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NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

+ + + + +

FUKUSHIMA SUBCOMMITTEE

+ + + + +

PRELIMINARY PLANS FOR DISPOSITION OF

NEAR-TERM TASK FORCE TIER 3 RECOMMENDATIONS

AS WELL AS HARDENED AND FILTERED VENTS

+ + + + +

TUESDAY

MAY 22, 2012

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ROCKVILLE, MARYLAND

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

SUBCOMMITTEE MEMBERS PRESENT:

STEPHEN P. SCHULTZ, Chair

J. SAM ARMIJO

SANJOY BANERJEE

DENNIS C. BLEY

MICHAEL CORRADINI

HAROLD B. RAY

JOY REMPE

MICHAEL T. RYAN

WILLIAM J. SHACK

JOHN D. SIEBER

GORDON R. SKILLMAN

JOHN W. STETKAR

NRC STAFF PRESENT:

ANTONIO DIAS, Designated Federal Official

JOHN MONNINGER

DAVID BROWN

ROBERT FRETZ

ROBERT DENNIG

TIMOTHY COLLINS

RICHARD LEE

DON DUBE

JENISE THOMPSON

NILESH CHOKSHI

DOUG COE

KEVIN COYNE

ALSO PRESENT:

PAUL GUNTER

STEVEN KRAFT

BOB LEYSE (present via telephone)

ADRIAN HEYMER

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

C-O-N-T-E-N-T-S (CONTINUED)

P R O C E E D I N G S

1:13 p.m.

CHAIR SCHULTZ: [presiding] The meeting will now come to order.

This is a meeting of the Advisory Committee on Reactor Safeguards, Subcommittee on Fukushima. I am Stephen Schultz, Chairman of the Subcommittee.

Members in attendance are Sam Armijo, Sanjoy Banerjee, Dennis Bley, Michael Corradini, Harold Ray, Joy Rempe, Michael Ryan, Bill Shack, Jack Sieber, Dick Skillman, and John Stetkar.

The purpose of today's meeting is to receive a briefing and hold discussions with the NRC staff on the plans for implementation of the Near-Term Task Force Tier 3 recommendations. The Subcommittee will gather information, analyze relevant issues and facts, and formulate proposed positions and actions as appropriate for deliberation by the full Committee.

Antonio Dias is the Designated Federal Official for the meeting.

The rules for participation in today's meeting have been announced as part of the notice of this meeting previously published in The Federal Register on May 15th, 2012.

A transcript of the meeting is being kept

and will be available, as stated in The Federal Register notice. It is requested that speakers first identify themselves and speak with sufficient clarity and volume, so that they can be readily heard.

Due to the many different topics that will be covered during this one-and-a-half-day meeting, we are planning to allow public comments to be provided at the end of each Tier 3 topic. We have received no written comments or requests for time to make oral statement from members of the public regarding today's meeting. But, as I just mentioned, we will have opportunity for comments as desired.

We will now proceed with the meeting, and I call on John Monninger from the Japan Lessons Learned Directorate to open the presentations today.

MR. MONNINGER: Thank you, Dr. Schultz and fellow ACRS members.

My name is John Monninger. I am the Associate Director for the NRC's Japan Lessons Learned Directorate. I am leading up our efforts on the Tier 3 activities which is the focus of today's discussion.

I would also like to introduce Mr. David Brown, who is with me today. He is Senior Project Manager, also within NRR's Japan Lessons Learned Project Directorate.

I think one thing that it is important to highlight or to recognize is that David is actually an NRO employee, but he is on loan to the Japan Lessons Learned Directorate. So, our organization I think is very reflective of the agency coming together, whether it is staff from NRR, staff from NRO, staff from Research, NMSS, the regions, et cetera, to address these various issues.

Dave had the lead for the February paper which provided the Tier 1 orders and also has the lead for the July paper which is coming forth.

As you mentioned, we will discuss our plans and approach for addressing the Tier 3 regulatory actions. And also, as part of that, we will do a brief refresher on what the tiers mean and what is Tier 1, Tier 2, et cetera.

We are very much interested in your feedback and comments. We are still at the formative stages of our plan. These are our draft plans.

However, with that said, they have been reviewed and approved by our Steering Committee for engagement of stakeholders. We have had three public meetings on these draft plans. In advance of the public meetings, we have released the plans to facilitate public dialog.

We are very much interested in the ACRS's views. To that extent, we are interested in a letter from the Committee on the Tier 3 recommendations. We think the direction from the Commission, as part of our normal business, we should always do that, but it has especially been highlighted by the Commission, the need for ACRS engagement. And that is what we are here today to do.

While we are working on the Tier 3 actions, I do have to note that the agency's focus and priority continues to be on the Tier 1 issues. So, to a certain extent, we are working the Tier 3 issues, but the priority and the resources are being applied first to the Tier 1 and Tier 2 issues.

So, if I could please have the second slide?

Just briefly, though we are going to be talking the Tier 3 activities, which are to a certain extent longer-term, I think it is very important to sort of baseline us into all the things that the agency has done. Hopefully, I will be able to do it rather quickly.

But when the event occurred, the agency very quickly went into monitoring mode. And the initial focus, then, was on our material licensees within potentially Hawaii, Alaska, the West Coast and, also, the power plants on the West Coast, Diablo, San Onofre,

et cetera.

Very shortly after that, we started to engage with our counterparts within Japan, our regulatory counterparts, as we started monitoring the events. We stood up the Operations Center, and, eventually, over that weekend and the following Monday, we sent an expanded team over to Japan that was stationed within the U.S. Embassy there. And we probably had staff in Japan for six, eight months or so. So, it was a very significant agency effort.

In addition to that, very shortly, within a week, we issued an Information Notice. A lot of information was already out there, but we wanted, of course, to highlight it to our licensees. And that was the Information Notice issued on March 18th.

We subsequently issued two Temporary Instructions, and a Temporary Instruction is direction, direction to our inspectors, our inspectors out in the field, to begin to look at things, to see how do U.S. operating nuclear power plants size up to these types of challenges.

The focus of one of the TIs was on the potential ability to respond to large fires, explosions, station blackouts, et cetera. It was a lot of the stuff that was done in response to B.5.b. Is the equipment

there? Are the strategies there? Has training been undertaken?

Approximately a month or so after that, we issued a second TI. And that second TI was at the request of the task force that was put in place to come up with recommendations. That second Temporary Instruction, it was focused on looking at SAMGs, Severe Accident Management Guidelines, and do the procedures exist? What type of training and equipment is available out there for licensees to respond?

Ultimately, in May of 2011, we issued a bulletin to further follow up on the extent of compliance with the NRC's requirements within Part 50 for responding to aircraft impacts and large fires and explosions.

If I could have the next slide?

Then, the Commission, in March, approximately two weeks after the event, the Commission issued directions to the staff to establish the Near-Term Task Force. The Task Force and the report was led up by Charlie Miller, and it was to conduct a systematic review of the lessons learned from the event. It is from this Task Force report that we begin to pick up on our Tier 3 items that are going to be the focus of the next day-and-a-half discussions.

If I could have the next slide?

Where are we? This is, on here, this is the conclusion from the Task Force, and this is also a conclusion that the Commission reached: that a similar sequence of events that had occurred in Japan was unlikely to occur within the U.S., within the nuclear power plants within the U.S. And that, also, we had confidence that there are existing mitigation measures that could be used to reduce and mitigate the potential of a severe accident. As a result, there was no imminent risk from continued operation and licensing activities. Nevertheless, the Near-Term Task Force and the Commission highlighted a significant list of areas that warranted further enhancements in our safety posture for U.S. nuclear power plants.

So, if we could have the next slide?

The Task Force issued the report last July. The Commission directed the staff to evaluate that report, evaluate the recommendations within the report, and propose a disposition. The staff came up with something they called the Tiers, the Tier 1, the Tier 2, the Tier 3. Today, we will chat about the Tier 3.

But, just as a refresher, the Tier 1 recommendations were those that should be started without unnecessary delay. That was the focus of the

staff's paper in February and the orders and the requests for information and the rulemakings that began this past March.

The Tier 2 issues were issues in which further technical assessment was needed or issues where we may not necessarily have the availability of critical skill sets at the immediate time. So, the notion was, once some of the Tier 1's activities move on and as resources become available, the Tier 2 activities would then be worked on.

And the third group is the Tier 3 items. These recommendations were binned Tier 3 for one of various reasons. Either it required further staff study to support a regulatory action or the need for a regulatory action would be one case or there was a potential that there was a shorter-term action that needed to be completed in order to inform the longer-term action, or some of these Tier 3 items, first, depended upon completion of maybe a Tier 1 or a Tier 2 item, or they were dependent on resolution of another recommendation.

So, that is sort of the grouping or the logic behind the various tiers. To a certain extent, I think to myself, the Tier 3, it is the basis. It is sort of a catchall for the rest of the recommendations.

In November of last year, the Commission agreed with the tiering process and directed the staff to proceed with the Tier 1 actions. Subsequently, the orders and requests for information went up in February, and the staff issued those in March.

So, then, we have three orders, three Tier 1 orders that did go out in the March timeframe. The first one was the need to develop strategies and procure additional equipment to address beyond-design-basis external events and multi-unit events. The staff is working, not only for this one, but for all of the orders, is working on the guidance development and engaging with all our stakeholders out there on these particular technical topics.

The second order that was issued was for Mark I and Mark II plants or those plants with Mark I and Mark II containments. The order required the installation or the upgrading of existing vent paths to provide a reliable hardened vent.

And later today, there is a subset of action relating to this order that you will also hear about today. There is sort of an IOU due to the Commission on this particular topic that you will be hearing about.

And the third topic was an order requiring the installation of accurate spent-fuel pool

instrumentation. The strong basis behind that was there was a considerable distractor in terms of the exact status of the spent-fuel pools. So, the notion was, for proper resource allocation, it would be quite beneficial for licensees to have much better information on the exact status of the spent-fuel pools in the event of an accident.

So, the next slide.

Requests for information. We issued three-four requests for information. The first one, the focus was on seismic and flooding hazard reevaluation. The notion was that the standards throughout the years have changed, and for licensees to do an assessment of their current plants against the most recent flooding and seismic standards out there. In addition to that, licensees were to do walkdowns of their facilities, to once again verify compliance with the design basis at their plant.

In addition, there was a request for information issued requesting assessment of the current communication systems and equipment to be used in response to an emergency and to ensure that you have sufficient staffing available for multi-unit events.

The next slide.

Rulemaking. The staff has issued two

Advance Notices of Proposed Rulemaking, one on station blackout and the other on emergency procedures integration. The station blackout rule or the proposed rulemaking is intended to modify the existing one to provide enhanced capability to respond to a station blackout event.

And the second one is to try to provide a better integration amongst the various procedures out there. You have operating procedures, off-normal procedures, emergency procedures, SAMGs, and Extensive Damage Mitigation Guidelines out there.

So, the notion was to see if there is some way in which the procedures could be pulled together in a much better integrated manner, such as transitions from one set of procedures to the next set of procedures could be taken without distraction to operations.

So, that is a lot of the good background as to what the agency did. We mentioned the Tier 2, and we are going to roll into the Tier 3 recommendations, which is the focus of today's discussion.

So, if we just continue, then, onto slide No. 10.

Last year, in SECY-11-0117, the Commission or the staff proposed a charter for the longer-term review, and the Commission ultimately approved that

charter. Within that charter was the establishment of a Steering Committee, a Steering Committee composed of the various Office Directors, the Program Office Directors, plus two Regional Administrators. They were to oversee the implementation of the Tier 1 and Tier 2 activities and, also, guide the Tier 3 activities underway.

So, what we have done for the Tier 3 activities, given that they are longer-term-type activities, there was a view that they should really be owned within the Program Offices; they should be owned within the Division and the Branch that has the lead for that particular topic, as opposed to the JLD, the Japan Lessons Learned Directorate, which is essentially a project management organization.

So, for each of the recommendations that you will hear about, we have an SES manager assigned to that topic, and we have brought about subject matter experts across the agency, be it NRO, NRR, Research, NMSS.

The Japan Lessons Learned Directorate, we are providing a facilitation, essentially, for the rest of the agency. We are providing the services and pulling together the Commission paper, the recommendations, the public meetings, essentially, all

of the project management functions. The notion is that, ultimately, the JLD will most likely disappear.

The timing of these recommendations and assessments and evaluations, we wanted to ensure that there was clear ownership for the long-term within an organization. So, that is why the focus of having these activities worked out of the technical organizations was pursued.

So, to me, this is sort of a very key slide, the focus on the longer-term review. So, we will talk about hydrogen. We will talk about spent-fuel movement from pools to casks. We will talk about instrumentation, et cetera.

So, the question is, in pulling together these plans, what is within the scope of these plans? What is the purpose of these plans? What we tried to do is really define what are the key issues that need to be addressed and what are the real information needs out there to support a recommendation on the need for regulatory action. We are not trying to pull together a 10-year research program on a particular technical topic. We are driving towards a plan that will support our needs for a regulatory decision, a regulatory decision meaning additional orders or a decision meaning no action is needed.

So, that is what we want our plans to do, is drive us to a clear decision where we can come back to you individuals and we can engage back with the Commission and say we have thought about this issue. We have pulled together a plan. We have pulled together the information. We did whatever research analysis testing is needed. And as a result of that, we recommend rulemaking order or we recommend this particular topic can be closed out, based on the following technical assessment.

That doesn't necessarily mean that the NRC will stop evaluating that particular technical topic for the next five-ten years or so. That just gets us past the point of saying, is there a need for definitively regulatory action in the near-term?

So, with that said, the last thing, our planning framework is taking us up to that decision point on the need for regulatory action or not. We are not presupposing upfront that all these activities will lead to a rulemaking. So, our plans don't necessarily include -- some of them do -- but don't necessarily include rulemakings, orders, et cetera, because we are currently just evaluating the technical issues and determining whether the issues merit that regulatory action or not.

So, that is one of the slides I actually enjoy a lot.

(Laughter.)

I think it is important; you know, what is our focus? My background is in severe accidents and PRA. And as an example, hydrogen, the NRC has had a very active hydrogen research program, more active in the past years than present. But the purpose of our plans is not to reopen a 10- or a 15-year hydrogen research plant. Our purpose is to look at what happened at Fukushima, pull together that information, and decide, hey, does 50.44 need to be revised? Does something have to happen with igniters?

MEMBER CORRADINI: Since you picked that example --

MR. MONNINGER: Shall I pick a different one?

(Laughter.)

MEMBER CORRADINI: No, no. That is a good example.

If we took that example further, that doesn't also change things around or that doesn't also preclude the need for, by one of the -- I can't remember, one of your slides; it is not important. The subject matter expert feels they need information, that they

have to go get the information to appropriately come up with either a decision to have an action or not have an action?

MR. MONNINGER: Right. No, the question is the extent of detail in the plant. But if they believe they need technical information to reach a decision for action or not, we should be including that.

For hydrogen -- and hydrogen will be a very good discussion, and Fred will lead it up to us -- but we are going to look at it, various issues, as just starting out with the basic how is hydrogen produced. Is it consistent with our understanding? How much hydrogen is produced? Is it consistent with our understanding? Is the timing of hydrogen produced consistent with our understanding? What is the threat of hydrogen and the potential pathways in which it can be migrated?

But some of those issues, you know, we are also mindful of the Commission's desire for completing or closure of these issues within five years. So, some of the information, if there is a long-term pulling apart of the Fukushima Dai-ichi reactor, some of that information that would really give you insights on the extent of core damage, where is the core, how much hydrogen was or how much zirconium was reacted, or how

much potential core-concrete interaction, that may not be known for five-ten years or so.

So, whatever information is available out there and additional analysis -- so, it is meant to be within the staff's and our contractors' capabilities.

MEMBER CORRADINI: The reason I am glad you used this example is because I am pretty sure the Committee has -- I can't remember the letter -- has some words to this effect: that it is pretty clear you have a source for it.

MR. MONNINGER: Yes.

MEMBER CORRADINI: It is pretty clear it got out.

MR. MONNINGER: Yes.

MEMBER CORRADINI: Therefore, if one worries about effects within the building, not the containment but within the building, one may have to think about distribution, analysis of distribution, decide if things need to be done to essentially mitigate combustion events in the building.

So, I understand what all you are saying, but, on the other hand, I wanted to just make sure, though, that if things are needed to be done, part of this is the line organization of the expert would go back and say we need to get A, B, and C done.

MR. MONNINGER: Right.

MEMBER CORRADINI: And with all due respect to schedules, regardless of the schedule, we don't want to rush into something. We want to get it so we have it right before we try to do something.

MR. MONNINGER: One of the things you won't see in your package, and it was deliberate, is schedules. We deliberately did not provide you with our schedules, and we did not our provide our public stakeholders with the staff's draft schedules because our intent was to do exactly that, to come up with the correct plan, the correct approach.

So, we wanted the focus to be more on what we propose to do than the particular timing. We did not want that to be a distraction to defining what work needs to be done.

MEMBER REMPE: So, something else I didn't see information provided to us was anything on Recommendation, I see it sometimes referred to as 2(f) about what data are needed from the plants.

And hydrogen, again, is a good example. If I look at some of the information for Recommendation 6, it talks about getting insights if the seals leak, data that are needed to go forward. And I don't see anything about that explicitly in the packages that have

been prepared. And we have said, be proactive; start thinking about what data you need to make appropriate actions. Some actions may be taken earlier, but in the long-run the NRC needs to start planning ahead and identifying what information is needed, so our insights about severe accidents improve.

MR. MONNINGER: Right, right.

MEMBER REMPE: And I was interested in your viewpoints on why that was totally neglected.

MR. MONNINGER: So, the question is, was it neglected or is it a level of detail?

MEMBER REMPE: Uh-hum.

MR. MONNINGER: You know, is it a level of detail in our plants or neglected? I can't speak to the particular one. Once we get into that area, we can discuss it and go back and forth.

If you bring up hydrogen -- and I don't want to steal Bret's thunder --

MEMBER CORRADINI: You did it; we didn't.

(Laughter.)

MR. MONNINGER: The interesting thing is the interrelationship. You talk about migration into the potential reactor building. Well, the interrelationship of hydrogen and successful venting, you know, if you have successful venting through a

hardened vent or through a potentially-filtered vent or a severe accident event, et cetera, will you obviate the potential migration from primary containment to the reactor building?

So, these issues, even though there is a recommendation A, B, and C, to a large extent, many of these issues relate or link to each other. That is one of the things that we have tried to do. We call them dependencies, but I am not quite sure if that is the right word, or interrelationships. We have tried to highlight some of those.

So, anyway, this is a listing, and you will have a briefing on each and every one of these issues over the next day and a half. It continues to the next page up through to the third item there.

Then, there are four additional items that were identified in previous Commission papers. The staff recommended that they go forth and prioritize these issues and assess them. So, these are four additional issues that have been added to the traditional Tier 3 items. So, these are within our scope also.

MEMBER REMPE: But, again, I don't see anything about a proactive approach, about getting the data from Fukushima, which the instrumentation one, for

example, came from ACRS, but that one is not listed here. Is there a reason?

MR. MONNINGER: Yes. The only thing I can really say is these were the explicit recommendations that went up to the Commission and this is, essentially, the approved list. The actual disposition, you know, I would have to go back and read the disposition of, I guess it was, ACRS Recommendation 2(f).

MEMBER REMPE: I believe that is how it is characterized a lot of times.

MR. MONNINGER: Yes. So, I would have to go back and re-read that. But if it is not on this list, it is currently not part of our activities. That is not to say that some --

MR. BROWN: It may not be as a separate item; it may have been, the argument may have been that the staff is already pursuing research in the area of forensics, getting data from Fukushima that will support future actions.

But, like John, I would need to refer to our February paper to see exactly how we --

MEMBER REMPE: I have heard that sometimes, but, again, doing the analysis is not starting to identify what information is needed and making plans for it.

MR. MONNINGER: Yes. You know, to a certain extent, I personally believe that there is a wealth of information out there, and not to say it is an experimental facility, but the information to be gained out there is much better than some small-scale experimental laboratory experiment or international program or a bunch of code runs, et cetera.

But, with that said, the focus of the actions that we are working on are those that would lead to a regulatory action, a rule, order, et cetera. So, there could be a long-term program, a long-term international program, to evaluate the facility for the best information on source-term distribution, et cetera, but it wouldn't necessarily be within our plans for assessing issues for our regulatory decision.

Does that --

MEMBER REMPE: I understand.

MR. MONNINGER: Yes.

MEMBER REMPE: I just want to make sure it doesn't get lost --

MEMBER CORRADINI: It doesn't get lost --

MEMBER REMPE: -- because it was assigned to the Tier 3.

MEMBER ARMIJO: John, I would like to ask a question.

MR. MONNINGER: Yes.

MEMBER ARMIJO: One of the recommendations that the ACRS made was related to shared ventilation and shared stacks, that that should be included. And the staff response at that time was that you would include it in some sort of an enhancement. I don't see it on this list.

MR. MONNINGER: So, I would assume the shared ventilation/shared stack goes back to the hydrogen in --

MEMBER ARMIJO: Yes, in unit --

MR. MONNINGER: -- units 3 and 4, et cetera.

MEMBER ARMIJO: Right.

MR. MONNINGER: We issued the order in March for 5.1, and then it had various criteria.

MEMBER ARMIJO: It was in that?

MR. MONNINGER: It may not have been within the criteria. But, then, from the criteria, you go to a document we call an ISG, Interim Staff Guidance. That is, essentially, where we would address that type of issue.

MEMBER ARMIJO: Okay.

MR. MONNINGER: I mean, that issue is very integral to the issue of venting.

MEMBER ARMIJO: Okay. Okay. So, it is

actually, even though it was a Tier 3 recommendation, it got into a Tier 1 or Tier 2 activity?

MR. DIAS: The ACRS recommendation on shared ventilation, that was ACRS 2C, and that is included in Tier 3, Recommendation 6.

MEMBER ARMIJO: Yes, right. But it is actually being addressed in a higher tier.

MR. MONNINGER: So, Recommendation 6 is for hydrogen, and venting is Recommendation 5.1.

MEMBER ARMIJO: Okay, as long as it is being addressed.

MR. MONNINGER: What I would say is, since we have a day and a half -- (laughter) -- we can come back.

MEMBER ARMIJO: But it is being addressed?

MR. MONNINGER: Yes. And my thought still takes me back to 5.1 and the reliable hardened vent and the design criteria for that. I do recognize that it says it would be addressed within Recommendation , but we will have to come back to you.

MEMBER ARMIJO: Yes, you could have reliable hardened vents, but --

MR. MONNINGER: Right.

MEMBER ARMIJO: -- if you haven't done a good job of systems engineering, when you have

multiple-unit failures, and one guy is venting and the other one is failed open, you pump hydrogen into his plant -- that is not a good idea.

MR. MONNINGER: Or, even if all the hydrogen is gone, just the source-term, so it is not just limited.

Okay. Initially, we tried to come up with a flowchart as to how we would look at these issues. And the notion was that we could come out in one of three different paths. It didn't quite turn out exactly this way. There are some hybrids between them.

But the notion is you are coming in with a Tier 3 recommendation, whether it is hydrogen, spent-fuel pools, instrumentation, whatever. Does the staff have sufficient information to make a regulatory decision? If so, then we would go to our left and we would develop an implementation plan, develop a plan to issue an order or a rulemaking, et cetera.

If the staff had sufficient information and they believed regulatory action was needed, that is what the top left was, develop an implementation plan. On the other hand, if the staff evaluated, if there was sufficient information and they didn't believe sufficient safety or risk/benefit was there, they would develop a proposed assessment that would recommend

closeout of that particular issue.

MEMBER CORRADINI: Okay. So, closeout means do nothing?

MR. MONNINGER: Do nothing. But we would have to fully document what the original issue was, what did the staff look at, and what was the basis. And you don't have any of those within your package. But that was a potential.

Then, if we needed additional information, were there dependencies upon other issues, explicit dependencies? And one of them that comes up that is pretty straightforward is Recommendation 12.1 or 12.2, the one that says, for the agency to revise the reactor oversight process, to incorporate the defense-in-depth approach that the Task Force had envisioned within Recommendation 1.

Well, Recommendation 1 is on a totally separate track. So, the staff can't really proceed with revising the ROP for that until Recommendation 1 proceeded.

