The legal authority for the Commission, in the realm of dam safety, derives from:
  - the Atomic Energy Act of 1954, as amended;
  - the Energy Reorganization Act of 1974, as amended; and
  - the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA)

Regulatory Authority

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

- SECY 91-193 establishes the NRC DSP and outlines the roles and responsibilities of the Dam Safety Officer
- Dam Safety Act of 2006 – Amended original Act
- Requires the Secretary of the Army to maintain and update information on the inventory of dams in the United States. (National Inventory of Dams – NID)
- Requires the strategic plan for dam safety prepared by the Director of the Federal Emergency Management Agency (FEMA) to establish performance measures, in addition to goals, priorities, and target dates, toward effectively administering the Act to improve dam safety

Regulatory Authority

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

NRC has regulatory authority over:

- uranium mill tailings dams
- storage-water-pond dams at in-situ leach mining facilities, and
- those dams integral to the operation of licensed facilities, or the possession and use of licensed material, that pose a radiological safety-related hazard should they fail.

Dam Inspection Program

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

- Memorandum of Understanding with FERC - 1992
- FERC provides technical assistance to the NRC by inspecting dams under NRC jurisdiction
  - In lieu of creating NRC inspector program
  - Inspections are performed every
    - 2 years (Power Reactors)
    - 3 years (Uranuim Mills)
- Ensure compliance with Federal Guidelines for Dam Safety

NRC Regulated Dams

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

- **Uranium Mills (Inspected Every 3 Years)**
  - Crow Butte (Nebraska)
- **Power Reactors (Inspected Every 2 Years)**
  - North Anna (Virginia)
  - Shearon Harris (North Carolina)
  - McGuire (North Carolina)
  - Catawba (South Carolina)
  - Summer (South Carolina)
  - Farley (Alabama)
  - Comanche Peak (Texas)

Closing:
Learn More About ECHOE

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

- ECHOE SharePoint Site
  - https://usnrc.sharepoint.com/teams/NRR-External-Hazards-Center-of-Expertise/
- Information on our areas of expertise and guidance for reactor safety reviews
- EHCOE Briefs on our work
- Our Draft Revised Charter and Draft Engagement Plan

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

Thank You ...

Questions ?

Abbreviations

EHCOE
ESP
COLA
HMR
FHRR
LIP
PMP
POANHI
SRP
RG
PFHA
SSE
SPRA
PSHA