So, we were still going to include that, but we coined something we call a status summary. You won't see a full plan for those particular issues.

MEMBER CORRADINI: Maybe this is the wrong place to ask the question, but then you can just postpone

it. But you have this risk-informed regulatory framework report that came out of Commissioner Apostolakis' Task Force.

MR. MONNINGER: Yes.

MEMBER CORRADINI: You have that combined with Recommendation 1. What you said, it is not the same, but seemingly very intermingled, and that is a long time scale, as you have said, there.

Are you going to use any of the pieces of what is recommended either in that Task Force or in Recommendation 1 to address these issues?

MR. MONNINGER: Well, my current knowledge of Commissioner Apostolakis' Task Force report, we are aware of it; we have looked at it. The staff is still awaiting a tasking for the particular report. Whether it is combined within the staff's assessment of Recommendation 1, we have to wait for direction for that.

MEMBER CORRADINI: Okay.

MR. MONNINGER: But, regardless of that, the Commission basically said proceed with Recommendations 2 through 12 and have Recommendation 1 on a separate track.

MEMBER CORRADINI: Okay. But I am asking my question; I guess I am probably not framing the question correctly. But you used hydrogen, so we will

just go back to that one, just for the sake of that.

It seems to me there has got to be some sort of risk-informed thinking process in all these little blue boxes. I am asking myself the question, what is the process? How do I determine when something is a closeout versus an implementation plan? It has got to be based on risk.

MR. MONNINGER: It could be a risk-informed approach or the staff could come up with some type of deterministic safety assessment.

MEMBER CORRADINI: So, buried in all of this is going to be some sort of not protocol, but thinking process. I am curious, is the Task Force work informing any of this at all?

MR. MONNINGER: Yes.

MEMBER CORRADINI: Or is too high-level at this point?

MR. MONNINGER: Yes, so let's go back to vents. Well, it was hydrogen before. But, as an example, for vents, the staff currently has in front of them an action item to evaluate filtered vents. And the staff --

MEMBER CORRADINI: Uh-hum. We are going to talk about it today, in fact.

MR. MONNINGER: You are going to talk about

that today.

And we would proceed using our existing framework. One of the existing frameworks is the regulatory analysis guidelines where you look at PRAs and you look at risk numbers, and you look at delta consequences.

So, that is an existing tool that the staff would use. If the staff wanted to proceed with any of these items here, if they want to pursue regulatory action, they have to try two things: adequate protection or the cost-beneficial safety enhancement. And the cost-beneficial safety is heavily influenced or heavily based on PRA. It is based on the safety goals, based on risk-informed regulation.

MEMBER ARMIJO: John, following up on that, if the Tier 1 actions which are going forward, the rulemaking on station blackout, all of those activities, unless they are completed and somehow incorporated into a PRA, how do you make a decision on whether you really benefit from a filtered vent or not?

MR. MONNINGER: Yes, and that is a good question. That is one that the staff is currently addressing or -- I won't say struggling to address, but that is one that we are currently addressing. When we do a regulatory analysis, you are supposed to include

the plant and how it is operated and operational data and requirements and voluntary initiatives, et cetera.

So, you have the order under 4 for essentially the flex program, well, the order on what industry has proposed, the flex program. It has an impact, most likely has an impact on --

MEMBER ARMIJO: All of these --

MR. MONNINGER: -- core damage.

MEMBER ARMIJO: -- all of Tier 3.

MR. MONNINGER: Right. So, we are trying to work through that particular issue now.

MEMBER CORRADINI: But I guess, I mean just to follow up Sam's point, and then I will stop at least on this, I appreciate his question because, in some sense, you have made the deterministic judgment that it is important to have a hardened vent on Mark Is and Mark IIs, granted. And so, now there will be something there that will be consistent, integrated, tested, and watched. Then, performance or some estimation of this performance has got to be included in all the Tier 3s, or at least the ones that that would affect.

MR. MONNINGER: Yes, and that was some of the, we used the word, dependencies or the relationships. We are trying to talk about the influence of one on the other.

The example is venting and hydrogen, and the migration of hydrogen from the primary containment to the reactor building. You know, there is a stream of thought that says, well, if you have successful venting for severe accident conditions, do you need to address this? So, we are trying to -- we understand we have to do that.

MEMBER CORRADINI: Okay.

MEMBER SHACK: You mentioned regulatory analysis. I understand the staff is preparing a new SECY paper on land contamination. I assume that will impact or could potentially impact regulatory analysis.

So, can you tell us anything about what might be going into that?

MR. MONNINGER: Yes.

MEMBER CORRADINI: Is that part of the last one there?

MR. MONNINGER: No.

MEMBER SHACK: No, that is a separate thing.

MR. MONNINGER: So, economic consequences or land contamination or offsite property damage, you know, there is various terminology that is out there. And the staff is currently pulling together a Commission paper. It is scheduled to be issued in the

July timeframe.

Its intent, it really has two purposes. As a matter of fact, we have a public meeting later this week, on Thursday of this week. But its intent is to lay out to the Commission how do we currently consider property damage, land contamination, economic consequence within our regulatory analysis guidelines or within the reactor area, within the fuel-cycle area, et cetera. So, its intent is to very clearly provide an assessment of how the agency currently does in all the various arenas.

And then, the staff is also considering development of options. They haven't finalized on any particular options yet.

But, going back to your question, we would not or we could not use that. The issue is, say, for example, if the staff came up with a proposal to the Commission to change it over here. We have current activities that we have to proceed with. You have to use your existing regulatory framework. You know, if we are pursuing some type of regulatory action, we have to evaluate it within our framework, as opposed to guessing which way this particular issue may or may not come out. We could potentially do sensitivity studies over here to evaluate alternatives, but we always have

to go back to our existing regulatory framework.

MEMBER SHACK: But filtered vents, in particular, could be very sensitive to what you thought about land contamination.

MR. MONNINGER: Well, my thought is, all these features -- you know, if you prevent the accident in the first place, there is not going to be land contamination. So, all the various preventative and mitigation features can have an impact on land contamination, but we have to use our current regulatory process. That is what we are proposing to do.

MR. BROWN: Which includes consideration of land contamination.

MR. MONNINGER: Which includes consideration in a way.

MEMBER RYAN: Do you have a time and a place for that public meeting?

MR. MONNINGER: Yes, I do. It is this Thursday, the 24th, from 1:30 to 3:30. And it is probably in your room. It is in Two White Flint 2B3. So, whether it is this room or it is the next one --

MEMBER RYAN: Thank you.

MEMBER RAY: It just struck me to ask this question. 10.2 has to do with qualification of decisionmakers --

MR. MONNINGER: Right.

MEMBER RAY: -- through training, and so on. And it is in Tier 3 here, I guess under this heading, "Additional EP Topics".

MR. MONNINGER: Right.

MEMBER RAY: Are we going to talk about that any further?

MR. MONNINGER: Yes. So, you will have a presentation from NSIR.

MEMBER RAY: Okay.

MR. MONNINGER: And they have wrapped up the various EP issues, but that is part of one of the discussions that you will have.

MEMBER BLEY: They have wrapped up?

MR. MONNINGER: Well --

MEMBER BLEY: Or put them in package?

MR. MONNINGER: They have put them in a package, yes.

MEMBER SKILLMAN: It is 10 and 8.3 or something like that worked together.

MEMBER RAY: Yes, that's right. I was looking for the other one. Is it 8.3?

MR. BROWN: All 9.1 through 11, all now packaged together as one proposed rulemaking.

MEMBER RAY: Yes, that is what I was trying

to discern here, if that was the case. It was a little hard for me to parse that out here quickly. But that is going to be the upshot and we will talk about it tomorrow then.

MR. BROWN: We will talk about that, it looks like tomorrow, scheduled for 10 o'clock.

MEMBER RAY: Okay.

MR. MONNINGER: And then, just getting back to our flowchart, the majority of the items came to the big rectangular box at the bottom, the program plan. And that is the majority of the plans that were pulled together.

With that, as I mentioned upfront, we are very interested in your thoughts, comments, and recommendations. You know, the plans are still in the formative stage. We had had the three various public meetings. We are considering the comments that came back from the public and whether any changes are needed to the particular plans.

We do have a full Committee schedule with you next month in the beginning of June.

MR. DIAS: June 6th. June 6th at 10:15.

MR. MONNINGER: Yes, yes.

MEMBER SKILLMAN: John, I would ask this question: after the TMI-2 accident, NUREG-0737 came

out.

MR. MONNINGER: Yes.

MEMBER SKILLMAN: And in the years that followed NUREG-0737, there was a substantial amount of industry challenge, were some of these items too hasty?

MR. MONNINGER: Right, right.

MEMBER SKILLMAN: What governance do you have with your directorate to prevent from falling into that haste trap again?

MR. MONNINGER: I think if you just look at the notion of putting together the Task Force in the first place, of very senior agency managers to deliberately consider the various issues out there, I mean, I am not sure if the hundreds of issues that came out of TMI, I mean, this is a very focused, what I would call a very focused, concise list. So, they have been deliberate in trying to identify the issues and ensuring that there is a direct relationship back to the accident.

At any time, the one block up top, if the staff goes through the plans, they pull together the technical information, they do an assessment, a regulatory analysis, a risk-informed assessment or a deterministic safety assessment. If they don't believe that there is significant benefit to be gained from one of these particular recommendations, we would provide

that assessment that to the Commission and that recommendation for that particular item to be closed out. So, there always is the potential that one or more of these items may not result in regulatory action.

I am not sure if that helps.

MEMBER SKILLMAN: It does. Thank you.

MR. MONNINGER: Yes.

MEMBER SKILLMAN: Thanks.

MR. MONNINGER: I mean, the staff is very receptive, too.

MEMBER SKILLMAN: Thank you.

MEMBER CORRADINI: And I guess just to follow up on Dick's question, so, then, that decision would be based on -- maybe you said it and I missed it. What is the criteria that is going to decide between developing an implementation plan and recommended closeout? In other words, it could be risk-informed, but it is not going to be risk-based. So, that isn't it.

MR. MONNINGER: Right.

MEMBER CORRADINI: So, what is it?

MR. MONNINGER: You know, it is going to be dependent upon the team and when they evaluate the particular --

MEMBER SHACK: The greater decisionmaking

process, no doubt.

MR. MONNINGER: Yes.

MEMBER CORRADINI: Oh, that helps a lot.

(Laughter.)

MR. MONNINGER: And all these issues, I would assume that we will come back to the ACRS. Whether we are proposing an order, a rulemaking, or if we are proposing to close it out, the intent is to clearly document our assessment and our basis. So, for one reason or another, if we do recommend closeout and the Commission approves that, someone can come back in 10, 15, 20 years and determine what was the regulatory basis for that. Whether it is a risk-informed approach or some other criteria, you know, we would have to pull together that logic.

I mean, it works both ways. If we recommend to go forth, we have to provide the basis. So, it sort of cuts both ways.

MEMBER CORRADINI: So, let me ask about orders and Mark I and Mark II. Is there a basis there? I mean, the legalities of it escape me. So, let's put those aside. Is there a basis there that one can look at and say, "Gee, that basis made sense. We should apply that sort of approach to develop criteria to decide that you have to go forth with orders for these things that

are not necessarily orders, but might be some sort of an implemented regulatory guidance for action."?

MR. MONNINGER: Yes.

MEMBER CORRADINI: I am trying to get at, I know what you said to me.

MR. MONNINGER: Yes.

MEMBER CORRADINI: It sounds a bit fuzzy, but, of course, everything is a bit fuzzy at this point. I am just trying to work back to what you have already done, and under the assumption it wasn't done in haste, what is the criteria you used so that you could replicate it or the protocol you used to replicate it?

MR. MONNINGER: I think the Mark I is, actually, one of the easier ones to go back and come up with the technical basis. Because it essentially said we want to make a regulatory requirement, what the staff wanted back in Generic Letter 89-16. So, you can go back to the Containment Performance Improvement Program, back in the eighties, and the various recommendations that came out of that, if you can find the documents.

MEMBER CORRADINI: No, I have them. Those documents I have got.

MR. MONNINGER: But, you know, it was very clear that one of the potential dominant contributors

to risk for the Mark Is was the TW sequence, the transient with loss of containment cooling. And there were numbers back then, delta CDF, delta core damage frequency of an order of magnitude or more. So, that is a risk-informed basis back in our regulatory history for the hardened vents for at least the Mark Is.

MEMBER CORRADINI: Okay.

MEMBER SHACK: For an AC-powered unit.

MR. MONNINGER: Yes. But what the staff did say, though, was for industry, for licensees to look as part of the IPE program, of venting under station blackout conditions back then.

MEMBER SHACK: But the current guidance says to look at it to prevent core damage, which sort of implies to me that you would accept an AC-powered one.

MR. MONNINGER: Within the criteria within the rule, it says that they have to design it to be operable under station blackout conditions, whether it is additional accumulators, batteries, whatever. So, the current order addresses not only the TW sequence, but it addresses other sequences.

CHAIR SCHULTZ: John, before we get into a detailed discussion there, it is a nice lead-in to the next topic probably, which is Recommendation 5.1

and 5.2 on hardened and filtered vents with the Mark I and II. So, can we transition to that now?

MR. MONNINGER: Yes.

CHAIR SCHULTZ: You will be available for the discussions --

MR. MONNINGER: For the next day and a half.

CHAIR SCHULTZ: -- in the next day and a half?

MEMBER CORRADINI: I didn't even know I was going there half a week.

(Laughter.)

MR. MONNINGER: So, there is a little nuance or a little curve ball.

CHAIR SCHULTZ: Go ahead.

MR. MONNINGER: You know, 5.1 and 5.2, 5.2 is clearly a Tier 3 issue. And everything else you are going to hear is a Tier 3 issue, except for 5.1. Recommendation 5.1 was the orders for the Mark Is and IIs which the staff issued, the agency issued in March. There was an IOU to the Commission to look at the need for venting, considering severe accident conditions and, also, the need for filter vents for Mark Is and IIs.

So, this piece here is actually a Tier 1 issue, but we are taking advantage of this meeting.

MEMBER CORRADINI: I guess I don't appreciate what you just -- I'm sorry.

MR. MONNINGER: So, the Tier 1 issues, the agency issued the orders, issued the requests for information, and the NPRMs as a result of the staff's paper in February and the orders, et cetera, that went out in March. However, within that paper that went up to the Commission in February, the staff said we are still evaluating the merits of venting for mitigation of severe accidents. Should the design of the reliable hardened vent consider severe accident conditions, what would that result in?

And in addition to that, the Commission directed the staff to look at filter vents while we were addressing the 5.1 issue. So, we identified to the Commission within the February paper that there are various technical and policy issues that we are still currently evaluating, and we indicated to the Commission we would get back to them in the July timeframe.

So, we are going to have, actually, two papers going up. Actually, more than two. But one paper will have all the Tier 3 stuff, and then there will be a separate paper on venting, severe accident venting and filter vents for Mark Is and IIs.

So, this particular first issue is the

remains of one of the Tier 1 issues.

MEMBER SHACK: But you don't put SBO into the severe accident? That is really addressed in the current guidance?

MR. MONNINGER: Yes, because we talk the current vent for prior to core damage, the prevention of core damage.

MEMBER RAY: When you say "SBO," Bill, you are talking about Extended SBO?

MEMBER SHACK: Yes. Not SBO, as John points out to me, in the legal sense, but the SBO where you have lost all AC.

MEMBER RAY: Well, and it does ultimately produce a severe accident.

MEMBER SHACK: Well --

MEMBER RAY: Ultimately?

MEMBER CORRADINI: But I guess I asked you to repeat it and I thought I got it, but now with your question -- you are still, though, the current regulation is, though, prior to damage, the current order?

MR. MONNINGER: The current order.

MEMBER CORRADINI: I'm sorry, I said "regulation". I'm sorry. The current order is prior to --

MR. MONNINGER: You know, the design specs are written out based on prevention of core damage. If a feature is there, licensees would most likely still try to use it. They would try to use any resources available at their site. But the NRC's regulatory footprint currently is just on the prevention.

The question is, should we go the next step in potentially changing that design for however it may be changed for the source-term and the hydrogen, and everything else to come out following a severe accident? Or should we potentially consider putting a filter on the end of it? So, that is the piece that is still underway. And that is also recommendations to the Commission in the July timeframe.

MEMBER ARMIJO: Well, is a filtered containment venting system exclusively for BWRs with Mark I and Mark II containments? Or is this across the board for the fleet?

MR. MONNINGER: Right now, we are looking at it just for the Mark Is and Mark IIs. Recommendation 5.2, which is a Tier 3 issue, asks the staff to look at other containment designs. And I don't want to steal the group's thunder, but the notion is the bang for the buck is probably upfront with the Mark Is and IIs. So, that is where the current focus is, on the Mark Is and

Mark IIs. There is limited resources, and that is where the staff currently is focused. And dependent upon the outcome of that, the staff would, then, proceed with the other containment designs.

MEMBER ARMIJO: We had better talk about it since it is now a Tier 1.

MR. MONNINGER: So, I guess we have Bob and company coming up.

MR. FRETZ: Good afternoon. Good afternoon, Dr. Schultz and the Committee. Thank you for having us here to talk about the issue that John Monninger I guess did a great job of helping introduce. And that is the topic of filtered containment venting systems.

My name is Bob Fretz, and my card is a little bit wrong. I am supposed to be Office of Enforcement, but I was put on loan to NRR for the Japan Lessons Learned Project Directorate. So, I am helping them out with the issues related to containment venting as well as the filtered vents issue.

And joining me today is Bob Dennig. He is the Branch Chief from the Containment Ventilation Branch within NRR, as well as Tim Collins, who is Senior Advisor for the Office of Nuclear Reactor Regulations.

So, we are here to discuss the Tier 1 issue

that John talked about relating to the filtration of containment events.

The next slide. We can just go over our agenda real quickly.

Again, as John Monninger introduced, he briefly introduced the topic, but we will try to provide a little bit more background relating to this topic as well as take a look at the staff actions as a result of the Commission's direction, as guided by the Japan Lessons Learned Steering Committee.

But the primary focus of our talk to this morning is to primarily talk about some of the foreign experience with filter containment venting systems, as well as go over a little bit about some of the stakeholder input we have received to date.

MEMBER ARMIJO: Before you do that, could you just give me an overview of where these filtered vents would be used? You can vent from the BWR Mark I. You can vent through the wetwell expression chamber or the drywell. And is there any difference? Everything would go through this one filtered containment vent? Or could you just describe where the problem is and where the most benefit is?

MR. FRETZ: Okay. Yes. Primarily, the focus of the staff efforts right now are related to the

BWR Mark I and Mark II containments only, as John talked about earlier. We are, indeed, looking at the various aspects on where the location of where we might be venting, whether through the wetwell or through the drywell. So, we are looking at both aspects.

MR. DENNIG: If you consider a filter, an external filter, and you are not tied to the wetwell as your primary scrubber, then you can consider a drywell vent.

MEMBER ARMIJO: Well, if you filter it through the wetwell, you have a scrubber right there, but a drywell is a different situation. And I can see where that might have a benefit. But I just wondered exactly what the thinking was as to where it would be used and how you would evaluate the benefits of a filtered vent.

MR. DENNIG: Right. As Bob said, the current idea is that you would put an external filter on the wetwell vent, and the basis or rationale for doing that is additional scrubbing, whatever you have got, and to a certain extent a way of dealing with any uncertainty in the degree of scrubbing that you would get in the wetwell, the idea being that you would have an engineered system that was designed basically for decontamination; whereas, the wetwell, there are a whole

lot of parameters that determine how much you are going to get out of that.

There is also the consideration that if you are using venting to assist in flooding up, that you could flood over the vent-line if you are venting from the wetwell. If you have a vent from the drywell, you are not limited in that way.

MEMBER ARMIJO: You know, the wetwell, the suppression pool is very effective in decontaminating the vent and venting gases. The drywell is the last place in the world you really want to vent from, but --

MR. DENNIG: Well, oddly enough, they put the filter on the drywell vent, is how they do it.

MEMBER ARMIJO: Well, yes.

MEMBER SHACK: But I thought you said that your primary consideration was to put it on the wetwell vent.

MEMBER ARMIJO: Yes.

MEMBER SHACK: It would seem to me more logical to put it on the drywell vent.

MR. DENNIG: We are looking at the options, but we have got to start someplace and go someplace. But we are aware of the different configurations. The fact that Mark IIs are starting from scratch, they could put a vent wherever they would like. Some Mark IIs have

vents from both places. They have a drywell vent and a wetwell vent. And a lot of Mark Is just have the wetwell vent. We are not entirely certain to what extent that existing vent in its pathway, in its integrity, is going to meet the needs of having a reliable hardened vent.

So, there is all this going on as far as how you do this, yes.

MEMBER ARMIJO: Since there are so many different designs, at some point it would be good if we could hear the details of the plumbing, where it makes a difference, where it is really a big benefit, and, also, what we have learned from Fukushima, how much decontamination happened when they vented, becaue there has got to be information there.

MR. DENNIG: They vented in an undesirable way.

MEMBER ARMIJO: I understand that. I understand that, but that wasn't an issue of whether you had filtered venting or not filtered venting, just ability to vent. So, somewhere along the line you have got to look in to address what actually happened at Fukushima.

MEMBER BANERJEE: They had hardened vents, but they couldn't get to them, right?

MEMBER ARMIJO: Yes, they couldn't open them up.

MEMBER BANERJEE: Or could they?

MR. DENNIG: They had vents that couldn't be operated under SBO conditions.

MEMBER BANERJEE: Right. But they had hardened vents.

MR. DENNIG: And they couldn't get to them to operate them locally. So, they had a pipe or some pipe with rupture discs and valves on it, and I understand that their rupture disc was set very high, not near the design pressure, but up toward the ultimately failure pressure, which turned out to be a problem. When they got below that pressure, they couldn't open it.

MEMBER BANERJEE: So, they had to manually open it?

MR. DENNIG: They tried to manually open it.

MEMBER ARMIJO: Okay. Go ahead. I just would like to understand where it is going because, I will tell you, in Japan they are going to put filtered vents on everything, PWRs, BWRs. I just hope we don't do the same thing here because I would like to see some --

MR. DENNIG: Well, that is not the

intention. The Tier 1 is Mark Is and Mark IIs. And your Tier 1, because of Mark I failure at Fukushima and there is a significant amount of research on Mark Is that basically says that they are very highly likely not to contain severe core damage; and that, thus, the original hardened vent. And so, you have a sense from the analytical side that this is probable or possible. And now, you have operating experience that says yes, indeed, you are right in terms of your postulations. And that is why that is Tier 1.

MEMBER SHACK: Yes, but it is Tier 1 only to prevent core damage.

MR. DENNIG: Well, that is where the IOU comes in.

MR. COLLINS: No, it is Tier 1 to consider filters, not necessarily put filters on. It is Tier 1 to put in an unfiltered vent. That is the order. Okay? That is Tier 1. But it is also Tier 1 to examine filters.

MEMBER CORRADINI: For the BWR?

MR. COLLINS: For the BWR, Mark I and Mark II.

MEMBER SHACK: But, you know, a hardened vent to prevent core damage, you keep talking about how useful it is in severe accidents, which I would agree

with, but is it really --

MR. DENNIG: Step 2 is that we were tasked to start with the notion of, before core damage, prevention of core damage, now look at making it serviceable under severe accident conditions. And then, the next step, if it is going to be operated and you intend to operate it during severe accidents, do you or do you not want to put an installed filter on it?

MEMBER SHACK: Okay. I guess it is doing that in the sequency affair that somehow seems like it might lead to additional effort. I mean, just tell them to go ahead and put in a hardened vent that will work under severe accident conditions.

MR. DENNIG: It does make for additional --

MR. COLLINS: Well, it depends on what you mean by work.

MEMBER SHACK: Right.

MR. COLLINS: Right?

MEMBER SHACK: I realize that there is always a problem.

MR. COLLINS: When you talk about a vent that is unfiltered, working means you remove the heat, period. If you are talking about a vent that is filtered, working means you remove the heat and you

maintain the containment integrity at the same time. You maintain the integrity by capturing the fission products in the filter. Okay?

Remember, the containment is there not to contain heat. It is there to contain fission products. So, it is very confusing when you talk about these two different vent concepts. One removes the heat; the other one removes the heat and maintains the containment integrity at the same time. That is why the second one is being considered to filter it. Do we really want to strengthen the containment or do we just want to remove the heat, hoping to prevent core damage?

MEMBER ARMIJO: But you do both if you vent through the suppression chamber.

MR. DENNIG: That is one of the considerations. That is one of the considerations.

MEMBER ARMIJO: One of the things, you know, that is confusing to me is many people say we already have hardened vents. I don't know that is true or not. But there are a variety of different designs in the BWR Mark Is and IIs. Part of the thing that would help me, and maybe the other members, can we at some point, just to answer the question, do we have hardened vents in the United States in BWRs or not, and which are the ones that are really super-good, in your opinion,

and which are the ones that need upgrading?

MR. DENNIG: We have asked for the details of what the as-installed is on maybe half a dozen occasions. The BWR Owners' Group has that information, but they have not shared with us. So, in terms of the details of what is in there, we really don't know what they have in there.

MEMBER CORRADINI: But they will need to probably in all this effort. Is that not true?

MR. DENNIG: At some point, they are going to submit a design that meets whatever the requirement is.

MEMBER CORRADINI: For the order? For the order?

MR. DENNIG: For the order. And we may or may not see the starting point for that. They might not say, "Here's what we started with. Here's the mod, and here's why it is okay."

MEMBER CORRADINI: Okay.

MR. DENNIG: We could just get the whole thing and say, "This is what we are going to do."

MEMBER CORRADINI: Right. Okay. Thank you.

MR. FRETZ: Okay. Shall we go on to the next slide?

(Laughter.)

So, I can quickly go through the next couple of slides because we have essentially touched on both of them, but it will maybe help.

MR. DENNIG: These are all good questions.

MR. FRETZ: Last fall, in the Staff Requirements Memorandum for SECY-11-0137, the Commission directed the staff to take certain actions that relate to the hardened vents issue. First of all, they supported the Near-Term Task Force recommendation to pursue the order, that I think we have touched on earlier, relating to the hardened vent for the BWR Mark Is and IIs. And that was a Tier 1 issue. Okay?

In addition, they also tasked the staff to perform the long-term evaluation, which is binned as a Tier 3 issue, that we will be talking about a little bit later, related to venting for other containment designs. And so, we will talk about where we are with that plan.

But included in the SRM to the staff was that they did tell us to consider the issue of filtration in containment events. That is really what brings us here today, is to really talk about some of the progress we have made relating to our efforts to study that issue, to determine whether or not additional requirements

should be made on the Mark I and Mark II containments.

Okay. Slide 4, please.

MEMBER CORRADINI: I know you are going to go through history. I was just looking ahead. Does your history include what John Monninger mentioned about in the eighties in the containment performance research that was done specifically on filtered vents?

MR. DENNIG: Not today.

MEMBER CORRADINI: But you are aware of it and are looking at it?

MR. DENNIG: Oh, yes. Oh, yes. Oh, yes. But not today. Today the emphasis is on what we learned at other regulators, other utilities.

MEMBER CORRADINI: Okay. Fine. Thank you.

MEMBER BLEY: You are reporting to us on your information-gathering kind of so far?

MR. DENNIG: Right. This is a trip report.

MR. FRETZ: And we will anticipate that we will have another opportunity to talk about the results of our review and our recommendations, about where we are going with that.

But, again, in response, the staff sent a Commission paper up that included the proposed order for the reliable hardened vent. And again, like we

talked about earlier, the design requirements were there simply for the prevention of core damage, and there were absolutely no requirements relating to severe accident service.

Again, the paper touched upon that aspect in that we essentially set up the IOU that we would look at severe accident service and filtration as a separate issue, and that we would report back to the Commission sometime this summer, in July.

Next slide, please, slide 5.

Now some of the staff actions we have taken, we did issue the order on March 12th for the reliable hardened vent. And again, that was for prevention only.

To address the other issues, I guess we call it kind of like a Tier-1-plus, issues relating to the severe accident service and filtration issues. We assembled a team of experts from around the agency. We have members of the staff from the technical branches, the Containment and Ventilation Branch. We also have folks from the Reg Analysis group that will help us with our regulatory analysis to address those issues, the current process that we use for evaluating potential backfits.

We also assembled a team from the Office of Research, Regulatory Research, that will help us

understand some of the insights from Fukushima as well as doing code runs that would help us understand the accident a little bit better. In addition, we do have other members from other offices, such as the Office of New Reactors, that will help us with those insights.

Again, the staff is currently reviewing the myriad of issues that relate to this whole issue of whether or not additional requirements are needed for the hardened vents that we ordered in March and related to severe accident service or filtration.

MEMBER SHACK: Let me just harp on this one more time --

MR. FRETZ: Sure. Please.

MEMBER SHACK: -- to make it clear to myself.

MR. FRETZ: Okay.

MEMBER SHACK: This vent that is going to be installed under the order, will it be operable remotely without AC power? Will that be one of the design requirements?

MR. DENNIG: It will be operable remotely without dependence on emergency or normal AC, yes. That is part of the SBO fix.

MEMBER STETKAR: Be careful about your words. I'm an electrical engineer. No AC power

means --

MR. DENNIG: No. It is not DC -- no, that isn't part of it. No, it is not limited to DC.

MEMBER STETKAR: Will it be operable if you no alternating current power available in the plant? No alternating current power available in the plant, I am asking for a yes or a no.

MR. DENNIG: Yes.

MR. FRETZ: I think it is yes.

MEMBER STETKAR: Okay.

MR. FRETZ: Because there is a requirement that the system be capable of operating under a prolonged station blackout condition.

MEMBER STETKAR: But some people define a station blackout as power available from a non-safety-related alternate AC generator. That is, alternating current is available in the plant under those conditions. That is why I would like to know if it must be available with no alternating current anywhere.

MR. FRETZ: I believe the answer is yes.

MEMBER STETKAR: Okay. Whether it is DC power or mechanical, manual, that is a different issue. At least let's get the AC power straightened out.

CHAIR SCHULTZ: Go ahead.

MR. FRETZ: Okay. Thanks.

In addition, part of our review will be taking a look at some of the past regulatory actions. You know, Containment Performance Improvement Program is, indeed, among the many items we will be looking at. We will also be looking at establishing insights from Fukushima and, then, informing our recommendations and decisions under that.

Again, like we touched upon earlier, we will be using the NRC's Regulatory Analysis Guidelines to inform our decision and recommendations, as well as, like I say, what we want to talk about today is experience with filter containment venting systems pretty much exclusively overseas, and that we did take a look at some of the systems that are installed overseas to help us, essentially, gain an understanding or the reasons why the various regulators required filter containment venting systems there, what their basis was, some of the design considerations that they considered with respect to the design and the decontamination factors.

We also wanted to take a look at the constructability issues, you know, whether or not something like this is even practical over here, as well as get an idea of the cost and essentially some of the things of what it would take to actually do something

over here.

With that, I wanted to turn the rest of the presentation over to Bob Dennig, who will help talk about our foreign experience and the insights we gained from that.

MR. DENNIG: First, as far as the current order, you would probably be very interested in the development of the Interim Staff Guidance, which is now moving along on the assumption that the hardened vent will be able to operate during prolonged SBO, but not necessarily under accident conditions. So, the operation of that and the equipment involved in that is being developed in detail in the Interim Staff Guidance.

MR. DIAS: The ACRS will be briefed on the three ISGs being developed on June 20th.

My name is Tony Dias.

The ACRS will be briefed -- sorry for this -- on June 20th on the three ISGs being developed to support the orders that were issued.

MEMBER ARMIJO: Okay. The date?

MR. DIAS: June 20th.

MR. DENNIG: I am going to talk about what we learned on a trip to review foreign regulatory decisionmaking and implementation of the filtered

containment venting system. The motivation for this trip came out of staff's review in the immediate time after the Fukushima accident, looking at alternative designs and alternative ways of doing things in terms of containment venting. And it turns out that in Europe a reliable hardened vent with an external filter is pretty much a standard feature for containment, and it became so prior to the mid-nineties. So, it seemed to make sense to find out more about that and what their motivations were, and how they think it makes things better.

MEMBER ARMIJO: You say Europe, and you have got two countries there, Sweden and Switzerland. Do you know if the Germans --

MR. DENNIG: Yes.

MEMBER ARMIJO: And the Finns?

MR. DENNIG: Yes.

MEMBER ARMIJO: All of them?

MR. FRETZ: We considered all the countries. We wanted to get a diversity of what is really out there. Essentially, the Finns have essentially the next generation of what the Swedes put in. And in Switzerland, their technology is very similar to what the Germans put in. So, there are essentially two different types.

Now, obviously, there is the French, and they have their type of filter. We did not choose to go there. And again, the Swedes and the Swiss did respond to our request to be able to look at their facilities.

MEMBER BANERJEE: They are all ABB plants?

MR. FRETZ: Yes.

MEMBER ARMIJO: No. No, no, no. Muhleberg is a GE plant.

MR. DENNIG: Leibstadt is a GE Mark III and Muhleberg is a GE Mark I.

MEMBER BANERJEE: Leibstadt is?

MR. DENNIG: A GE Mark III.

MR. FRETZ: It is a BWR/6 with a Mark III containment.

MEMBER ARMIJO: And then, there are a couple in Spain. Do they use filtered vents?

MR. DENNIG: No.

MEMBER ARMIJO: In Nuclenor and --

MR. DENNIG: No. There is a Mark I in Spain that is --

MEMBER ARMIJO: That is Nuclenor.

MR. DENNIG: -- going to be operating for a short time, as I understand it, before they are going to permanently shut down. The last I knew, the Spanish

regulator had decided to put filtered containment vents on PWRs but not BWRs, but was urging that that be done.

MEMBER ARMIJO: Okay. Okay. But you visited these guys?

MR. DENNIG: Yes.

MEMBER ARMIJO: Okay.

MR. DENNIG: Okay. We visited. We had talks with the Swedish Radiation Safety Authority, with the regulator, and we visited Forsmark Unit 2 and Ringhals Unit 1, which are similar to Mark II in containment. We also visited Switzerland and their regulator, the Swiss Federal Nuclear Safety Inspectorate. And then, we had planned visits to Leibstadt, which, as previously has been said, is a Mark III containment, and Muhleberg, which is similar to a Mark I.

Next slide, please.

We were tasked to find out what we could about the regulatory and technical bases for the filtered containment venting systems. What we learned was that, in response to TMI, Sweden issued a report by the Swedish Government Committee on Nuclear Reactor Safety, two major recommendations following TMI, that the plants be able to mitigate the consequences of a severe accident by strengthening containment and reduce

the risks that could result in radiation fatalities or high-radiation dose from ground contamination. Out of that direction, the regulator and the industry engaged in a joint project to develop specifically an external filter for filtered containment venting systems.

Next slide, please.

In the energy bill of 1980 and 1981, the government specified, basically, a two-step process. First, that they expedite a filtered containment venting system for Barseback, which is located near Copenhagen, and consider filtered containment venting systems for Forsmark, Ringhals, and Oskarshamn, and, also, identify any alternatives to filtered containment venting systems that would accomplish the same purposes of strengthening the containment and reducing the risks, as I mentioned on the previous slide.

By way of an outcome, Barseback did have installed a first-of-a-kind, basically, a gravel filter, quite large, almost the size of the containment building. That was not used or duplicated anywhere else, but the first one was very expensive.

And then, the other part of the decision is that, going forward, there is a second generation of filter containment venting systems which are water-based, liquid-based, that are used at Forsmark,

Ringhals, and Oskarshamn.

MEMBER ARMIJO: Bob, you didn't discuss that cost/benefit issue that is on your chart. What is the point there?

MR. DENNIG: Oh, that is a point that was a question that we asked because of the cost/benefit interests, what role did that play in the decisionmaking. And in terms of the details of how that was done or how they do it, we don't have any specific information.

MEMBER BANERJEE: So, you mean that the benefits of not contaminating the ground was not considered? Is that it? Double-negatives.

MR. DENNIG: No. No, the benefits were considered, but the cost was not.

MEMBER BANERJEE: But cost was not?

MR. DENNIG: It was not.

MEMBER ARMIJO: So, it is not really a cost/benefit ratio.

MEMBER CORRADINI: May I ask another question? Because I can see you have a number of slides on kind of the history of what led to what they put in.

Did you see calculations as to the effectiveness of what they put in? I am very curious about curves that say what is released when it works,

what is the release when it doesn't work, what is the release when it goes through the wetwell. Did you see those sorts of analyses?

MR. DENNIG: No.

MR. COLLINS: Wait a minute. We did see a curve of contamination of land as a function of using the filter. Remember, they showed us that plot where they had the land contamination.

MR. DENNIG: Oh, yes. Yes.

MR. COLLINS: Yes. Do, we did see that.

MEMBER CORRADINI: Well, but where I am going with the question is that I am trying to look at the delta effect of these systems. And I am just curious, were you able to get analyses that investigated the delta effect of the systems in differences of, essentially, venting through a wetwell? I am kind of backwards saying this.

MR. COLLINS: No, they didn't compare venting through a wetwell.

MEMBER CORRADINI: Okay. Thank you.

MEMBER BANERJEE: The first-of-a-kind in Barseback was hooked up?

MR. DENNIG: Yes.

MEMBER BANERJEE: For five years? Is that it?

MR. DENNIG: I think the last unit went out of business in 2005.

MEMBER BANERJEE: Okay. And you said this was almost as big as the containment. Was it gravel beds? It was sort of in a silo or something?

MR. COLLINS: I wish we had a picture of that with us.

MR. DENNIG: Yes, it was a very large silo.

MEMBER BANERJEE: Okay. And full of gravel?

MR. DENNIG: Full of gravel.

MEMBER BANERJEE: And the other ones were what? Just tanks of water or --

MR. DENNIG: The ones that are used now?

MEMBER BANERJEE: Yes.

MR. DENNIG: I have some pictures that will show you what they are using.

MEMBER SKILLMAN: The gravel was resin of some sort?

MR. COLLINS: I think it was plain gravel.

MR. DENNIG: Basically, it was just sand and gravel.

MEMBER CORRADINI: I had two other technical questions, and you can postpone them, but at least I want to ask them. What is the logic of venting

the drywell versus directing the flow to the wetwell and then using its suppression, its filtering capability. That is question one.

Question two is, I read through the history. Is the Swedish regulatory emphasis to deal with severe accidents or to deal with design-basis events that could lead to severe accidents? In other words, you were very clear in operating, removing heat, and then, essentially, looking at the venting system if it goes into the realm of severe accidents, and then looking at its capability and then filtering for fission products. What was the history here?

MR. DENNIG: They addressed severe accidents.

MEMBER CORRADINI: So, these were designed for severe accident performance?

MR. DENNIG: Yes.

MEMBER CORRADINI: Okay. Fine. Thank you.

MR. DENNIG: They were backfit on all plants for severe accident purposes --

MEMBER CORRADINI: Okay.

MR. DENNIG: -- for mitigation purposes.

MEMBER CORRADINI: Okay. And then, my other question about why would you vent through a drywell

and not force the flow through the wetwell?

MR. DENNIG: Well, it is basically there are some advantages to having, if you are going to have a vent and you do have a filter, so that you are not limited, if you will, to using the wetwell. There are heat-removal advantages from taking the heat out higher up and having a vent that allows you to flood up without fouling the vent. What else?

MR. COLLINS: The last one was the one they expressly mentioned to us, the ability to flood up. If you cover the vent when you are flooding up, then you can no longer vent through that path. So, they wanted to be able to use the vent for a flood-up possibility as well.

MR. DENNIG: Again, for pressure control.

MR. COLLINS: Right.

MEMBER CORRADINI: Okay. Thank you.

MR. DENNIG: Okay. Let's see. After a program involving PRA and PSA and Level 1 and Level 2, worked with the industry. The regulatory decided that "the filter containment venting system was required for defense-in-depth purposes, given uncertainties in the analysis and the PRA." And that is a quote.

They wound up with a filter containment venting system from the drywell. It is required for

slow overpressurization, for use in feed-and-bleed and flood-up by an additional independent containment spray system. They have a reliable drywell spray to flood up the containment, a reliable means to flood under the pedestal, and a feature that we don't have for an accident we don't analyze is a large-break LOCA with a break in a downcomer tube in a Mark II, which is basically a loss of heat sink. There is an unfiltered vent that opens for 10 minutes following a high-pressure signal and then closes.

MR. FRETZ: It is a much bigger vent line and it is unfiltered.

MR. DENNIG: It is meant for a pressure spike, an early pressure spike, and then the thing is sealed up. And that is done automatically.

MEMBER BANERJEE: How? Just a valve opens and closes?

MR. FRETZ: It is a rupture disc.

MEMBER BANERJEE: Okay.

MR. FRETZ: Go ahead.

MR. COLLINS: The valves in the line, there are motor-operated valves that are normally open in that line. And the rupture disc will rupture on a very-high-pressure signal, and the valves will close 10 minutes later.

MR. DENNIG: If it does or does not rupture, the valves still close.

MR. COLLINS: Yes, whether or not the rupture disc opens, right.

MEMBER CORRADINI: In other venues here we ask the licensee about testing these systems. Were these systems tested before installed or replicates or scale models of these systems tested before they were installed to verify performance?

MR. FRETZ: The protective filters?

MEMBER CORRADINI: Yes.

MR. FRETZ: Yes, the filters were extensively tested.

MEMBER CORRADINI: Okay. But I am thinking of the plumbing aspects of this. I am listening to all this and it seems complex, more complex than I first would have imagined. So, these systems were tested in terms of systems interactions?

MR. DENNIG: Well, there are no systems interactions because they were built entirely independent of any systems on the site.

MEMBER BANERJEE: They are external, right?

MR. DENNIG: They put in another path for drywell spray. That goes to the fire system.

MEMBER CORRADINI: Okay.

MR. DENNIG: They put in a means to flood under the pedestal, in addition to the spray. That is independently-powered and has its own instrumentation, dedicated batteries. So, there is no systems interaction just because there are no systems tie-ins.

MEMBER CORRADINI: All right. Thank you.

MEMBER BANERJEE: How do they test them? I mean, Mike asked the question; they were tested. What did they do to test them?

MR. DENNIG: To test the filters themselves?

MEMBER BANERJEE: Yes. And the whole system.

MR. DENNIG: The whole system?

MR. FRETZ: Well, they do periodic valve stroking to make sure that the valves remain operable. But when they do their version of like the ILRT, they do vent through the system to depressurize the containment following that test. So, they actually validate --

MEMBER BANERJEE: They do the whole flow path?

MR. DENNIG: Yes?

MEMBER BANERJEE: Everything?

MR. DENNIG: Yes.

MR. COLLINS: They have tech specs. They have tech specs on it.

MR. DENNIG: Yes.

MEMBER BANERJEE: How often do they do that?

MR. FRETZ: I believe they said in Sweden that they do that test, the full system test, about once every five years. It is on the order of that.

MEMBER SKILLMAN: What is the filter media?

MR. DENNIG: It is chemically-treated water.

MEMBER SKILLMAN: Okay. Thank you.

MEMBER BANERJEE: The stuff just bubbles through the sparger.

MR. FRETZ: Using the multi-venturi effects.

MR. DENNIG: This is the holistic concept, if you will, for severe accident management that Vattenfall and other Swedish plants have installed. You have the filter for pressure relief of the containment. You can also accomplish hydrogen control. The plants are inerted. Not the Mark III, but the Mark-II-likes are inerted. You can use it for hydrogen control.

Containment sprinkling is containment spray. That is an independent system, has its own supply and its own pump.

Core-melt cooling is accomplished through the flooding-up with the containment spray, and then heat removal with feed-and-bleed with the filter containment venting system.

The reliability is credited largely because of the independence. The filter containment venting system itself will operate passively for up to 24 hours without any intervention. At 24 hours, you have to go put some more water into the tank for the filter.

MEMBER BANERJEE: It just evaporates? Is that --

MR. DENNIG: Well, the heat is going through there and it --

MEMBER BANERJEE: It evaporates?

MR. DENNIG: Yes.

MEMBER BANERJEE: When you said it has got a multi-venturi, is it like a venturi with the water coming? It is almost like an ejector for the gas, sucking water into the venturi? Or what did you mean by multi-venturi?

MR. FRETZ: I wish we had a picture of our candelabra with holes.

MEMBER BANERJEE: Oh, it is just a straight set of venturis? It doesn't suck water through the narrow part of the venturi? Not like an ejector?

MR. FRETZ: I think that is part of it.

MEMBER SKILLMAN: It sounds like what you have described is a set of spargers with venturis.

MR. FRETZ: Yes.

MEMBER BANERJEE: Just a sparger with venturi?

MR. FRETZ: It is submerged in the water, yes.

MR. COLLINS: It is a submergence effect with an overlying body of chemically-treated water that does the scrubbing. I think that that is what you are talking about.

MEMBER BANERJEE: So, why have a venturi? What does it do for you?

MR. FRETZ: Well, it helps optimize the bubbling.

MR. COLLINS: Flushes the gas and it optimizes bubbles, is what it should do.

MR. FRETZ: In fact, it is like a V-shaped thing. So, depending on what the containment pressure is, it allows more venturis to come into play to maintain a constant bubbling effect. So, they get the most

efficient way to scrub the effluent from the containment.

The next time we meet, we will make sure we provide a better picture.

MEMBER BANERJEE: Yes, it would be nice to see a picture.

MR. DENNIG: Forced effervescence. We have a set of slides with basically the designs that we can share.

Next slide, please.

Let's kind of start at the bottom, if you will, in terms of the decontamination factor requirements. To get a DF of 100 for aerosols and a comparable figure for iodine, if you have that, then you are considered to have met the criteria that is above that, which is that there is no release, no more than .1 percent core inventory cesium-134, -137, and iodine from the equivalent of an 1800-megawatt thermal reactor.

And then, if you meet that, then you are considered to meet the criteria above that, which is a limited area first-year dose from ground contamination with rain of greater than 50 millisieverts.

And the limited area is on the order of equal to or less than 50 square kilometers. We are trying to get the details of that calculation.

And then, in terms of the decontamination factor as installed, as it was explained to us, to hit the target of 100 with uncertainties, it was designed on paper for 500 and it tested out at 1,000 for aerosols, and there was no particular reason to make it not work that well.

MEMBER SIEBER: All these performance factors are calculated values, right? Has it ever been tested to prove those decontamination factors?

MR. FRETZ: No, this was tested.

MEMBER SIEBER: Oh, it is tested?

MR. FRETZ: Yes.

MR. DENNIG: They told us, but everybody is very much interested in the details of the testing. So, I think we are going to go find out the details of the testing.

MEMBER BLEY: You have not seen those yet?

MR. DENNIG: No. No. We were only there for two weeks.

MEMBER STETKAR: Bob, I think I heard you say -- I am not familiar with Sweden, but I am assuming they have at least a Level 2, if not a Level 3, PRA for this plant.

MR. DENNIG: Yes.

MEMBER STETKAR: You didn't ask them what

the net benefit to release categories was from filter versus no filter? Not vent versus no vent. Filter versus no filter?

MR. DENNIG: Right. Do we ask them for the calculations behind what --

MEMBER STETKAR: No, no, no. I understand this is design.

MR. DENNIG: Uh-hum.

MEMBER STETKAR: In the risk assessment, they ought to be able to give you results for release categories, filter versus no filter. Did you ask them for that?

MR. DENNIG: We asked them for that, and they said they hadn't done it.

MEMBER STETKAR: They hadn't done it?

MR. DENNIG: Right.

MEMBER ARMIJO: Why? That is hard to understand.

MEMBER STETKAR: I will ask the same question when we get to Switzerland.

(Laughter.)

MEMBER CORRADINI: Why? Did you do them?

MEMBER STETKAR: Back in the nineties, yes.

MEMBER ARMIJO: Sure.

MEMBER STETKAR: But they have redone them.

MEMBER CORRADINI: Can we ask you, then, the answer?

MEMBER STETKAR: Nope.

(Laughter.)

MR. DENNIG: Next slide, please.

Okay. A summary of the design. It is passive filter. It is inerted with nitrogen. The achieved decontamination factor for aerosols is 1,000. The heat-removal capability is calculated to be 1 percent. It is acknowledged as a vent for hydrogen. So, there are no ignition sources, and it is vented to a safe location.

The seismic design is the same as the containment seismic design: 24-hour passive operation. You can operate it actively if you so choose, if you want to intervene or control it after the rupture disc opens.

Valves are operable from the control room, have independent electrical and pneumatic supplies. In the case of Forsmark, they have a local manual station where you can turn wheels to operate the valves.

The instrumentation has its own independent batteries. And as I said before, the connection is from the drywell. The vent is from the drywell.

MEMBER SHACK: And the pressure they vent

at? Or the pressure for the rupture disc?

MR. DENNIG: It is like 25 percent above design pressure.

MEMBER SHACK: Design?

MR. DENNIG: It is fairly close to design pressure.

Next slide, please.

This is an arrangement at Forsmark, some of the arrangement. And containment is on the right, and there is a single pipe on the other side. It branches into two.

The bottom line is the one that has the rupture disc in it, and then followed by two normally-opened valves. The top line is for active control. That valve is normally closed, and there are additional control valves to the left off of the picture. And then, you can obviously close these normally-open valves to stop the flow through the rupture-disc line.

MEMBER BANERJEE: Why are the control valves there? What is it supposed to control?

MR. DENNIG: Well, this is flow through the vent. These are isolation valves on a penetration.

MEMBER BANERJEE: Right. I mean, the rupture disc is on the line which is the lower line, right?

MR. DENNIG: Uh-hum.

MEMBER BANERJEE: And then, it has got valves to close it off?

MR. DENNIG: Yes.

MEMBER BANERJEE: Right?

MR. DENNIG: Uh-hum.

MEMBER BANERJEE: I am talking about the line on top. What is the function of that line?

MR. DENNIG: You can actively vent --

MEMBER BANERJEE: For control vent?

MR. DENNIG: Yes. You can control the pressure through that before the rupture disc goes, if you wish. If you want to vent earlier than the rupture disc, then you can use that.

MEMBER BANERJEE: Okay. And that runs off what, DC power or?

MR. DENNIG: Air.

MEMBER BANERJEE: Yes, but air comes --

MR. DENNIG: And then, the nitrogen bottles.

MEMBER BANERJEE: Oh, off nitrogen bottles?

MR. DENNIG: Yes, that is in the picture next to it.

MEMBER BANERJEE: Okay.

MR. DENNIG: The bank of nitrogen bottles for the pneumatic supply for those valves, again, dedicated to the operation of those valves.

MEMBER BANERJEE: So, just solenoids have to open?

MR. DENNIG: Right. Uh-hum.

MEMBER ARMIJO: But it doesn't matter which line you vent through it? It goes through the filter somewhere downstream?

MR. DENNIG: Yes. Yes.

MEMBER ARMIJO: Okay.

MEMBER SHACK: And how big is that vent line?

MR. DENNIG: It's 10 inches?

MR. FRETZ: Ten inches, something like that.

MEMBER BANERJEE: These are seismically-qualified and everything?

MR. DENNIG: Yes.

MEMBER SKILLMAN: That is a Monroe shock absorber.

MEMBER BANERJEE: Yes, that is a shock absorber. Okay.

MR. DENNIG: Okay. Next slide.

MEMBER BANERJEE: And to what sort of

earthquakes is this supposed to be?

MR. DENNIG: Whatever the containment is.

MR. FRETZ: Whatever the containment is designed for, the system is designed the same.

MR. DENNIG: Next slide, please.

This gives you an idea of the size of the installation in Forsmark and Ringhals. They chose to put a building outside, so that it wouldn't interfere with operation of the plant. They could do this mostly with the plant running. They could use their allurgist to do the tie-ins. So, there wasn't any impact on production while the system was backfit.

You can see the stack for the filter at the top of the box, the red box. On the right is the top of the moisture separator MVSS filter. The spargers are down below. The inlet line runs into the center of the tank, through the spargers, exits through the line behind the individual there, up through a moisture separator that is basically a gravel filter, around and then out through the plant stack. And this thing, while it is in standby, it inerted. There is another rupture disc in the discharge line that keeps the nitrogen in the system while it is in standby.

Next slide, please.

Again, Forsmark. On the left you see

basically the severe accident control panel where you can control and monitor the filter containment venting system if you want to operate that actively, you want to know the status of it. There is also radiation instrumentation.

You can activate and operate the under-vessel flooding system and, also, the same thing with the drywell spray, from this particular panel. So, all that is together in one place.

With respect to the flood-up drywell spray, on the right you can see coming from the floor, heading straight up on the lefthand side of the picture is the fire system, and that is the normal path of supply. It has a diesel-powered fire pump. And then, should that not be operable, there is another line, as you see with the hookups, where you can bring in a portable pump or a fire truck and hook it up to those hookups.

Below is the Ringhals configuration -- next slide, please -- similar to the hookup, the fire pump, the fire truck. They have a specially-designed vehicle that has units that it can drop at -- I think two units they have. You can back out. I think the legs go down and you have a generator and a pump, and you can hook it up to the inlets, that are shown in the little circle below, from outside the containment. And then, there

are some power hookups that are available, should you lose the dedicated battery power.

MR. COLLINS: They did a failure modes and effects analysis on this, and they found it was the battery, starting battery, for the truck that was the limiting component. So, they put in a second battery.

MEMBER BANERJEE: How long have they had this, pre-Fukushima or post-Fukushima?

MEMBER SIEBER: It is a pretty old truck.

MEMBER BANERJEE: It looks like an old truck, yes.

MR. DENNIG: Good question. I don't think it is --

MEMBER SHACK: Well, it doesn't wear out.

MR. DENNIG: Okay. So, more details about the regulatory aspects and costs. The final guidance was issued in 1986. The required backfits were implemented by 1988, and that includes the independent water systems.

MEMBER SIEBER: Twenty-six years ago.

MR. DENNIG: It is really worked on that power; use the allurgist for tie-in. From an engineering perspective, because it was all independent, it wasn't very difficult.

These costs are not in 2012 dollars. So,

you know, we have yet to translate them into anything, and I am not sure that we are going to use them other than as ballpark numbers anyway.

MEMBER BANERJEE: When did they find out about the second battery? How long ago?

MR. FRETZ: How long ago?

MR. DENNIG: I don't know. The second truck battery?

MEMBER BANERJEE: Yes. I hope they didn't put the same type of battery.

(Laughter.)

If it was failing due to the cold or something, they will both fail.

MR. FRETZ: They didn't say.

MR. DENNIG: Annual maintenance, 10,000 and 30,000. It gets pretty much the standard for a standby system inspection testing maintenance regime as another standby system.

MEMBER ARMIJO: Bob, did they tell you how they test these things? What constitutes a good test for a system like this?

MR. DENNIG: Well, I don't think --

MEMBER ARMIJO: I know they can open a valve.

MR. DENNIG: Right.

MEMBER ARMIJO: But how do you say, well, this thing is really --

MR. DENNIG: Whether they do a flow test or whatever --

MEMBER ARMIJO: Yes, yes.

MR. DENNIG: -- I know they do that. Whether they have a test line, I don't have the details and I don't know. I am assuming that they can do it in a way that doesn't interfere with anything else.

And some more bullets, and then on to Switzerland. Next slide, please.

The Swiss acted on this later than the Swedish authorities. They benefitted from the Swedish development efforts. Basically, they adopted the Swedish approach as a standard, and they did that following Chernobyl. Before that, they had done some things to provide a more secure source of injection water, and so on and so forth, in a bunkered system with its dedicated diesels.

But, following Chernobyl, the authority asked the licensees to evaluate FCVS. And they do that in the context of their law which says that "Licensees are required to backfit as appropriate, in response to operating experience and consistent with available technology, to further reduce risk to people and the

environment."

So, one can infer that the availability of the wet-filter technology in Chernobyl met the requirements for the request, and so they went forward with it.

Next slide, please.

I wanted to show how the filter venting was integrated with SAMG implementation. This is at Muhleberg, which is like a Mark I. In 1992, they put the venting system into service.

MEMBER CORRADINI: Did you say it, and maybe I missed it, this is a drywell filter vent for Muhleberg?

MR. DENNIG: No, Muhleberg --

MEMBER BANERJEE: Mark I.

MEMBER CORRADINI: I know that, but I am trying to understand, where do they take a vent --

MEMBER ARMIJO: It is a BWR/4 Mark I. It probably looks a lot like the ones we have here.

MR. DENNIG: Yes, it is from the drywell.

MEMBER CORRADINI: So, it is a drywell filter vent.

MR. DENNIG: Yes. They have this --

MEMBER CORRADINI: Well, that is okay. That's all.

MR. DENNIG: That is part of the torus. Part of the containment is on in the reactor building. It is already there. It is like a suppression pool outside primary containment. That was there. So, they put their spargers down into that ring of water.

MEMBER ARMIJO: The torus, yes.

MR. DENNIG: Well, into their --

MEMBER ARMIJO: Outer torus.

MR. DENNIG: -- outer torus.

MR. FRETZ: They have an inner torus and an outer torus.

MR. DENNIG: The they have two toruses.

MEMBER ARMIJO: Two?

MR. DENNIG: Yes.

MR. FRETZ: An inner torus and an outer torus.

MR. DENNIG: Yes, there is one that is part of primary containment and then there is an other torus that is part of secondary containment.

MEMBER CORRADINI: Oh. And that is where the drywell filter vent --

MR. DENNIG: Goes to.

MEMBER CORRADINI: Okay.

MR. DENNIG: Yes. Instead of a separate tank, they just use the existing torus.

MR. FRETZ: They didn't have to buy the tank.

MR. DENNIG: They didn't have to buy the tank, right.

MEMBER CORRADINI: Okay. Thank you.

MR. DENNIG: Next slide, please.

This is pretty much a repetition of the Swedish situation. A development of guidance. The features are basically the same as the Swedish features.

Next slide, please.

Some more pictures. This is Leibstadt. Again, you see this branching. You have an inboard valve that is open, an outboard valve that is closed on the bottom line, and then the rupture disc is in the top segment that bypasses the closed outboard valve. The rupture disc is the containment boundary, and then you can open and close the vent outboard valve and the vent inboard valve to control the flow actively or shut off the flow after the rupture disc has ruptured and you don't want it anymore.

The filter itself you can see at the right. Those are turbine building and reactor building buildings. They have two filters, basically, two wet filters. They are 9 feet by -- what? -- 27 feet high. They are located there because it is a location that

is inaccessible and basically shielded. So, they took advantage of that particular location to minimize the cost of having to build a shielding building.

MEMBER ARMIJO: And inside there is basically water and some structures?

MR. DENNIG: Yes, it is the same. Yes, yes. We will get to the slides that address the things.

Again, some information that is basically the same as the Swedish case. Ballpark figures for installation. Again, the thing was designed so that they could do it at power, and there wasn't any impact on production.

They do have technical specifications, and neither they nor the Swedish authorities or the Swedish utilities thought that there was any safety tradeoff in putting this in, that somehow they were introducing something that degraded safety and that there was some tradeoff. They didn't think there was anything like that.

MEMBER BANERJEE: What do you mean by the last statement?

MR. DENNIG: "No stated negatives for FCVS - utility representatives considered FCVS cost-beneficial as designed." I use the term "value" for money. Given the decision to make the containment

sturdier, to beef up the containment, that filter containment venting system was a good way to do it in terms of how much it cost to do it.

MEMBER BANERJEE: Compared to what else?

MEMBER STETKAR: Bob, you were there at the host of ENSI?

MR. DENNIG: At the what

MEMBER STETKAR: You were hosted by ENSI --

MR. DENNIG: Yes.

MEMBER STETKAR: -- not the utilities?

MR. DENNIG: Yes.

MEMBER STETKAR: You might get a different answer on that last bullet if you talked to the utilities.

(Laughter.)

MR. DENNIG: Well, we did. We did meet with the utilities.

MEMBER BANERJEE: It says "utility representatives".

MR. DENNIG: Yes, we did meet with the representatives, yes. Yes. And I understand your point in retrospect.

(Laughter.)

MR. COLLINS: We asked the utility representatives were there any negatives to this system.

MR. DENNIG: Well, no. If you are going to do this, if you decide that you want to do this, that you want to strengthen the containment, this is a good way to do it. And it was an engineering solution that the engineers agreed on.

MEMBER ARMIJO: Right, but the question Mike asked about land contamination without filters or with filters -- the question that John Stetkar refused to answer, did you ask them --

MR. COLLINS: No, we didn't ask.

MEMBER ARMIJO: -- the benefit in that --

MR. COLLINS: Oh, we did. I asked that question.

MEMBER ARMIJO: Okay. All right.

MR. DENNIG: I was going to say they have done a risk study on installing filters.

MR. FRETZ: Oh, this is Muhleberg. Yes.

MEMBER ARMIJO: Muhleberg is fine.

MR. COLLINS: I asked them the same question, and they said they had done one and they had submitted it to their regulatory authority, but they didn't think they were free to release to us because of security reasons, or whatever. So, we have asked their authority if we could get a copy of it. And that is where it stands now. We have not yet gotten an answer

to that. But they said they had done one.

MEMBER ARMIJO: Well, if you get a copy, can we --

MR. COLLINS: Well, we are hoping. I mean, we asked them formally if we could get the copy, and we haven't gotten an answer yet.

MR. DENNIG: Okay. Next slide, please.

Just a summary reiteration of some of the things that we have already said.

And then, I am going to turn it back over to Bob Fretz for discussion of stakeholder input and 5.2.

MEMBER ARMIJO: Just a real quick one. I saw on your slide this new chemistry for iodine retention.

MR. DENNIG: Uh-hum.

MEMBER ARMIJO: Can you expand on that a little bit?

MR. DENNIG: Not too much beyond some names. We have some details. It is called aliquot chemistry. The other chemistry is a pH control, a basic pH control. This aliquot is a proprietary chemistry that Paul Scherrer Institute has developed and is marketing.

MEMBER ARMIJO: Okay.

MEMBER SIEBER: Interesting.

MR. FRETZ: Okay. I guess next slide.

As part of our process for evaluating whether or not we should impose requirements related to severe accident service as well as filtration of these hardened vents, we have held a number of public meetings. Specifically relating to this issue, we held two public meetings during the month of May to discuss the issue of filter vents.

In addition, I know the Nuclear Energy Institute has sent Chairman Jaczko a letter. It was actually dated the 15th of May. That is a typo on there. But it was dated the 15th of May, asking consideration for other alternatives relating to that. And now we are looking at that letter, and we hope to inform our decision based upon some of the ideas that are being presented to us from the industry.

But during the public meetings, again, some of the sense we get is the public is very engaged in this issue. In fact, at our last meeting on the 14th, we probably entertained about anywhere from four to five hours of comments from members of the public regarding this issue. We find all that very helpful. And so, we hope to use that to help inform some of our decisionmaking.

Next slide.

I guess the next steps. We still have a little bit more work to do regarding this issue. There is still a lot of work to do.

Research is going to continue to do some analyses that related to Fukushima. They have done a number of MELCOR --

MR. DENNIG: And they are doing them with and without calculations on the wetwell --

MR. FRETZ: Yes.

MR. DENNIG: -- to look at the benefit.

MR. FRETZ: Yes. Yes, and so that is primarily to help us to inform our regulatory analysis of this issue.

We hope to soon finalize the various options and recommendations. Again, like we mentioned earlier, we are considering the various stakeholder input.

All this will need to be reviewed by our Japan Lessons Learned Steering Committee to gain their alignment with our various recommendations. Our plans are to come back to the ACRS to share with you our recommendations and the various options that we may or may not consider, you know, depending on what the outcome of our review is.

And again, you, the Commission, we provide

them a paper in July. And so, we are still working toward that goal. And again, we will include various options and recommendations. That is our intent, is to take a look at some of the various options that might be considered.

Next slide.

Again, as John Monninger mentioned earlier, there is a Tier 3 activity relating to the issue of containment venting for containment designs other than the Mark I and Mark II containment designs. And so, I will briefly tell you where we are going with that. And again, we can discuss the various ways we are approaching this.

Again, as a part of background, the Near-Term Task Force made a recommendation that the staff evaluate the need for hardened vents in the designs other than the Mark I and Mark II. This was prioritized as a Tier 3 issue in SECY-11-0137. And again, the Commission did agree with that Tier 3 prioritization.

Again, I guess as we have touched upon during our presentation, the primary concern with containment venting has been focused on the Mark I and the Mark II containment designs. The analyses in the past have shown that the Mark I and Mark II designs are susceptible to overpressurization if it a means to

remove heat from the containment is lost. And so, again, that same analyses has shown that the other containment designs are less susceptible to overpressurization concerns.

Next slide, please.

So, with that, again, with our focus on the Tier 1 activities, there are just limited resources within the staff. That includes Research as well as the Office of Nuclear Reactor Regulation in this area. So, we are going to recommend that further consideration of venting for designs other than the BWR Mark I and Mark II be deferred, at least at this time, until a decision is essentially made on the Mark I and Mark II filter issue, severe accident service issue, that we hope to get settled really this summer or later on.

Next slide, please.

That is the end of our presentation. We obviously are here to take any questions concerning the Tier 3 issue as well as the Tier 1 issue.

CHAIR SCHULTZ: Other comments or questions by the Committee?

MEMBER ARMIJO: I guess I have a question on the filter containment venting. Basically, I was surprised that in Japan they are really considering or

may likely install it in big containments, in PWR containments. Does the staff have a technical reason why that is, other than availability of expertise? But is there another better reason than that, since you really don't need it for PWR containments?

MR. DENNIG: We currently are not concerned about the PWRs in large drys. And I don't know the basis for which they decided to do that.

MEMBER ARMIJO: Yes, I am looking for some expert input.

MR. DENNIG: Because of the size and the overpressure vulnerability is why we are dealing with Mark Is and Mark IIs.

MR. LEE: Dr. Armijo, this is Richard Lee from Research.

MEMBER ARMIJO: Yes?

MR. LEE: About Japan, when we read that boiling water reactors were going to install these vents, I did ask the staff from the Atomic Energy Commissions what is the technical basis for doing such implementation. The answer from that is that the utility designed it to take that action. The government has not told them to do anything, and there is no technical basis coming from the Atomic Energy Commissions.

MEMBER ARMIJO: Well, I don't want to debate it, but I was in Japan a few weeks ago, and the utility guys had a different view of that, who said what. But I just was looking for a technical reason. Is there something fundamentally-good about a big containment that somehow takes out particles in the aerosols, so you wouldn't benefit from a filtered --

MR. COLLINS: No. I think it just gives you more time to respond. Ultimately, you have got to arrest a core-damage event by reestablishing heat removal from the containment.

MEMBER ARMIJO: Right.

MR. COLLINS: And what the filtered vent would, hopefully, do in the Mark Is and Mark IIs better than in a bigger containment is -- the time is shorter in the Mark Is and Mark IIs, okay? So, if you can extend the time available to arrest a core without having a release, that is a better state. In the PWR large drys, you have got more time available just by virtue of the volume in the containment.

MEMBER ARMIJO: But if you have got a severe -- well, let me talk to my severe core accident colleagues sometime later, and they can explain it to me. I just don't understand.

MR. MONNINGER: Dr. Armijo, this is John

Monninger from the staff.

MEMBER ARMIJO: Yes.

MR. MONNINGER: I think it is also important to recognize the fundamental difference within the U.S. in the designs of BWRs versus PWRs for these accident sequences. The BWRs, you are essentially dumping your heat into your suppression pool and you are isolated.

MEMBER ARMIJO: Right.

MR. MONNINGER: Right? What do our PWRs do? Within the PWRs for these equivalent-type sequences, you are running your aux feedwater into your steam generator and you are dumping to the environment. So, there is a fundamental difference in the management of decay heat between the BWRs and the PWRs for these equivalent accident sequences. BWRs are bottled up. You are dumping it into your suppression pool and you are heating it up. The PWRs, through aux feedwater, you are dumping it to the environment.

So, that is why the historical emphasis or focus has been on venting for the BWRs. So, there is a technical basis here.

If you look at your potential weaknesses in your containments for a PWR, it is typically steam generator tube rupture or some type of ISLOCA or

something like that. So, there is a technical basis.

And what the staff is trying to say here -- I won't say please don't divert us -- but, hey, we think the biggest bang for the buck, if there is one, is to focus on the Mark Is and IIs, and there is a basis to pursue these plants first.

MEMBER ARMIJO: Okay.

MR. MONNINGER: I am not sure if that helps or not.

MEMBER ARMIJO: Yes, it does. It does. Thanks, John.

CHAIR SCHULTZ: Other comments from the Committee?

(No response.)

I would like to ask if there are any comments from members of the public. I understand the phone lines are open. If you would like to make a comment, please identify yourself and make your comments to the Committee or the staff.

(No response.)

Hearing no comments, we have a comment here.

MR. DUBE: Yes, Don Dube, the Office of New Reactors. Just some thoughts for the Committee's consideration.

And Dr. Shack was kind of hinting at this

about an hour and a half ago. In an ideal world, one would put the horse before the cart in the sense of, if you look at the new reactor designs, first, the Commission started with a policy on core damage frequency, large release frequency, condition of containment, failure probability, as well as the industry with the utility requirements document. And then vendors designed reactors to meet those goals.

Here the logical process would be, first, to have a policy statement on land contamination and offsite property damage. From that, it would set, based on protective action or something, what the land contamination levels would be in terms of becquerels per square meter or curies per square meter, from which one could back off what is the decontamination factor of the filter have to be to meet that, and then work in reliability of the filter, and so forth.

Here we have a concern on my part that we may be out of phase in the sense of we are going to have a recommendation to the Commission on a filter, but the policy statement on land contamination may be several years away. And hopefully, the policy on land contamination will fit what the filtered vent decontamination factor will be.

So, it is just some consideration for the

Committee and the staff as well. Are we getting out of phase with regard to timing?

MEMBER RAY: Yes, and I would think that is the kind of thing we might comment on at the appropriate time.

CHAIR SCHULTZ: Other comments? Yes?

MR. GUNTER: Thank you.

My name is Paul Gunter. I am with Beyond Nuclear.

I guess, first of all, as has been indicated, there has been lots of public contact and interaction with these staff meetings. And I just wanted to convey that there is, at least within the public interest community, there is a lot of concern with regard to separating out the issue of the filtered containment vent and the whole accident mitigation process.

I think a lot of that stems from the demonstration of Fukushima. And so, for many in the public, there is this disconnect that the process that is moving forward has essentially separated out what was demonstrated and that we had containment failure, we had vent failure stemming from a severe accident.

So, why aren't we looking at the severe accident issue in sequence rather than separating it

out? And frankly, there is a lot of concern that this is moving toward political and financial considerations rather than public health and safety.

So, I just wanted to make that as a bottom-line statement. That is not just coming from me, but from the Natural Resources Defense Council, from a whole host of public interest communities.

Also, with regard to the whole idea of the current DTVS and the adequacy of the scrubbers in the torus, one of the public comments -- I guess there have been several instances of this -- reference a 1988 study that was basically, apparently, a trip report from a specialists' meeting on filtered venting containment systems in Paris, France, from 1988.

So, we are a little puzzled by the fact that we have got this demonstrated history. We have now got a demonstrated event. And we are proposing again to debate this issue further when, in fact, at page 4 of this report it does state, quote, "Within the United States, the only commercial reactors approved to vent during severe accidents are boiling water reactors having water-suppression pools. The pool serves to scrub and retain radionuclides.

"The degree of effectiveness has generated some debate within the technical community. The

decontamination factor, DF, associated with the suppression-pool scrubbing can range anywhere from, 1, no scrubbing, to well over 1,000, 99.9 percent effective. This wide band is a function of the accident scenario and composition of the fission products, the pathway to the pool through spargers, downcomers, et cetera, and the conditions in the pool itself. Conservative DF values of 5 for scrubbing in Mark I suppression pools and 10 for Mark II and Mark III suppression pools have recently been proposed for licensing review purposes. These factors, of course, exclude considerations of noble gases which would not be retained in the pool."

So, for quite some time now, the public has not shared confidence in the scrubbing qualities in the torus. And this has been backed up by not only the report back from the NRC, but what is being demonstrated now by the service that has already been put into these foreign reactors.

So, again, we are concerned that we are moving along this separate track, rather than what we believe should be a direct outcome of the Fukushima accident, which is what was demonstrated.

But, you know, I just want to add one note as well. We continue to make this plea that what we

see here is a fundamental problem that the regulator is not recognizing the license conditions under General Design Criteria 16, which would seem to us o be a fairly-definitive definition of containment integrity and a strong containment.

So, when you talk about strengthening containment by temporarily defeating it, that doesn't speak to General Design Criteria 16, which says you shall have an essentially leak-tight containment. So, another disconnect here with what we see as the license condition and the track that the agency is on with regard to public health and safety.

But I guess, more particularly, the questions that I would like to ask: with regard to the current filtration systems that you saw in Europe, how did they evaluate the filtering-out of noble gases? Was there any way of --

MR. DENNIG: It is excluded. That is not included.

MR. GUNTER: It is excluded, right.

MR. DENNIG: It is excluded, yes.

MR. GUNTER: So, then, there are the daughter products of cesium-137 and strontium-90. These would be the daughters of xenon and krypton. And so, it seems like, there again, I think this speaks to

the land contamination issue as these products are being excluded from any evaluation.

And also, with regard to 5.2, I just wanted to get some sense of, on slide 28, when you say, "Other containment designs are less susceptible to overpressure," are you addressing the Westinghouse ice condenser in this category?

MR. DENNIG: Yes.

CHAIR SCHULTZ: Thank you for the comments, Paul. We appreciate that.

Hearing no other comments at this time --

MR. KRAFT: Excuse me. Sorry.

CHAIR SCHULTZ: Yes? Go ahead.

MR. KRAFT: Steven Kraft from the Nuclear Energy Institute.

There is a reference that Robert made to our letter that we sent in the other day. Here it is. If you don't have copies of it, I am more than happy to make it available to you.

The point of our letter was to really pick up what I thought I heard a lot of the members here asking and in a reference that Dr. Gunter made to the need for holistic analysis, if I could use what is becoming an overused word. Yes, there was a containment failure at Fukushima, but that is the point, that we have to

look at all of those processes, all of those scenarios, all of those potentialities when assessing how you, in fact, not vent filters versus not venting or not filtering, but how do you manage a molten core? And that is what we are looking at.

In our letter, we point out that the kinds of analysis we are doing, we are looking at containment sprays and flood-up and the venting, and all the things that you saw on the pictures from the international work that we would like to know a heck of a lot more about.

We have a series of questions that we gave Dr. Dennig. I am curious to know when we might see some response to that. They were questions we had, maybe about two dozen of them, about the European experience that we would like to learn from.

MR. DENNIG: Yes, those were on the table when we had the meeting. So, we will dig that out.

MR. KRAFT: Thanks very much.

And really, what we are asking for here is we recognize that there is a possibility that if we go forward with the reliable hardened vent at the Mark I and Mark II containments, that if the Commission ultimately turns around and says, "Well, look, let's revise that order and put in filters," there is potential for rework. We understand that.

But the industry is willing to accept that to gain some time to do the proper analyses, so that we know that we are doing things correctly and not just running to put a vent on the end of a pipe, a filter on the end of a vent pipe.

Thank you.

MR. LEYSE: Can you hear me?

CHAIR SCHULTZ: Yes, we can.

MR. LEYSE: Am I on?

CHAIR SCHULTZ: Yes. Bob, please identify yourself for the record.

MR. LEYSE: Yes. Yes, this is Bob Leyse, and I will be damned brief because I have said this before.

In terms of a holistic approach, this 2200-degree Fahrenheit criterion that many plants run under, for example, Palo Verde, the Baker-Just equation is based on specimens, zircaloy specimens, that you can handle, walk around with in your pocket as pocket change.

In contrast to that, NRC is funding a huge program at Sandia in which bundles of fuel rods, 49-rod bundles, and earlier I guess some BWR bundles, are tested in air only. For a fraction of the cost of that stuff, you could do the kind of tests that would show in terms of U.S. data that the 2200-Fahrenheit limit is too high.

End of comment.

CHAIR SCHULTZ: Thank you, Bob.

Other comments?

MR. MONNINGER: Dr. Schultz?

CHAIR SCHULTZ: Yes?

MR. MONNINGER: If I could maybe either help or confuse the ACRS, you just heard a discussion on a Tier 1 issue and a Tier 3 issue.

CHAIR SCHULTZ: Yes.

MR. MONNINGER: The staff's desire is, of course, a letter from the ACRS, preferably a positive letter, at this time or in the near future on the Tier 3 items. So, that would not include our discussion at the current time on the filter vents.

You heard information on the filter vents, but you didn't hear the staff's recommendation yet. We have been talking with Antonio and Ed Hackett, et cetera, with the need to re-engage your group further on the Tier 1 issue on hardened vents, filter vents.

So, just trying to keep your books straight, our hope or desire would be that you we would maybe have two separate letters, the one letter which we will dialog with you again in the future on the hardened vent and the filter vents, and then a separate letter on all the Tier 3.

CHAIR SCHULTZ: We should discuss that schedule --

MR. MONNINGER: Okay.

CHAIR SCHULTZ: -- separately, and we will have more discussion at the full Committee related to Tier 3.

MR. MONNINGER: Right.

CHAIR SCHULTZ: And we will have opportunities later on in June, depending on your schedule, for other discussions on the Tier 1 filter venting issue.

MR. MONNINGER: Yes. Thank you.

CHAIR SCHULTZ: Thank you.

Hearing no further comments, I will declare a recess until 10 minutes of 4:00, so we can continue the dialog on Tier 3.

(Whereupon, the foregoing matter went off the record at 3:40 p.m. and went back on the record at 3:53 p.m.)

CHAIR SCHULTZ: Okay. I would like to call the meeting back into session following the recess.

The next presentation this afternoon is on Recommendation 2.2, Periodic Reassessment of External Hazards, and Jenise Thompson is going to make the presentation for the staff.

Jenise, welcome.

MS. THOMPSON: Thank you.

Good afternoon.

My name is Jenise Thompson. I am a geologist in the Office of New Reactors, Division of Site Safety and Environmental Analysis, and I have been part of the larger-scale team that has been addressing Recommendations 2.1, 2.2, and 2.3, but I will just be briefing you today on Recommendation 2.2, which is the Periodic Reassessment of the External Hazards.

As I am sure you are all probably sick of hearing, the Near-Term Task Force Report identified a set of recommendations to be undertaken by the staff. Recommendation 2.2 reads that, "The staff should initiate rulemaking to require licensees to confirm seismic hazards and flooding hazards every 10 years and address any new and significant information; if necessary, update the design basis for SSCs important to safety to protect against the updated hazards." So, that is the text of Recommendation 2.2.

This was put into Tier 3 because the staff has been focusing its efforts on Recommendations 2.1 and 2.3. In Tier 1, the staff is focusing on the seismic and flooding hazards for both Recommendation 2.1, which is the reevaluation of the hazards at the site, and

Recommendation 2.3, which are walkdowns at the sites, which is the most near-term of the actions that we are currently undertaking.

Based on some feedback that we have received from ACRS, as well as the Consolidated Appropriations Act language from Congress, other natural external hazards were added to the scope of Recommendation 2.1, and that is something that has been put into Tier 2, based on resource limitations.

So, with respect to Recommendation 2.2, the staff's approach, as of today, is to define and begin some initial pre-rulemaking activities that we feel are necessary to position us for a future rulemaking activity to implement this recommendation. And that would only be done as resources become available because the staff is very heavily engaged with Recommendations 2.1 and 2.3 in the Tier 1 activities at this point. So, we don't want to take away any resources, either staff or contractor resources, for a Tier 3 item at this point.

Also, we are looking at the scope of the rulemaking. Currently, based on Recommendations 2.1 and 2.3, we have seismic and flooding based on what was in the Near-Term Task Force. As I previously mentioned, the ACRS and the Consolidated Appropriations Act

included other natural external hazards. So, the staff is also assuming that those other natural external hazards would be included in the scope of Recommendation 2.2 as well.

And a fourth possibility that is still under discussion at this point amongst the staff is whether or not to include other man-related external hazards, such as transportation accidents. But, as I said, that is something that is under discussion. So, your feedback on that would be appreciated.

MEMBER SKILLMAN: Jenise?

MS. THOMPSON: Yes?

MEMBER SKILLMAN: What other natural external hazards are on your platter right now, please?

MS. THOMPSON: Some of the examples would be a transportation accident. So, if you are located on a riversite or --

MEMBER SKILLMAN: Natural.

MS. THOMPSON: I'm sorry?

MEMBER SKILLMAN: Natural.

MS. THOMPSON: Oh, natural, I'm sorry. Severe storms would be considered. High-wind effects, tornadoes, those would fall into the natural external hazards.

MR. CHOKSHI: Yes, we are looking at a slew

of natural hazards, including tornado, temperature extremes, some of the sand storms, all kinds of different things, you know, what you typically look at, I think, if you go to the PRA standard or something. But, you know, there is a big list of the events, but then a few of them are common to everybody, like wind and tornado -- that comes to the first thing -- and the temperatures.

MEMBER SKILLMAN: Well, certainly, those are two that come to my mind. But I think around this table some of us have experience with jellyfish, masses of biomaterial in the Delaware River, and other natural events that are truly aquatic biological that have a tendency to kill the cooling water systems. And then, for plants that have their own internal cooling water systems -- Palo Verde is an example where you have got great ponds of water that is susceptible to a great amount of ultraviolet and infrared -- the ability to grow material that fouls all the heat exchangers that are essential for emergency core cooling.

So, it would seem to me that there is a body of evidence that is readily available, and it is probably in operating experience.

MR. CHOKSHI: Exactly, yes. In fact, I think one of the things that right now we are looking

in the standard area is how to do the screening analyses for this long list of events. And that operating experience is one of the big things. We need to sort of analyze through that and see what is applicable to your site outlined.

But that is still being -- we started with a long list of those kinds of events, and have done some thinking, but haven't really --

MEMBER BANERJEE: So, do they include these solar storms that we hear about?

MR. CHOKSHI: Yes. Well, that is magnetic and lightning.

MEMBER BANERJEE: No, no, the --

MR. CHOKSHI: Yes, magnetic event storm like some --

MEMBER BANERJEE: No, where a lot of transformers like got burnt out in the twenties and before that.

MR. CHOKSHI: Yes, there are quite a few different things, yes.

MEMBER RYAN: I assume flooding covers flooding from any source?

MR. CHOKSHI: Yes, flooding --

MEMBER RYAN: Rain, tornadoes, hurricanes?

MS. THOMPSON: Right.

MR. CHOKSHI: Yes, those come as part of the flooding, right.

MEMBER RYAN: Oh, okay, yes.

MS. THOMPSON: Yes, and all the points you are mentioning also play into Recommendation 2.1 for other natural external hazards. So, that is something that, going forward with Recommendation 2.1 for other external hazards as a Tier 2 item, the decisions on the scope of the hazards to be considered, that would be something that would feed into Recommendation 2.2, once we get to that point.

MEMBER SKILLMAN: Okay. Could you give a little briefing on what you see on the fourth bullet, man-related external?

MS. THOMPSON: Man-related hazards would be something like a transportation accident. So, if you have a barge accident on a river near your intake structure or if there is a chemical plant or some kind of chemical site located near your power plant, what would the impact of an accident there be to your site, as well as if any large airports or air pathways have been rerouted over the plant since it was licensed, you would have to consider the effect of an aircraft impact at or near the plant as well in your re-analysis.

MEMBER SKILLMAN: Thank you.

MEMBER BANERJEE: But you do already consider a lot of these man-related hazards, right?

MS. THOMPSON: Right. The man-related hazards -- and that is not my area of expertise -- but my understanding from our staff who do deal with the man-related hazards is that it is something that is considered during the licensing process, but it is not a requirement to update as your plant ages. So, whatever was the licensing basis for the plant in terms of other man-related external hazards --

MEMBER SKILLMAN: Right. Okay.

MS. THOMPSON: -- remains their licensing basis to this day, and they have not reevaluated that based on any changes made to transportation corridors or anything along those lines.

MEMBER SKILLMAN: Thank you.

MS. THOMPSON: All right. So, the staff's proposal for Recommendation 2.2 at this point is to begin pre-rulemaking activities. As I mentioned before, a lot of that is going to be information that we collect as we proceed through the process of resolving Recommendations 2.1 and 2.3.

As part of the scope of work for Recommendation 2.1 and 2.3, we are also heavily engaged with the external stakeholders and internal

stakeholders as well. So, trying to capture those interactions as well to see how they would feed into Recommendation 2.2. So, as you were bringing up some of the examples of other natural or man-related external hazards, that is something that will be addressed as part of Recommendation 2.1. So, we want to make sure that we are not making two different decisions, one for 2.1 and one for 2.2.

We want to capture the information as it is being decided upon for Recommendation 2.1 or 2.3 and applying that to Recommendation 2.2, once we get to that point, which is why we are calling this the pre-rulemaking activity and information-gathering. It is primarily a lot of knowledge-capture on behalf of the staff, so that we have all of the information at our fingertips ready to go when we feel that we have enough of it to support a rulemaking activity.

So, some of the things that we anticipate will come up as we deal with Recommendation 2.1, primarily 2.1 because 2.3 is that nearer-term action that is going to feed a lot into 2.1. So, most of the feedback for Recommendation 2.2, we are expecting that from Recommendation 2.1.

One of the biggest questions is, what constitutes new and significant information? That is

something that the staff is grappling with with respect to Recommendation 2.1, and we expect to capture that decision and apply it to Recommendation 2.2 in the future.

Also, the staff is having to decide what are we going to do with the updated hazard information.

MEMBER SHACK: I thought that is why you put 10 years; you wouldn't have to come up with that criterion.

MS. THOMPSON: So, what will we do with the updated hazard information? We will be using a risk-informed approach to disposition that information and to make decisions going forward. And how will the staff determine if it is necessary to update the design bases for SSCs important to safety? Do we need to determine if there is a threshold for regulatory action and, if so, what is that threshold for regulatory action.

And again, that is something that we expect will come up in the process of dealing with Recommendation 2.1, because we are expecting updated hazard information. So, we will have to answer all of these questions for Recommendation 2.1, and then we can use that experience and apply it to Recommendation 2.2, so that our rulemaking will be a much more focused approach and we will know exactly what we want the

end-product to be at the end of it.

And then, finally, there is a lot of information from international practices, as well as our own experience here in the U.S. We would like to harness that information. We want to look at the ROP. We want to look at the experience that international regulators had with similar approaches.

A lot of the European regulators have a periodic safety update. So, we would like to look at what they have succeeded with in the past, what hasn't necessarily worked as best as it could. And that is going to take some time to dive into and to process with the staff and see how can we best use that international experience and our own domestic experience to really make sure that the scope of our rulemaking for Recommendation 2.2 gets us the information that we need in the timeframe that we need it, and it is in a workable format that will allow us to easily make regulatory decisions going forward.

So, we have had one public meeting so far, but that is because our staff has been very, very heavily engaged with Recommendations 2.1 and 2.3. So, our public meeting was on May 7th. We had very few questions, I think because we have been having so many interactions and people have been so focused on

Recommendations 2.1 and 2.3.

But some of the questions that we received from the public were: the nexus to Fukushima for the inclusion of the other man-related external hazards. This was something that we had discussed internally pretty extensively with the Steering Committee as well.

For Recommendation 2.1, initially, the thought was all external hazards, but because of the nexus to Fukushima and putting it in Tier 2, for resource limitation reasons, the other man-related external hazards were removed from Recommendation 2.1. So, that is something that, as I said before, is still under discussion with the staff internally. We seek your feedback on that, and the Steering Committee is still discussing that as well.

There were also some concerns from the public about old information that is newly-discovered. The staff's opinion of that is that, if the information has been previously identified and dispositioned, that you wouldn't have to go back and rehash something. But if the information is older information that has never been assessed and dispositioned for the site, then that may be included, if it meets the threshold for new and significant information.

The date of the information isn't

necessarily the focus, but it is the newly-discovered. So, if it is newly discovered or recently brought to their attention, then that may be something to consider.

MEMBER STETKAR: Do you have an example of what that might be?

MR. CHOKSHI: Yes, I think the one example was there are some new estimates of the tsunami waves' heights from an Alaska earthquake of Good Friday.

MEMBER STETKAR: Okay.

MR. CHOKSHI: And so, that kind of things.

MEMBER STETKAR: Thanks.

MS. THOMPSON: One of the other questions that we received was how to handle the information that has been submitted as contentions to new reactor licensing. As the new reactor sites are going through their licensing process, some information is being brought to light as contentions. And there was a question from the public as to how we would handle that information.

And again, that goes back to the previous point of, it has already been dispositioned for that particular site, then, no, it wouldn't fall within the scope of this. But if it hadn't been considered at the site, then it would fall within the scope of new and possibly significant information. But, again, we would

have to determine what is new and significant, and if the information meets that criterion, then, yes, it would be included within the scope of Recommendation 2.2.

Another point that was brought to our attention is that we have had very similar actions to this in the past. It hasn't necessarily been a rulemaking, but particularly with seismic hazards, the GI program has been used as new and significant information has come to the NRC's attention. So, there was a question of whether rulemaking was the way to go about this or could we rely on existing programs like the GI program to handle new and significant information.

And then, also, as I keep mentioning, the staff is heavily engaged with Recommendation 2.1 and 2.3. There has always been a schedule concern that are we going to start Recommendation 2.2 too soon. We may get into schedule concerns where people are still so busy with the work for Recommendation 2.1 and 2.3 that we may not have the staff resources to start the work on Recommendation 2.2. And that may be true for other external stakeholders as well. So, that is something that we are trying to be mindful of going forward, that the schedule does play into this quite heavily.

MEMBER STETKAR: Jenise?

MS. THOMPSON: Yes?

MEMBER STETKAR: I want to ask, and I guess I am still struggling with -- you have mentioned it four or five times -- this wonderful phrase "new and significant". Is that something that the staff has imposed upon themselves?

MS. THOMPSON: The new and significant is directly from the Near-Term Task Force recommendation. It asked us to address any new and significant information.

I can go back to the text, but --

MEMBER STETKAR: That is okay. I now know where the quote comes from.

MS. THOMPSON: Yes, that is where it comes from. That is one of the things that the staff is considering, is do we have to define what constitutes new and significant information and, if so, we need to come to some consensus, both as an internal regulator as well as with the industry to determine --

MEMBER STETKAR: I understand. I understand.

MS. THOMPSON: -- what is new and significant.

MR. CHOKSHI: Yes, I think there is a lot

of new information out there, but not necessarily really to go back and look at all of that, you know. Some of that makes a difference.

MEMBER STETKAR: I would encourage you, and you have mentioned it, to look at some of the European regulatory --

MR. CHOKSHI: Exactly.

MS. THOMPSON: Right.

MEMBER STETKAR: -- experience of how they treat that concept.

MR. CHOKSHI: Yes.

MS. THOMPSON: Right.

MR. CHOKSHI: Particularly, I think, you know, what they do and how that gets incorporated into the plant, the decisions that they make. Because I think before we go forward, we need to lay out that whole process, so people know what we are asking or what this means.

MS. THOMPSON: Yes.

MR. CHOKSHI: So, we have been talking. I was in India last week and we talked to them about that periodic safety review. I think I have gotten some information from them.

It is not clear that people have a consistent process. And so, it is good to find out.

I mean, some of them do, but there are a lot of questions. What do you do with this? What regulatory actions? You know, the NTTF report talks about extended design basis and some of the different concepts. All of that needs to be thought through and understood before we embark on any kind of rulemaking activities.

MEMBER ARMIJO: Well, that is a very tough problem.

MR. CHOKSHI: Exactly.

MEMBER ARMIJO: The Japanese had a perfect example with the new tsunami hazard evaluation techniques that were being proposed by Dr. Satake, and they were being worked on, but nobody really took them that seriously. And it might have helped.

MR. CHOKSHI: Yes. Exactly. I think that whole decisionmaking process, once you have new information, that is --

I think that was the presentation, right?

MS. THOMPSON: Yes. We went for brevity.

(Laughter.)

MR. MONNINGER: Dr. Schultz, are there comments from the Committee?

CHAIR SCHULTZ: Oh, excuse me.

MR. MONNINGER: John Monninger.

So, one of my thoughts is, as we are going

through here, to sort of compare and contrast. So, parts of this, you heard 5.2, which was other containment designs. And there, no decision has been made with regard to whether regulatory action is needed or not for venting for other containment designs versus you look at this issue here, 2.2, and the decision has already been made, pursue rulemaking. That was recommended by the Task Force and directed by the Commission.

So, in this example, we are working in the implementation phase. We won't get too far because the rulemaking really isn't needed for 10 years, but it is important to recognize that here the proposed regulatory decision has been made. The agency should do rulemaking. Now we are in implementation.

Versus when we talk about 5.2, it is study the technical aspects of venting for other containment designs. We may ultimately provide recommendations to you on the Commission for an order or rulemaking or, for that, we may recommend sunsetting.

So, you are going to hear a bunch of different things in the Tier 3 activities that, for one reason or another, they go different directions.

CHAIR SCHULTZ: Thank you, John.

MEMBER SKILLMAN: Could I ask you to go back

to slide 19 for a minute, please?

At the last bullet, in my view, there are two independent thoughts that are communicated. One is the practice and one is the insight.

We heard in the previous presentation regarding the filtered containment vent system that the Swedes and the Swiss simply said, "Do it." after TMI; whereas, in our country, we have agonized over what to do with many of these things.

So, there is an example of where -- and I would say the Germans probably did the same thing; the Reaktor Sicherheits Kommission, they simply said there is no question you are going to do this if you are going to operate this plant. So, there is in those countries a practice of the regulator giving very clear instructions to the licensees, and the licensees comply.

To what extent will your product from 2.2 examine how the regulation is pumped out to the licensee before the licensee is perhaps willing to take action?

MR. CHOKSHI: I think if I understood correctly, that is one of the things we wanted to look at the international practice, is what they have mandated, and is their clear guidance on what to do with -- first of all, how they judge what is significant information. I am sure they have to answer that

question.

The second thing is, what actions were automatically triggered at what level? For example, if they find a new seismic hazard type levels -- like we do every so many years, USGS comes out with new maps and things. Is there a practice that, okay, you have to evaluate your plant or do maybe a risk-based analysis and demonstrate that you can meet certain performance goals?

So, we want to find out what are the practices. You know, what triggers an action, either regulatory or by a licensee?

So, that is the purpose of that, to understand the practices outside. And then, you can make a recommendation to the Commission on the program.

MEMBER SKILLMAN: To whom will you report this output?

MR. CHOKSHI: Once we do this study?

MEMBER SKILLMAN: Uh-hum.

MR. CHOKSHI: I think before we -- and John correct me -- but we have to write a SECY paper and we explain the options to the Commission. You know, we probably will have certain options, including one option being no rulemaking, and then we will have probably a couple of options, different rulemaking. And after we

get all this information and form a position, that will be the next step.

MEMBER SKILLMAN: Okay. Thank you. Thank you.

MR. CHOKSHI: Does that answer your question?

MEMBER SKILLMAN: Thank you. Uh-hum.

CHAIR SCHULTZ: Other comments from the Committee or questions?

(No response.)

Thank you, Jenise, for the presentation. We appreciate it very much.

John, we will change out for the next presentation?

MR. MONNINGER: Yes.

CHAIR SCHULTZ: I was going to ask for public comments after these two presentations.

Jenise, are you going to be here?

MS. THOMPSON: Unfortunately, I have to leave at 4:30. Nilesh will be here.

CHAIR SCHULTZ: Then, I will ask for public comments at that time. We had it on the agenda here at the end of this segment.

So, we are now moving to Recommendation 3, Potential Enhancements to the Capability to Prevent or

Mitigate Seismically-Induced Fires and Floods.

MR. COE: Thank you. I will just introduce Kevin Coyne, Branch Chief in the Probabilistic Risk Assessment Branch and Research. We have been assigned this task, and Kevin will lead us through the presentation today.

CHAIR SCHULTZ: Thank you, Doug.

MR. COYNE: Just some background on this item. I think everyone is aware seismic events have the potential to cause multiple failures of safety-related SSCs and non-safety-related SSCs, induce separate fires and flooding events in multiple locations at the site, and degrade the capability of plant systems, structures, and components intended to mitigate the effects of fires and floods.

There is some operating experience that is available on seismically-induced fires post-earthquake. It has been things like breaker cubicles, having a fire ignition event. You could also imagine that transformers and things like that, that could be impacted by the seismic event, could also represent a fire ignition source in the plant.

From a flooding perspective, piping system failures induced by a seismic event or tank failures induced by the seismic events could represent a

potential flooding hazard in the plant.

So, in the Near-Term Task Force Report, this is Recommendation 3, which recommended, as part of a long-term review, that there be an evaluation of potential enhancements to the capability to prevent or mitigate seismically-induced fires and floods.

The scope of this item pertains to internal seismically-induced fires and floods. So, fires involving things like breakers and transformers, floods involving things like tanks and piping systems.

External seismically-induced fires and floods are considered to be outside the scope of this issue. Externally-induced fires are considered to be a low-risk contributor, and external seismically-induced floods are covered by Recommendation 2.1, 2.2, and 2.3 activities. So, we are not considering them within the scope of this particular item.

In the SECY-11-0137 that came out in the fall, the staff prioritized Recommendation 3 as a Tier 3 item. In the SRM that the Commission issued in response to that SECY paper, the Commission agreed with the Tier 3 prioritization of the overall recommendation, but also directed the staff to initiate development of a PRA method to evaluate potential enhancements as part

of the Tier 1 activities.

So, as John indicated just a minute ago, there is a lot of variety in the Tier 3 items. This is somewhat unique in that the recommendation itself is Tier 3, but there is a significant part of it that the Commission elevated essentially to a Tier 1 activity, to initiate this PRA method development.

The basis for that was largely that there was an understanding that preventing seismically-induced fires and floods could be done using existing deterministic methods, but to assess the mitigation capability of equipment in the plant and under these circumstances, we really needed the knowledge of the accident context that you were demanding these components to operate in.

And the systematic way to get an appreciation for that context is using a PRA-type approach. So, that was the motivation for elevating the PRA item as a prerequisite activity for the eventual resolution of this issue.

MEMBER STETKAR: Kevin, before you flip, I am trying to keep all of the bits and pieces straight. Seismically-induced external floods are treated where?

MR. COYNE: So, these would be things like dam failures leading to onsite flooding. And those

would be treated under Recommendation 2.1, is my understanding.

MEMBER STETKAR: How do I know that the seismic event that fails the dam doesn't also fail equipment in the plant, because the external flooding in 2.1 just looks at a term called "external flooding" --

MR. COYNE: Right.

MEMBER STETKAR: -- which most people will say, "Well, we will look at random dam failures" or "It is my job to look at a dam failure, but I don't know anything about the power plant."

The seismic event could fail the dam, cause a flood, and also cause disruption of things inside the power plant because the seismic event doesn't know that it is supposed to be segregated that way.

So, I am not sure that 2.1 covers seismically-induced external flooding. I can deal with seismically-induced external fires. I will give you that one. But it just not clear to me that it does.

MR. COYNE: I am looking at --

MEMBER STETKAR: It is not clear to me that it doesn't, but it is not clear to me how it does, if it does.

(Laughter.)

MR. COYNE: Now, John, again, your question

pertains more towards seismically-induced failure of a structure that could cause external flooding. It, presumably, would be covered by 2.1, but the combination of having the external flood with seismic-induced damage to the plant a la a typical seismic PRA doesn't appear to be captured.

MEMBER STETKAR: Knitting the two together.

MR. COYNE: Right.

Nilesh has a comment.

MR. CHOKSHI: Yes, I think you are absolutely right. We are looking at the seismically-induced dam figures, but they fall far from the plant, not the vibratory effects on the other seismic; that is not included.

We hadn't thought about that question until you asked it. I don't think it is normally we combine seismic and flood at the same time. An assumption is probably it is the event which leads to the dam failure, depending -- it is a good question. I mean, in the external part, we are only looking at the flood effects.

MEMBER ARMIJO: It is too compartmentalized when the seismic event can do the dam failure --

MEMBER STETKAR: We talked about

fragmented earlier.

(Laughter.)

MEMBER ARMIJO: It is fragmented. But the dam failures, station blackout, internal damage --

MR. COYNE: I agree with Nilesh. It is a good question. To be honest with you, we are not sure how to handle internal seismically-induced fires and floods; the external places another element to it. We will go back and look at that item and work with the JLD. It is a good comment we will take back.

MEMBER SHACK: An earthquake big enough to kill a dam is likely to do some damage.

MR. COE: Yes, depending on the location of the earthquake, the location of the dam, and the location of the plant.

MR. COYNE: Exactly. And induce fires internally to the plant and/or flooding events.

MEMBER SHACK: It is all site-specific.

CHAIR SCHULTZ: But these, to us, look like good Tier 3 activities.

MEMBER SKILLMAN: It appears as though the bounds that you put around this on this slide are shaped by the text of Chapter 4.1.2 in the NTTF.

MR. COYNE: Leading up to the recommendation. Absolutely. Absolutely.

MEMBER SKILLMAN: I think the broader approach is the wiser approach because this gives at least those of us who are thinking about it the impression of a very limited view of what can be a very broad and significant nature event that affects a whole lot of stuff.

MR. COYNE: And I agree; it can be a very broad event. And that is one of the challenges we face, is putting some bounds on it, so we can come up with a workable solution. That scope was driven largely by the text of the NTTF report, which is somewhat narrow in its application of where that recommendation was playing.

But we will take the comment and go back and take a look at it.

MEMBER SKILLMAN: Thank you.

MR. COYNE: As if to underscore the point, and this is not meant to be a comprehensive list, but just some of the things that are challenges with this particular thing.

So, I think everyone understands we have seismic PRAs; we have fire PRAs; we have flooding PRAs. The challenge here is that we are looking at concurrent and coupled events, the seismic event that leads to fires that also leads to flooding.

So, hazard definition and characterization is always a challenge. In this case, we think it would be even more so.

Seismic fragilities for SSCs, you know, that is a known thing that we know how to do in general for seismic PRAs, but we are talking about SSCs that go beyond typically what we may consider. So, things like fragility for fire protection piping, things that may be needed for suppression of an event. Also, looking at fragilities in different ways: what is the seismic fragility of a breaker as a fire-ignition source? The transformer is a fire-ignition source. So, it is looking at fragilities in a different way than we typically do under a seismic evaluation.

The modeling of concurrent and subsequent initiating events, including the combinatorial effects you could have. If you could get a seismically-induced fire in one breaker cubicle, you could imagine getting it in another breaker cubicle and another in another location throughout the plant; similar with flooding. So, getting a handle on these combination of events that could be happening concurrently through the plant and how to model them within the existing framework that we use.

System interactions, obviously, could be

important, the HRA challenges associated with seismic events, and it is not lost us, the multi-unit risk considerations for sites with multiple plants, that it could be multiple units impacted by the hazard.

So, this was just meant to be laying the foundation that this is a challenging problem, and the scope considerations that were brought up earlier underscore that even further.

So, the current status: earlier this year in SECY-12-0025, the staff presented, I guess what we would call, a plan for a plan, sort of a few pages in that SECY paper, the last few pages, as a matter of fact, that provided staff assessment of the issue in general and provided sort of a framework for a pre-plan that identified a few objectives the staff would consider.

And that includes things like what would be the overall objective of a PRA method. This is focusing mainly on the Tier 1 portion. The Commission directed development of a PRA method. So, defining objectives of the method: who would use the method? Is it intended for NRC use, licensee use, or both? Stakeholders that should be involved in the development of the method and the review of the method. Information-gathering activities, that includes the traditional literature searches, but also interacting

with some of our international counterparts to determine how this issue is treated in other countries.

Very important for this was the coordination with other ongoing initiatives. As we have heard in the last presentation, Recommendation 2.1 and 2.3 will bring a lot of information to bear that is relevant to this issue. We want to make sure we remain cognizant and engaged with these other items they are developing and factor it in as appropriate into the PRA method development activities.

And then, finally, the last portion of that plan was develop some resource and schedule estimates. The staff is currently drafting that plan. Our intent is to make it available in a publicly-available memo that will be referenced in the upcoming July SECY paper. So, it wouldn't necessarily be part of the SECY paper itself, but it would be available to anyone who was interested to see what was in there.

MEMBER STETKAR: Kevin, the reason I asked about the external dam failure thing was in the SECY paper it explicitly calls out that the scope includes external seismically-induced floods; for example, upstream dam failures and seismically-induced losses of heat sink, downstream dam failures.

So, I was curious whether an active decision

had been made to depart from that scope or --

MR. COYNE: It was a refinement of our understanding of how the interaction between the various NTTF --

MEMBER STETKAR: Of 2.1 --

MR. COYNE: Of 2.1 and the recognition that GI 2.04 was closed to Recommendation 2.1. And it is a good point that we will have to go back and take another look at.

MEMBER STETKAR: Okay. Okay.

MR. COYNE: A number of key considerations: you already heard about staffing and resource limitations. This is an area where we have a very limited number of staff with the requisite knowledge, skills, and abilities, not only for PRA, but external hazard evaluation, and adding to that method development experience. So, it is more than just application of existing methods. It is being able to actually develop PRA methods that could be applied in a practical manner.

Based on the literature reviews we have done and the information-gathering with some of our international counterparts, it is our opinion that there is no current consensus state-of-practice methods that exist for seismically-induced fires and floods. That is not to say that we haven't found examples where

methods have been applied to non-nuclear facilities. There is at least one example we know of where it has been applied to a nuclear power plant, but it is not up to the level where we would consider it a state-of-the-practice kind of application, where it has been a demonstrated method. So, there is nothing we can readily borrow that has already been developed.

The ASME/ANS Joint Committee on Nuclear Risk Management has recently formed a working group to address multiple concurrent events. This would eventually go to the PRA standard. This is very early in the process, but timely and a good opportunity for the NRC to remain engaged in that activity. So, our intent would be to continue our engagement in that working group.

And then, finally, recognition of other Tier 1 activities will provide substantial information relevant to the issue. Some examples: obviously, the 2.1 and 2.3 issues; to some extent, the 4.2 mitigation strategies issues, and probably of lesser importance are the 5.1 and 7.1 issues that are currently working their way through the process.

But it was our assessment that it would be more efficient, before we tried to make substantial progress on this issue, to wait until some of the

information from these activities became available to factor that into the overall assessment of where we would head with this.

That said, we recognize that there are things that could be done right now. So, we plan to engage the standards development organization, ANS and ASME, and have one of our staff members participate in the working group for looking at concurrent events.

We will maintain cognizance of what is going on with some of the other NTTF recommendations and other activities throughout the agency, and, in particular, the Recommendations 2.1 and 2.3 activities, and then continue PRA method development.

I would note on the standards development, when we considered this, this really is an opportune time to engage the standards development. It is an opportunity we don't often get where the standards tries to define what we should do with a method, and then the method itself defines how to do that. And it seems, in the timing of things, very rarely do we have the opportunity to define what a method should do before we go off and try to develop a method. So, this is actually trying to do things in the right order. So, I think it is going to be a very important part of our overall activity.

CHAIR SCHULTZ: Kevin, before you leave that, John mentioned this earlier in the presentation, that we weren't going to talk about schedules. But it does seem here like you have got some connections that at least you have drawn out between the activities that are being relied upon to get to a conclusion --

MR. COYNE: Right.

CHAIR SCHULTZ: -- later on. Can you give us a sense of what we might be talking about here in terms of the dates of the industry-related, the ANS/ASME activities. They are just talking about it at this point in time? Or is there any schedule? I am not talking about your schedule, but these other activities --

MR. COYNE: Right.

CHAIR SCHULTZ: -- are they scheduled yet? Or are they just being formulated?

MR. COYNE: I am pausing to remember a conversation I just had with Mary Drouin, who is our representative for that committee. That working group hasn't taken off yet in the standards group, but they are doing some preliminary work to set up the working group. So, she is engaged with that. And then, our intent is to have one of our senior reliability analysts who is conversant in external hazard analysis to

participate in that working group. My understanding is that would be in the relatively near-term, months rather than years from now.

CHAIR SCHULTZ: The initiation part?

MR. COYNE: The initiation of that.

The NTTF recommendations, the Tier 1, the schedule is fairly well-known from, say, the orders for 2.1. We are cognizant of that, but we think the advantage we would have from getting some of the information back from the sites on seismic and flooding hazard information would be very valuable for the development of the PRA method and knowing what the current status of the information available to plants would be. And that would speak to the feasibility and practicality of any method we come up with through any Recommendation 3 activities.

So, for example, it is not hard to imagine it would be easier to apply an eventual PRA method for this area if we were starting with a plant that had a seismic PRA and a fire PRA. If we were starting from nothing, it would be more difficult, you would think, to make progress in that area. So, knowing what the status of plants were as Recommendation 2.1 plays out would be very useful going forward, so we have a better sense of the environment.

CHAIR SCHULTZ: Thank you.

MR. COYNE: Continuing on with the staff recommendation on Recommendation 3, it is to continue development of the PRA methodology, as we were directed to in the Commission SRM to SECY-11-0137. And that would involve two main activities: engagement with the PRA standards organizations, as I described, and, also, conducting what we are calling a feasibility study to assess PRA approaches for evaluating multiple concurrent events.

As we talked about in some of the challenges of the method, we are talking about multiple events happening in multiple locations throughout the plant, potential dependencies between the events, things that the linked fault-tree framework don't necessarily handle well, not that it is impossible to handle these concurrent types of events through that methodology, but it is not a known thing that that is the best method to evaluate this type of issue.

So, we would intend to do a feasibility study to evaluate limitations and challenges with using the current state-of-practice approaches for nuclear plant PRA; also, looking at other potential methods that may be better suited for handling these kinds of interactive events of multiple fires being caused by

a seismic event, multiple floods, multiple areas of the plant being impacted.

We would also want to look at potential screening approaches that could help focus staff effort on the more risk-significant scenarios. And then, finally, look at how to best integrate the method into an existing PRA framework, so that it can be more readily adapted and used within the existing framework.

MEMBER REMPE: Could you elaborate a little bit more about what you are thinking of doing for the feasibility studies?

MR. COYNE: Not much more because we are still in the planning. It is kind of too soon to tell exactly.

MEMBER STETKAR: I guess I am curious why the current methods wouldn't handle that; in other words, why the staff feels that it is necessary to go out and do research. If you have an integrated PRA model, I can pretty easily think of ways of manipulating that model to get multiple events in multiple locations without going out and doing research on some of other logic format that might go into three or four years of National Lab contract dollars, for example.

MR. COYNE: Right. I think it is --

MEMBER STETKAR: It can be done because

people have done it. So, looking at the feasibility of being able to do it, I can tell you it can be done because people have done it. So, I am curious what you are thinking about to see whether or not it can be done.

MR. COYNE: Well, first of all, if I stated that the current methods couldn't be used for it, that was misstatement on my part. I think it is too soon to tell that.

As far as feasibility, you know, the question of, is it practical and efficient to use the existing framework to look at events where timing may be very important, where you may have a potential -- I don't want to use the word "explosion" -- but you have this combination of events that could be more than just ones and twos, depending on the dependency you have. You could imagine if you had a breaker fire caused by a seismic event, there would be a dependency among multiple breakers throughout the plant, that it would be more likely to see multiples potentially. I mean, it is very early in this method development to get at that, but it is to look at those issues.

MEMBER BLEY: If you have an earthquake, there is dependency among all the breakers in the plant already.

MR. COYNE: That's right.

MEMBER STETKAR: And if you have a fire in a cable area, you have got dependency among a bunch of systems in the plant.

MR. COYNE: That's true, too, yes.

MEMBER STETKAR: And if you have a flood, you have dependency among different things at different elevations.

MR. COYNE: Right. And so, it would be a question of how many areas you assume. I mean, you could clearly assume every breaker catches on fire. That gives you an answer that is probably pretty easy to calculate.

MEMBER BLEY: But if you have got people looking for multiple hot shots in PRA, I think you can take on that --

MR. COYNE: Well, that is actually a good analogy for this. Where do you stop the combinations? And that is what the feasibility study is really looking at. Is there a practical way to do it? Is the existing framework adequate to do it? And what kind of limitations will we have? And if there are smarter ways to put this together.

MEMBER BLEY: How are you going to do that, determine the feasibility? Are you going to do a study or two here to see?

MR. COE: Actually, one way to phrase it is -- and I know this is a topic that has been debated already -- and that is, do you take a seismic PRA and you burn it or do you take a fire PRA and you shake it? I mean, in simple terms, you are using the same methodology that Kevin is suggesting is the current state of practice.

But you have got these combinations of how do you assemble the model in a rational way that actually addresses all of these dependencies and system interactions. And then, you add flooding on top of that. You could actually envision flooding as a concurrent event with fire based on a seismic initiator.

So, as Kevin has tried to point out, it is an exceedingly-complex task to try to envision how to create a model that addresses all of these dependencies. And so, that may lead us outside of what the current event tree/fault tree approach is. We don't know yet.

MR. COYNE: But hopefully not.

MEMBER BLEY: How are you going to chase the feasibility?

MR. COYNE: How are we going to chase it?

MEMBER BLEY: Yes. Sit down and think about it or do a study or two trying to use tools you have already got?

MR. COYNE: And I didn't mean to not answer Dr. Rempe's question, but we are thinking about that right now, how we would structure such a study and what specific tasks we would look at.

I think we would have contractor assistance. I am not sure which contractor we would use at this point. It is a unique area. So, we would have to structure what we are looking for in that study carefully and then find an appropriate support contractor to help us --

MEMBER BANERJEE: Are there analogies in the chemical industry where they use cause/consequence diagrams?

MR. COYNE: I am not the right person to answer that question, unfortunately.

MEMBER BANERJEE: Because there are approaches that I think we encounter.

MR. COYNE: Right. We have done some literature searching, and at least for the application in the nuclear power plant context, we haven't seen a lot of examples where it has been done. We have seen examples in things like, for lack of a better way to put it, big-box stores where they have looked at non-nuclear facilities.

MEMBER BANERJEE: Maybe more qualitative.

MEMBER ARMIJO: Look at the next chart. Somebody has already --

MEMBER BLEY: I guess the reason I was pressing you on that is I remember when PRAs first started. Sometime -- I was going to say 30 years ago; it is probably 35 years ago -- in this country we started doing PRAs. The first ones weren't so great, but in a few years we were doing some pretty decent, useful ones.

There were some other countries that wanted to get it all right before they did one, and 15 to 20 years later they finished their first one. Probably the fastest way to get there is to --

MEMBER ARMIJO: Jump in.

MEMBER BLEY: -- start moving.

(Laughter.)

MEMBER STETKAR: And their first ones look an awful lot like what we did 15 years before this started.

(Laughter.)

MEMBER BLEY: I wasn't going to say, but yes.

MEMBER STETKAR: Yes.

MR. COYNE: And also, that certainly isn't our intent, to make this a multi-year effort. It is

to be smart when we really get into the nuts and bolts, as the other information becomes available from the other recommendations, that we are doing the most efficient thing we can do with that information to get it into a PRA.

The last item is future reevaluation of Recommendation 3, and that may end up with any of the three bins that John had mentioned earlier in the day, which was a recommendation for some form of regulatory action, a recommendation for further evaluation, or a recommendation for no action. So, that would be, as we work through this process, after the feasibility study, after we get some of the NTTF other recommendation information in, we would look at doing that.

We have had one public meeting to discuss this approach to Recommendation. That was on May 3rd. There was, I will say, general agreement because after the meeting we got a letter from Citizens' Environmental Coalition with an additional comment on this, but general agreement on the prioritization of the issue as Tier 3. The Citizens' Environmental Coalition, in a May 17th letter, noted that they felt that this issue really should be included in Recommendation 2 items. So, their feeling was that this should all be resolved under Recommendation 2, and Recommendation 3 would be

focused on a stronger qualitative assessment of the plant relative to this issue.

They also noted that developing a PRA method could be an outcome, but the focus should be on qualitative methods. And they noted their belief that sometimes PRA focuses too early on quantification and not enough on a more qualitative assessment. So, I am not sure how to read that, whether that was an agreement on the prioritization of Tier 3 or whether they felt that this would really be covered by, felt that it should be covered by some of the higher-priority items.

MEMBER BANERJEE: Do you know the source of that comment?

MR. COYNE: It was a letter from Barbara Warren, I believe, from Citizens' Environmental Coalition. She was at our public meeting, but this comment came in after the public meeting.

We did get a comment at the public meeting, and I think it is echoed by those earlier comments, that a qualitative risk assessment approach should also be considered. And I think that is not inconsistent with the Commission's direction on developing the PRA method, that one of the motivations was to understand the accident context that the equipment would be operating in, and a PRA method is a good way to systematically

do that. So, in my mind, that wouldn't rule out, certainly, looking at qualitative approaches for this resolution or for this method development activity.

And then, finally, ensuring that the PRA method and its application include documentation of key assumptions. And this came from a public comment that the PRA can often be viewed -- and these are my words -- as a black box, and some of the things going on in the calculation aren't necessarily readily available to a member of the public, but what is is the assumptions that are made supporting that PRA evaluation. So, a desire that whatever method we use for the PRA would include good documentation of the assumptions underpinning the method and the application of the method.

MEMBER SKILLMAN: I would like to offer an observation, then ask a question. In the older plants, those that were granted construction permits through the seventies, they were generally governed by emergent Reg Guides, 1.26, 1.29, and a bunch of others. And the Safety System Components, the SSCs, were commonly reactor coolant system, pressure boundary, emergency core cooling, that type of component. Fire equipment was not part of that. Fire equipment was left to the architect/engineers, and they basically went out and

bought commercial grade. Just if you would hold that thought for a minute.

In 2007, at KK7, the earthquake toppled part of the transformers, set them on fire. The station was unable to fight those fires, and they had to bring offsite firefighting onsite.

A couple of years ago, D.C. Cook had a STAT rotor explosion. The ground motion was so great, it severed the fire service system. And they had to fight that fire with alternate means, a hydrogen fire.

So, my question is, how much of the complexity, Kevin, that you point to is the result of an inadequacy on our part, industry's part, to make sure that fire equipment is basically at that same qualification level, the same mechanical robustness level as emergency core cooling?

Do we have hardware deficiencies that we are now trying to compensate for because we never really buckled down and said, "By golly, firefighting is as important as core cooling."?

MR. COE: If I may try to start, the current plant design bases don't necessarily account for multiple concurrent initiating events. That is an artifact of the historical design and licensing process.

And so, today we are examining these kinds

of complexities as an enhancement beyond that which the plants have been licensed to. So, we are quite aware of and sensitive to the fact that fire protection systems are not seismically-qualified in general.

And so, that will go into the modeling that we end up doing in terms of the fragilities and the likelihoods of those failures. The challenges in terms of modeling that Kevin has spoken of relate to this. There are fire systems that will break, but may not be needed. There are fire systems that will become unavailable that are needed. And there are likelihoods associated with all of that.

Proximities are also -- I mean, a fire system is segmented. So, part of it could break and part of it could not. And the part that broke might be needed and it might not.

So, I mean, it is a multitude of complexities here that the original design bases never even envisioned. Or maybe they envisioned it, but they chose to --

MEMBER SKILLMAN: Did not accommodate.

MR. COE: -- not address it because of the low likelihood that was expected at that time.

Did you want to add to that?

MR. COYNE: Yes.

MEMBER SIEBER: This is also driven by the fire protection insurance companies who demanded a commercial standard. You meet this and we will give you the insurance.

And a lot of the difficulties with separation on fire protection were solved by NRC action. You know, for example, all the aux feed pumps in one room, that required the addition of a separate aux feed pump for a lot of plants, including our plants, and tie wraps on cable trays, and so forth.

This has been going on for a long time. So, there have been upgrades. On the other hand, you still have cast fire mains, even though they are loop-type that a break can be isolated, but they still exist that way.

So, there are some deficiencies, but I think the history behind where that all came from has left us the artifact of meeting National Fire Protection Association codes, but not necessarily safety-grade nuclear standards. So, someplace along the line, the staff and the insurance companies have decided that is good enough.

MR. COYNE: Just to add, I am not in a position to really say whether the design-basis fire protection requirements we have are adequate or not.

But the state that you had mentioned, that they are subject to a different level of quality -- for instance, Appendix R has its own quality assurance requirements for fire protection equipment. That does make it challenging for the analysis and getting things like the fragilities for the fire protection piping and factoring that in the PRA.

An observation is PRA is a good, systematic technique for trying to evaluate these types of beyond-design-basis issues of multiple things happening or multiple equipment failures or fires with a degraded fire suppression system. So, to me -- of course, I am speaking to you as PRA Branch Chief -- to me, it seems like a natural thing to use a PRA to look at this type of issue for those kinds of concerns.

MEMBER SIEBER: Yes, the PRA can analyze it and tell you roughly what that risk really is. I mean, that is up to the licensee and the staff to decide whether that risk is tolerable or not.

MR. COE: And I would add, exactly right, but I would add, also, that the PRA will give us a better appreciation for what is important in terms of those interactions and what is not as important. We hope that that is even a more important value or benefit from even studying this from a PRA context than getting some kind

of an endpoint or best-estimate risk number. It is more the insights that you draw from doing the modeling work that I think really benefits the staff in the end.

MEMBER SKILLMAN: Okay. Thank you.

MR. COE: Yes.

CHAIR SCHULTZ: Dennis?

MEMBER BLEY: Let me ask you one thing. I mean, what you are talking about is modeling. But I remember -- I have been spending the last half-hour trying to remember the name of the guy -- a guy ran a seismic consulting firm up in San Francisco, a pretty famous guy. And that group, whose name I forget, for many years went all over the world investigating earthquakes and sent out reports on all of the earthquakes. And they especially looked at these kinds of things, at earthquake-induced fires and earthquake-induced floods, and identified when they happened.

My memory from all this stuff I looked at from them was that they were a lot more rare than we think when we think about all the possibilities for how they can happen.

They had quite a database and they shared it publicly. Oh, Peter Yanev, yes. What was the name of -- is he still around?

PARTICIPANT: No, he is not around anymore. Peter is around.

MEMBER STETKAR: EQU still --

MEMBER BLEY: Is EQU still maintaining the data?

PARTICIPANT: No, EQU is no longer in existence.

MR. CHOKSHI: EQU has --

MEMBER BLEY: Well, they are part -- yes, but they are still there?

MR. CHOKSHI: Yes. And Peter has a new company, and he is active. So, we can get --

MEMBER BLEY: I mean, it is worth looking at real data a little bit to scope this problem, rather than starting with high-powered analysis. We might get a pretty good idea from looking at that data, and they really had worked at keeping that pretty complete, and especially on these kinds of issues. Their reports were really nice on this stuff.

MR. CHOKSHI: This is Nilesh Chokshi, Office of New Reactors.

MR. COE: And as part of the literature review for this in addressing this recommendation, we will pull the string on that. That could be valuable. Thank you.

MR. COYNE: That is very useful. There's a handful of events that we are aware of, but that is really what we wanted to look at.

MEMBER BLEY: Somewhere I have got a box of all their old reports.

CHAIR SCHULTZ: And that is what I was taking from Dick Skillman's remarks as well, not only here, but other events that he mentioned earlier. These are at least precursor events that ought to be mined from the database that we currently have --

MEMBER SKILLMAN: Thank you.

CHAIR SCHULTZ: -- to determine how much information that really provides to either support or at least document any decisionmaking you might do in terms of the complex analyses that could result, where you are trying to answer should we move in that direction or is there an alternative. As you had on the public comment slide, there have been other alternatives recommended or suggested.

MR. COE: Any other questions?

CHAIR SCHULTZ: Other comments from the Committee?

(No response.)

I want to thank you very much for this segment in the presentation.

And I do want to at this point ask if there are any other comments from the public related to the last two presentations or any other items that have been brought to the Committee in this afternoon's session.

Yes?

MR. HEYMER: Good afternoon.

Adrian Heymer from NEI.

I will take the discussion on 2.2 first, and the topic in the discussion about new and significant information. That is a term that is used in the environmental, in NEPA space. We believe that is the right approach. Not only is it new, but is it significant?

Now the NRC staff were quite right to say, "Well, okay, what does that mean? And we need to work on that." But the industry really would lean towards that approach rather than a rote, 10-year sort of standard-review approach.

If you go back over 20 years and look at what actions have been taken, both in response to regulatory action initiatives as well as industry action, you see that we have over time reduced the risk from the plants as we have gone forward in time, without the need for a 10-year sort of update, safety assessment, or whatever.

But we agree, and I think one of the lessons learned from Fukushima is that there is new and significant information. Not only should you start evaluating it, but you should make people aware of it, so that everybody in the structure, certainly within a company, is aware of what is going on, and is aware of what could be the potential significance of that. So, I think that is one comment I had.

As regards the man-made hazards, that is considered in the initial licensing. I think, as new facilities are built in the vicinity of a nuclear power plant, there needs to be at least a look at that from the nuclear side as well as from the evacuation and what threat that presents. So, I mean, I think we would understand that, but it is considered in the licensing.

When we go on to the last discussion on seismic-induced fires and floods -- and this leads into sort of a more general comment overall -- that wasn't really a Fukushima issue. Even the Near-Term Task Force Report points to the fact that it was Kashiwazaki-Kariwa. In that case, it was associated with a non-safety-related transformer issue. And based on that, Tokyo Electric Power Company made sure that there were five trucks on each of its sites.

So, it wasn't safety-related. It didn't

have a safety-related impact, but it was there. And so, from our perspective, I think we have got to be a bit careful with the amount of stuff we are stuffing in the Fukushima bag. If this is an issue, there are set processes that the NRC has in place today that it could evaluate that and determine, okay, that is an issue, whether it is a GSI or whatever, that we need to look at or we need to move forward.

Now, having said that, I think we would say, yes, if we are going to go forward and look at something in this area, that we need to look at development of the methodologies or refinement of the methodologies and build on some of the insights that were mentioned in the discussion today about the SQUG program and experience data to help inform our discussion.

So, as regards the development of a methodology, it probably is a longer-term issue. I think both of these, 2.2 and this later one on seismic-induced fires and floods, Recommendation 3, are appropriate to be a Tier 3. It is a long-term issue, though I think on the seismic-induced fires and floods, I don't think there is the Fukushima connection there. So, I think that is where we stand on that as a comment.

But that leads to a broader statement that I think is worthwhile making. If you take the

Fukushima, the list of all the Fukushima recommendations, both in the Near-Term Task Force Report and the recent SECY documents, and look at the other generic regulatory issues that are underway, there is over 50 of these on the plate in the current timeframe. And in the current timeframe, I am looking between now and about 2017.

That presents the potential for a significant distraction, both here at the NRC and at the stations. Because a lot of these Fukushima issues are associated with the power block, and we really need to keep our focus on the safe operation of the 104 nuclear power plants.

So, I think as we look at this, and I would support some statements that were made, take a look at that list. I know we took a first cut and we put them into three bins of priority. But really take a look at these Fukushima-related items and say, what is the real safety significance associated with these? And is it something we really need to push ahead with in the next five years or not? And if it is not, then put it in a parking lot. I am not saying take it off the table entirely, but I think we have got to be careful what we are focused on and what we are trying to do.

We have got Tier 1. If we try to do too

much beyond the Tier 1 issues, we are going to spread our resources, which is only going to extend the time that Tier 1 takes to implement. And it is the Tier 1 that provides the major safety significance and safety improvement of these facilities.

So, with those three comments, Mr. Chairman, I thank you for the opportunity.

CHAIR SCHULTZ: Thank you for the comments.

Other comments from the public?

(No response.)

I am looking around the room. Any members of the public on the telephone who would like to make a comment? Is the line open?

MR. DIAS: It is open.

CHAIR SCHULTZ: The line is open.

(No response.)

Hearing none, I would like to take this opportunity to thank the staff for the presentations all through the meeting we have had this afternoon. The meeting will continue tomorrow.

So, we will recess until tomorrow morning.

If any of you have not yet picked up the agenda, there are copies on the back table. Those are the items that we will be discussing tomorrow as we continue our discussion on the Tier 3 activities.

So, with that, I will recess the meeting until tomorrow morning at 8:30.

Thank you.

(Whereupon, at 5:05 p.m., the meeting was adjourned, to reconvene the following day, Wednesday, May 23, 2012, at 8:30 a.m.)

U.S.NRC

UNITED STATES NUCLEAR REGULATORY COMMISSION

Protecting People and the Environment

Japan Lessons Learned Tier 3 Regulatory Actions

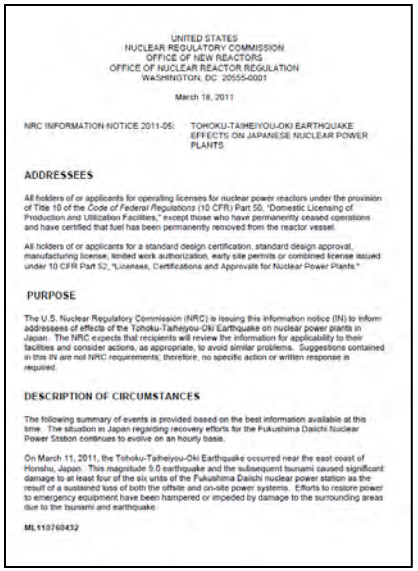
ACRS Meeting of the Fukushima Subcommittee

Rockville, Maryland

May 22-23, 2012

U.S.NRC
UNITED STATES NUCLEAR REGULATORY COMMISSION
Protecting People and the Environment

Initial NRC Actions In Response to Fukushima



UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NEW REACTORS
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, DC 20555-0001

March 18, 2011

NRC INFORMATION NOTICE 2011-05: TOHOKU-TAIHEIYOU-OKI EARTHQUAKE EFFECTS ON JAPANESE NUCLEAR POWER PLANTS

ADDRESSEES

All holders of or applicants for operating licenses for nuclear power reactors under the provision of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities," except those who have permanently ceased operations and have certified that fuel has been permanently removed from the reactor vessel.

All holders of or applicants for a standard design certification, standard design approval, manufacturing license, limited work authorization, early site permits or combined license issued under 10 CFR Part 52, "Licenses, Certifications and Approvals for Nuclear Power Plants."

PURPOSE

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice (IN) to inform addressees of effects of the Tohoku-Taiheiyou-Oki Earthquake on nuclear power plants in Japan. The NRC expects that recipients will review the information for applicability to their facilities and consider actions, as appropriate, to avoid similar problems. Suggestions contained in this IN are not NRC requirements, therefore, no specific action or written response is required.

DESCRIPTION OF CIRCUMSTANCES

The following summary of events is provided based on the best information available at this time. The situation in Japan regarding recovery efforts for the Fukushima Daiichi Nuclear Power Station continues to evolve on an hourly basis.

On March 11, 2011, the Tohoku-Taiheiyou-Oki Earthquake occurred near the east coast of Honshu, Japan. This magnitude 9.0 earthquake and the subsequent tsunami caused significant damage to at least four of the six units of the Fukushima Daiichi nuclear power station as the result of a sustained loss of both the offsite and on-site power systems. Efforts to restore power to emergency equipment have been hampered or impeded by damage to the surrounding areas due to the tsunami and earthquake.

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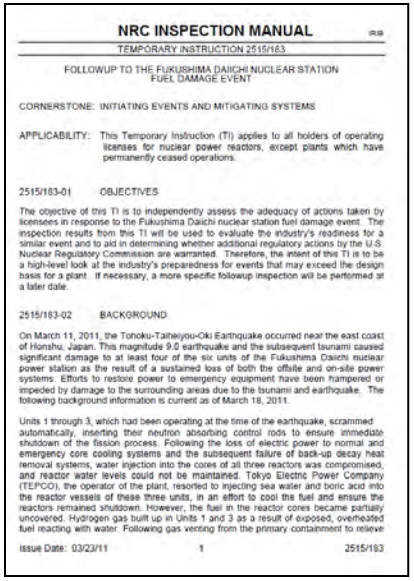
IN 2011-05



NRC INSPECTION MANUAL IRIB

TEMPORARY INSTRUCTION 2515/183

FOLLOWUP TO THE FUKUSHIMA DAIICHI NUCLEAR STATION FUEL DAMAGE EVENT

CORNERSTONE: INITIATING EVENTS AND MITIGATING SYSTEMS

APPLICABILITY: This Temporary Instruction (TI) applies to all holders of operating licenses for nuclear power reactors, except plants which have permanently ceased operations.

2515/183-01 OBJECTIVES

The objective of this TI is to independently assess the adequacy of actions taken by licensees in response to the Fukushima Daiichi nuclear station fuel damage event. The inspection results from this TI will be used to evaluate the industry's readiness for a similar event and to aid in determining whether additional regulatory actions by the U.S. Nuclear Regulatory Commission are warranted. Therefore, the intent of this TI is to be a high-level look at the industry's preparedness for events that may exceed the design basis for a plant. If necessary, a more specific followup inspection will be performed at a later date.

2515/183-02 BACKGROUND

On March 11, 2011, the Tohoku-Taiheiyou-Oki Earthquake occurred near the east coast of Honshu, Japan. This magnitude 9.0 earthquake and the subsequent tsunami caused significant damage to at least four of the six units of the Fukushima Daiichi nuclear power station as the result of a sustained loss of both the offsite and on-site power systems. Efforts to restore power to emergency equipment have been hampered or impeded by damage to the surrounding areas due to the tsunami and earthquake. The following background information is current as of March 18, 2011.

Units 1 through 3, which had been operating at the time of the earthquake, scrammed automatically, inserting their neutron absorbing control rods to ensure immediate shutdown of the fission process. Following the loss of electric power to normal and emergency core cooling systems and the subsequent failure of back-up decay heat removal systems, water injection into the cores of all three reactors was compromised, and reactor water levels could not be maintained. Tokyo Electric Power Company (TEPCO), the operator of the plant, resorted to injecting sea water and boric acid into the reactor vessels of these three units, in an effort to cool the fuel and ensure the reactors remained shutdown. However, the fuel in the reactor cores became partially uncovered. Hydrogen gas built up in Units 1 and 3 as a result of exposed, overheated fuel reacting with water. Following gas venting from the primary containment to relieve

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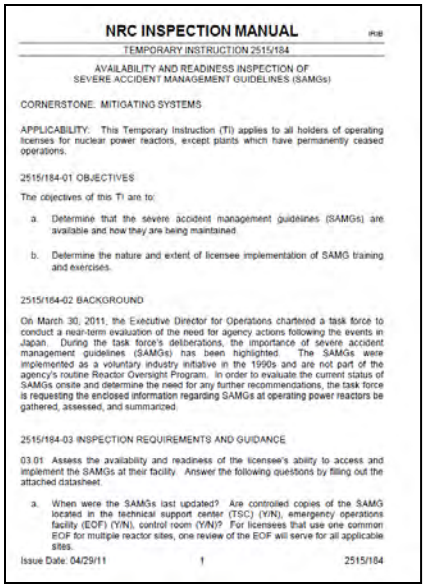
TI 2515/183



NRC INSPECTION MANUAL IRIB

TEMPORARY INSTRUCTION 2515/184

AVAILABILITY AND READINESS INSPECTION OF SEVERE ACCIDENT MANAGEMENT GUIDELINES (SAMGs)

CORNERSTONE: MITIGATING SYSTEMS

APPLICABILITY: This Temporary Instruction (TI) applies to all holders of operating licenses for nuclear power reactors, except plants which have permanently ceased operations.

2515/184-01 OBJECTIVES

The objectives of this TI are to:

a. Determine that the severe accident management guidelines (SAMGs) are available and how they are being maintained.

b. Determine the nature and extent of licensee implementation of SAMG training and exercises.

2515/184-02 BACKGROUND

On March 30, 2011, the Executive Director for Operations chartered a task force to conduct a near-term evaluation of the need for agency actions following the events in Japan. During the task force's deliberations, the importance of severe accident management guidelines (SAMGs) has been highlighted. The SAMGs were implemented as a voluntary industry initiative in the 1990s and are not part of the agency's routine Reactor Oversight Program. In order to evaluate the current status of SAMGs onsite and determine the need for any further recommendations, the task force is requesting the enclosed information regarding SAMGs at operating power reactors be gathered, assessed, and summarized.

2515/184-03 INSPECTION REQUIREMENTS AND GUIDANCE

03.01 Assess the availability and readiness of the licensee's ability to access and implement the SAMGs at their facility. Answer the following questions by filling out the attached datasheet.

a. When were the SAMGs last updated? Are controlled copies of the SAMG located in the technical support center (TSC) (Y/N), emergency operations facility (EOF) (Y/N), control room (Y/N)? For licensees that use one common EOF for multiple reactor sites, one review of the EOF will serve for all applicable sites.

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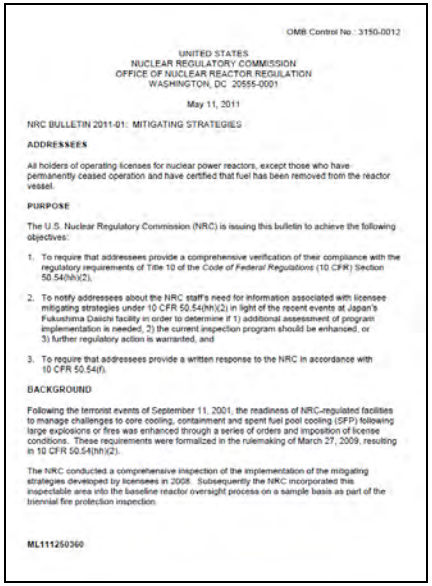
TI 2515/184



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UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF NUCLEAR REACTOR REGULATION
WASHINGTON, DC 20555-0001

May 11, 2011

NRC BULLETIN 2011-01: MITIGATING STRATEGIES

ADDRESSEES

All holders of operating licenses for nuclear power reactors, except those who have permanently ceased operation and have certified that fuel has been removed from the reactor vessel.

PURPOSE

The U.S. Nuclear Regulatory Commission (NRC) is issuing this bulletin to achieve the following objectives:

1. To require that addressees provide a comprehensive verification of their compliance with the regulatory requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.54(hh)(2).

2. To notify addressees about the NRC staff's need for information associated with licensee mitigating strategies under 10 CFR 50.54(hh)(2) in light of the recent events at Japan's Fukushima Daiichi facility in order to determine if 1) additional assessment of program implementation is needed, 2) the current inspection program should be enhanced, or 3) further regulatory action is warranted, and

3. To require that addressees provide a written response to the NRC in accordance with 10 CFR 50.54(f).

BACKGROUND

Following the terrorist events of September 11, 2001, the readiness of NRC-regulated facilities to manage challenges to core cooling, containment and spent fuel pool cooling (SFP) following large explosions or fires was enhanced through a series of orders and imposition of license conditions. These requirements were formalized in the rulemaking of March 27, 2009, resulting in 10 CFR 50.54(hh)(2).

The NRC conducted a comprehensive inspection of the implementation of the mitigating strategies developed by licensees in 2008. Subsequently the NRC incorporated this inspectable area into the baseline reactor oversight process on a sample basis as part of the biennial fire protection inspection.

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BL 2011-01

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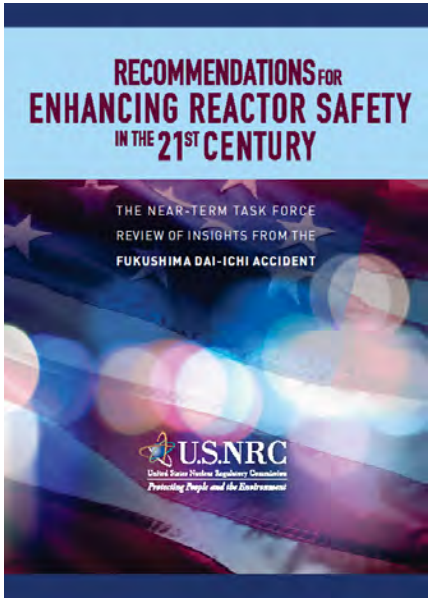
NRC Lessons Learned Review

- Commission directed a methodical and systematic review of the safety of U.S. facilities in light of events in Japan

- Near-Term Task Force review completed July 2011 (www.nrc.gov)



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U.S. Plant Safety

- Similar sequence of events in the U.S. is unlikely
- Existing mitigation measures could reduce the likelihood of core damage and radiological releases
- No imminent risk from continued operation and licensing activities

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Identifying Lessons Learned

- July 2011
  - Near-Term Task Force (NTTF) report issued
- September/October 2011
  - NTTF recommendations prioritized into Tiers 1, 2, and 3
- February 2012
  - Draft orders and requests for information provided to the Commission
- March 2012
  - The NRC staff issued the Tier 1 orders and request for information on March 12, 2012

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Orders

- The NRC staff ordered licensees to:
  - Develop strategies and procure additional equipment to address beyond-design-basis external events and multiunit events
  - Include a reliable hardened vent in Mark I and Mark II containments
  - Enhance spent fuel pool level instrumentation for beyond design basis accidents

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Requests for Information

- The NRC requested that licensees provide information on:
  - the adequacy of facility design bases with respect to seismic and flooding hazards
  - whether facility configurations, as confirmed by seismic and flooding walkdowns, are in compliance with current facility design bases
  - current communications system power supplies and their availability during a prolonged SBO event
  - the required staffing necessary to respond to a multiunit, prolonged SBO event

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Rulemaking Activities

- Station Blackout (SBO) Rulemaking
  - Modify the SBO rule to require enhanced capability to mitigate a prolonged SBO
  - Advanced Notice of Proposed Rulemaking issued
  - The Commission directed that SBO rulemaking be completed within 24-30 months
- Emergency Procedures Integration Rulemaking
  - Create a new rule requiring the integration of the emergency procedures
  - Advanced Notice of Proposed Rulemaking issued
  - The rulemaking is expected to be completed in 2016

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Other Recommendations for NRC Action

- Tier 2 Recommendations – Could not be initiated in the near term due to factors that include the need for further technical assessment and alignment, dependence on Tier 1 issues, or availability of critical skill set limitations.

- Tier 3 Recommendations – Require further staff study to support a regulatory action, have an associated shorter-term action that needs to be completed to inform the longer-term action, are dependent on critical skill sets, or are dependent on the resolution of NTTF Recommendation 1.

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Tier 3 Recommendations

- Commission-approve Charter
- Longer-Term Task Groups
  - Team Leader (SES or Branch Chief)
  - Subject Matter Experts
  - Japan Lessons-Learned Directorate
- Lead is with the Line Organizations
- Recommendation for action to the Steering Committee through the lead office

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Focus of Longer-Term Review

- Identification and resolution of key issues and information needed to support a recommendation on the need for regulatory action
- Program plans to guide issue identification and resolution
- Planning framework will extend to decision point on whether regulatory action is needed, but not beyond

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Tier 3 Recommendations

- 2.2 Periodic Confirmation of Seismic and Flooding Hazards
- 3 Potential Enhancement to the Capability to Prevent or Mitigate Seismically-Induced Fires and Floods
- 5.2 Reliable Hardened Vents for Other Containment Designs
- 6 Hydrogen Control and Mitigation Inside Containment or in Other Builidings
- 9.1/9.2 EP Enhancements for Prolonged SBO and Multiunit Events
- 9.3 ERDS Capability
- 10 Additional EP Topics for Prolonged SBO and Multiunit Events

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Tier 3 Recommendations (cont.)

- 11 EP Topics for Decision-making, Radiation Monitoring, and Public Education
- 12.1 Reactor Oversight Process Modifications
- 12.2 Staffing Training on Severe Accidents and Resident Inspector Training on SAMGs
- Transfer of Spent Fuel to Dry Cask Storage
- Prestaging of Potassium Iodide Beyond 10 Miles
- Reactor and Containment Instrumentation Ability to Withstand Beyond Design Basis Conditions
- Basis of Emergency Planning Zone Size

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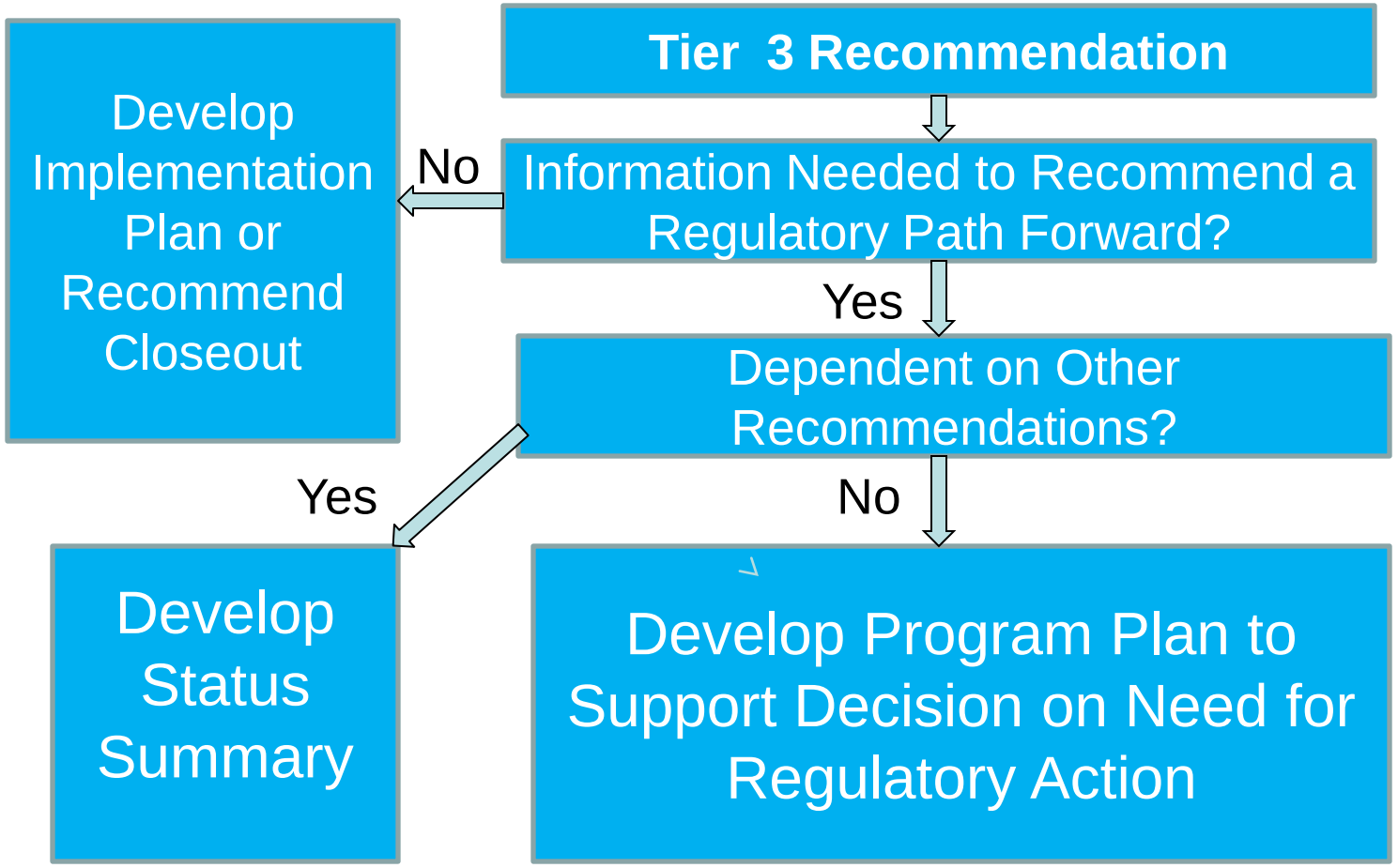
Flow Chart for Tier 3 Recommendations



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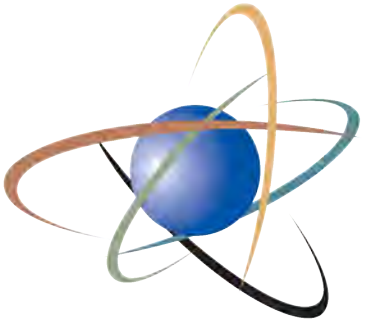
Questions?



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Recommendation 2.2 Periodic Reassessment of External Hazards

Jenise Thompson

May 23, 2012

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Background

- NTTF report asks staff to “initiate rulemaking to require licensees to confirm seismic hazards and flooding hazards every 10 years and address any new and significant information. If necessary, update the design basis for SSCs important to safety to protect against the updated hazards.”
- Recommendation 2.1 and 2.3 are currently underway for seismic and flooding hazards
- Recommendation 2.1 for other natural external hazards has not started work yet due to resource limitations.

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Staff Approach

- **Define and begin the initial pre-rulemaking activities necessary to position the agency for a future rulemaking to implement NTTF Recommendation 2.2, as resources become available**
- **Scope of rulemaking to include external hazards**
  - **Seismic**
  - **Flooding**
  - **Other natural external hazards**
  - **Other man-related external hazards (under discussion)**

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Pre-rulemaking Activities

- Collect information as it comes up for R2.1 and R2.3
- Engage with external stakeholders as appropriate

- What constitutes new and significant information?
- What will the staff do with the updated hazard information?
  - Use of risk-informed approach?
- How will staff determine if it is necessary to update the design basis for SSCs important to safety?
  - Threshold for regulatory actions
- Review of international practices and insights from Recommendation 2.1

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Public Meeting – May 7, 2012

- Questions from public
  - Nexus to Fukushima for inclusion of other man-related external hazards
  - “old” information “newly” discovered
  - Handling of information submitted as contention to new reactor licensing
  - Similar actions in the past (GI program)
  - Schedule concerns

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Questions?

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NTTF Recommendation 3: Seismically Induced Fires and Floods

May 22, 2012

Kevin Coyne, RES/DRA

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Background

- Seismic events have the potential to cause:
  - multiple failures of safety-related SSCs;
  - induce separate fires or flooding events in multiple locations at the site; and
  - degrade the capability of plant SSCs intended to mitigate the effects of fires and floods.

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Background

- The NTTF recommended, as part of the longer term review, evaluation of potential enhancements to the capability to prevent or mitigate seismically induced fires and floods
  - Scope includes internal seismically induced fires (e.g., breakers, transformers) and floods (e.g., tanks, piping systems)
  - External seismically induced fires and floods are considered to be outside the scope of this issue
- Prioritized as Tier 3 in SECY 11-0137
  - Commission agreed with Tier 3 Prioritization, but
  - Directed the staff to initiate development of PRA method to evaluate potential enhancements as part of Tier 1 activities

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Background (con't)

- PRA Method Challenges:
  - hazard definition & characterization
  - seismic fragilities for SSCs, including fire protection components
  - modeling concurrent and subsequent initiating events
  - treatment of systems interactions
  - human reliability analysis methodologies suitable for seismically induced hazards
  - multiunit risk considerations

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Current Status

- Staff developed an initial plan for PRA method development in SECY 12-0025.
- PRA pre-planning activities include:
  1. Define objectives of method
  2. Identify relevant stakeholders
  3. Information gathering
  4. Coordination with other ongoing initiatives
  5. Resource and schedule estimate

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Current Status (con't)

- Key Considerations
  - Limited number of staff with required knowledge, skills, and abilities
  - No current consensus state-of-practice methods exist for seismically induced fires and floods for NPPs
  - ASME/ANS Joint Committee on Nuclear Risk Management recently formed a working group to address multiple concurrent events
  - Other Tier 1 activities will provide substantial information relevant to this issue

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Staff Assessment

- Results from several Tier 1 recommendations will better inform the this issue:
  - 2.1 Seismic and flooding hazard evaluation
  - 2.3 Seismic and flooding vulnerability walkdowns
  - 4.2 Mitigation Strategies
  - 5.1 Containment venting
  - 7.1 Spent fuel pool
- More efficient to wait until sufficient information becomes available from these efforts.

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Staff Assessment (con't)

- Some work can be done now:
  - Standards development organization engagement
  - Assess results from NTTF Recommendations 2.1, 4.2, 5.1, 7.1 and other activities
  - Continue PRA method development activities

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Staff Recommendation

- Continue development of PRA methodology
  - Engagement with PRA standards development organizations
  - Feasibility study to assess approaches for evaluating multiple concurrent events
- Assess results from Tier 1 activities and other related work
- Future re-evaluation of Recommendation 3

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Public Comments (May 3)

- Agreement on prioritization of issue as Tier 3
- Qualitative risk assessment approaches should also be considered
- Ensure that the PRA method (and its application) includes documentation of key assumptions.

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Questions?

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Hydrogen Control and Mitigation (NTTF Recommendation 6)

Brett Titus
Office of Nuclear Reactor Regulation

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Background

- The NTTF recommended, as part of the longer term review, identification of insights about hydrogen control and mitigation
  - Scope includes generation, transport, distribution, and combustion of hydrogen
  - Primary areas of interest consist of containment and adjacent buildings (although other locations are not excluded)
- Prioritized as Tier 3 in SECY 11-0137
- Commission agreed with Tier 3 Prioritization

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Staff Assessment- Recommendation 6

- Interdependencies with other NTTF Tier 3 recommendations.
  - Implementation of Rec. 4 (SBO)
  - Rec. 5 (Hardened Vents) greatly reduce the likelihood of hydrogen explosions
  - Filtered Vents- concurrent analysis
    - Outcome could impact the path forward for Rec 6
    - These efforts will be collaborative

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Staff Assessment- Recommendation 6

- Potential risk of hydrogen production and combustion is well known
  - Three Mile Island (1979)
  - Numerous Generic Issues and Generic Safety Issues
  - Many studies performed worldwide

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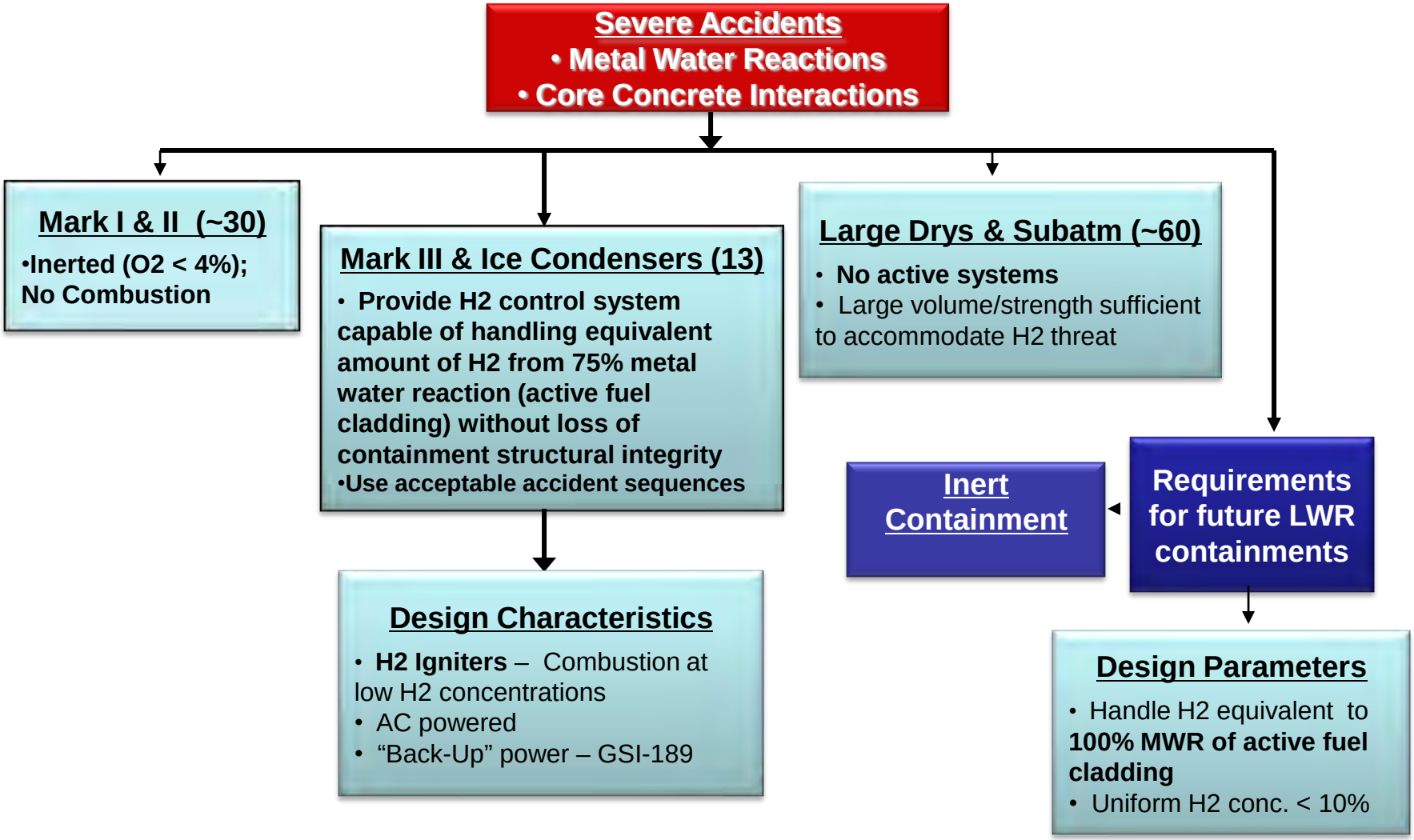
Staff Assessment- Recommendation 6

- 10 CFR 50.44, “Combustible Gas Control for Nuclear Power Reactors” revised in 2003
  - Eliminated requirements for H_2 recombiners and relaxed monitoring rules commensurate with risk significance
  - Retained requirements for mixed atmosphere, inert MK I&II containments, maintained 75% clad-water H_2 reaction criteria (100% for New Reactors) in MK III and Ice Condensers

10 CFR 50.44
Combustible Gas Control for LWRs



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Staff Assessment - Recommendation 6

- Key Questions to be Investigated
  1. Is there new information regarding H_2 in general?
  2. Was the failure of the buildings consistent with our understanding?
  3. Are there important gaps in our understanding of the threat from H_2 gas?
  4. Is there new information which conflicts with the current technical basis?
  5. Has new technical information been revealed to necessitate regulatory action?

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Plan for Addressing Recommendation 6

1. Examine additional H_2 control measures in adjacent buildings

    - Conduct stakeholder meetings for all existing containment types
    - Evaluate additional mitigation measures to improve robustness of reactor and auxiliary buildings
    - Quantify the impact on safety and risk

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Plan for Addressing Recommendation 6

2. Evaluate the sources and timing of H_2 generation

   - Review accident sequence info from Gov't of Japan, TEPCO, INPO, and international orgs
   - Compare the actual accident timing and amounts of generated H_2 to analytical predictions
   - Assess implications of results on the existing state of knowledge

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Plan for Addressing Recommendation 6

3. Assess the potential migration/release pathways

- Review available forensic info from Gov't of Japan, TEPCO, INPO, and international org
- Use information (supplemented by reasonable assumptions) to conduct best estimate modeling to evaluate containment release pathways
- Assess implications of results on the existing state of knowledge

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Plan for Addressing Recommendation 6

4. Review the Technical Basis for 10 CFR 50.44

   - Considering the results of Tasks 1-3, confirm the validity of the existing basis or identify gaps and characterize their safety/risk significance
   - Conduct stakeholder meetings for all existing containment types
   - Determine if any regulatory action is needed

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Challenges

- Very little reliable empirical data on H_2 has been reported since the accident
- Verifiable information on chain of events may not be available for 10+ years
- H_2 generation and control following a severe accident is a highly specialized technical discipline

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Public comments

- Public meeting on May 14, 2012

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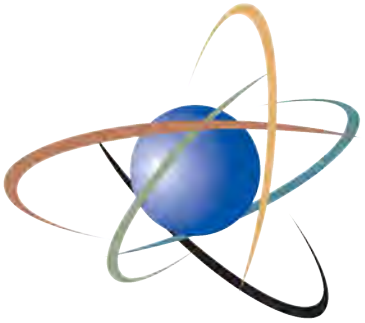
Questions?



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EP NTTF Recommendations Tier 2 & 3 Implementation

Kevin Williams
Office of Nuclear Security and Incident Response

NTTF EP Recommendations

Tier 2 Action

- NTTF Recommendation 9.3 - Emergency preparedness regulatory actions (the remaining portions of Recommendation 9.3, with the exception of Emergency Response Data System (ERDS) capability addressed in Tier 3)

Tier 3 Actions

- NTTF Recommendations 9.1/9.2 - Emergency preparedness (EP) enhancements for prolonged SBO and multiunit events (dependent on availability of critical skill sets)
- NTTF Recommendation 9.3 – ERDS capability (related to long-term evaluation Recommendation 10)
- NTTF Recommendation 10 - Additional EP topics for prolonged SBO and multiunit events (long-term evaluation)
- NTTF Recommendation 11 - EP topics for decision-making, radiation monitoring, and public education (long-term evaluation)

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NRC Staff Commitments

- SECY-11-137 stated that the staff will initiate the Tier 2 actions associated with EP regulatory actions when sufficient technical information and applicable resources become available.
- SECY-11-0137 stated that the staff will provide assessments of the Tier 3 recommendations once it had completed its evaluation of the resource impacts associated with the Tier 1 and 2 recommendations.
- The staff will address the Tier 3 EP-related recommendations, schedules, and resources in the upcoming July SECY paper to the Commission.
- The staff will take regulatory action, as appropriate, after evaluating the licensee responses to the 50.54(f) letters (staffing and communication).
- The staff will continue to engage with stakeholders on the Tier 2 and Tier 3 EP-related recommendations.

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Advanced Notice of Proposed Rulemaking

- The staff considers existing EP framework and regulations provide reasonable assurance of adequate protection of public health and safety in the event of a radiological emergency.
- The staff is considering an Advance Notice of Public Rulemaking (ANPR) to be utilized to determine if a technical-basis for rulemaking can be developed for EP-related NTTF Recommendations (9.1, 9.2, 9.3, 9.4, 10, and 11).
- Some of the recommendations may screen out to long-term studies.
- The staff would initiate the ANPR when sufficient resources become available which would include stakeholder engagement.
- The staff will address the ANPR and a completed evaluation of the resource impacts and scheduled in the upcoming July SECY paper to the Commission.

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Emergency Planning Zones

- The staff considers that the existing Emergency Planning Zone (EPZ) size provides reasonable assurance of adequate protection of public health and safety in the event of a radiological emergency.

- EPZ size re-evaluation is a longer-term action that is already being assessed by existing activities.

- The staff will utilize insights from the current Level 3 Probabilistic Risk Assessment (PRA) study results to inform the process for evaluation of potential impact that a multi-unit event may have on the EPZ.

- Any changes to EPZs would be discussed with stakeholders in public meetings.

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Potassium Iodide (KI)

- The staff considers that the existing KI framework and regulations provide reasonable assurance of adequate protection of public health and safety in the event of a radiological emergency.

- The staff has concluded that based on available data to date, it is unlikely that the FDA thyroid dose PAGs were exceeded beyond 10 miles as a result of the accident at Fukushima.

- The staff will continue to monitor and evaluate the results of the findings by the Japanese government from studies conducted in and around the Fukushima.

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Public comments

- Public meeting on May 4, 2012

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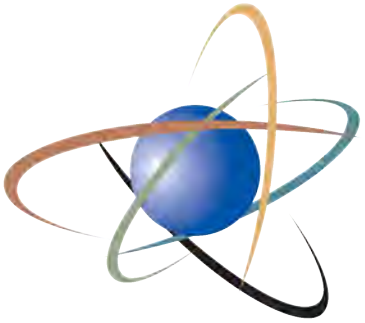
Questions?



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Recommendation 12.1 Status

May 23, 2012

Tim Kobetz,

Chief, Reactor Inspection Branch

Office of Nuclear Reactor Regulation

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Recommendation 12.1

Strengthen the Reactor Oversight Process (ROP) to more fully include defense-in-depth considerations

- Expand the scope of the annual ROP self assessment
- Expand the scope of the biennial ROP realignment

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Dependent on Recommendation 1

This recommendation is dependent on Recommendation 1 which recommended establishing a logical, systematic, and coherent regulatory framework that balances defense-in-depth and risk considerations.

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Plan

- The staff will continue to implement the ROP in accordance with current policy
- Staff will begin to consider potential changes to the ROP self assessment and realignment programs when an action plan for Recommendation 1 has been established.
- The staff does not envision any unique challenges.

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Communications

- Periodic stakeholder interactions will take place as necessary during the NRC's routine monthly meetings with NEI and the industry on ROP topics.
- Update the Commission on the status of Recommendation 12.1 in 2013 annual ROP Self-assessment SECY paper (issued in spring 2014).

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Public Meeting on May 7th

- No questions or comments were received

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Questions?

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Staff Training on Severe Accidents and Severe Accident Management Guidelines

May 23, 2012

Joseph G. Giitter

Travis L. Tate

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Purpose and Background

- Purpose
  - discuss the plan for Near-Term Task Force (NTTF) Recommendation 12.2 by describing the current level of NRC staff training on severe accidents and outline future training enhancements
- Background
  - SECY-11-0093 , NTTF Report – July 12, 2011
  - Staff Requirements Memorandum (SRM) for SECY-11-0093 – August 19, 2011
  - SECY-11-0137 – October 3, 2011
  - SRM for SECY-11-0137 – December 15, 2011

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NTTF Recommendations

- Recommendation 12.2 (dependent on Recommendation 8)
  - "Enhance NRC staff training on severe accidents, including training resident inspectors on Severe Accident Management Guidelines (SAMGs)"
- Recommendation 8.4
  - "Initiate rulemaking to require more realistic, hands-on training and exercises on SAMGs and EDMGs for all staff expected to implement the strategies and those licensee staff expected to make decisions during emergencies, including emergency coordinators and emergency directors"

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Severe Accident Training

- Accident Progression Analysis
  - post-core damage conditions
- Accident Consequence Analysis
  - transport from core damage
- Perspectives on Reactor Safety
  - overview (design for safety, defense-in-depth, ECCS rulemaking, severe accident and safety goal policy)
  - accident sequences
  - accident progression (vessel/containment)
  - radiological releases and consequences

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Relevant NRC Training

- Emergency Operating Procedures (EOPs)
  - GE Emergency Procedure and Severe Accident Guidelines
  - Westinghouse Emergency Procedure Guidelines
  - B&W / CE Emergency Procedure Guidelines
- Westinghouse SAMGs (video)

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Qualification Training

- Senior Reactor Analyst
- Reactor Technical Reviewer
- Reactor Risk Analyst
- Nuclear Safety Professional Development Program

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Enhancements

- Near-term actions
  - Frequency of severe accident courses
  - Update courses based on Fukushima lessons-learned
  - Qualification Program severe accident courses
  - Stakeholder feedback
    - Public Meeting – May 7, 2012

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Enhancements (cont.)

- Longer-term actions
  - Dependent on Recommendation 8
  - State-of-the-Art Reactor Consequence Analysis (SOARCA)
  - Level 3 Probabilistic Risk Analysis
  - Fukushima lessons-learned
  - Qualification Program SAMG courses
  - Potential new course development
  - Stakeholder feedback

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Public comments

- Public meeting on May 7, 2012

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Reactor and Containment Instrumentation (ACRS Recommendation 2(e))

Bill Kemper

Office of Nuclear Reactor Regulation

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Background

ACRS 2(e) – “Selected reactor and containment instrumentation should be enhanced to withstand beyond-design-basis accident conditions”

- Current Reactors –Implement Post-TMI instrument recommendations to address design basis accidents
- New Reactors—Implement Post-TMI instruments plus describe severe accident capabilities

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Dependencies

- Seismic and Flooding Evaluations
- SBO Rulemaking
- Mitigating Strategies Order
- Spent Fuel Pool Instrumentation Order
- EOPs/SAMGs/EDMGs Integration Rulemaking

Staff Recommendations

- Ensure that the need for enhanced reactor, containment , and SFP instrumentation is being adequately considered during Tier 1 NTTF actions
- Review/participate in domestic & international efforts to study/develop severe accident info needs and identify instrumentation gaps
- Gather and review information results from higher Tier actions
- Determine needs for a regulatory framework for enhanced reactor and containment instrumentation

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Stakeholder Feedback

- Public Meeting held on May 7
- NEI Feedback
- Public question

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Public comments

- Public meeting on May 7, 2012

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Additional Recommendation 5 Expedited Transfer of Spent Fuel to Dry Casks

Steve Jones

Office of Nuclear Reactor Regulation

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Background

- In SECY 11-0137, the staff included an additional recommendation for expedited transfer of spent fuel to dry cask storage.
- Stakeholders have repeatedly requested such action as part of petitions for regulatory action based on the perceived potential to reduce the probability and consequences of overheated stored fuel.
- This issue has a nexus to the Fukushima Daiichi event because the potential for overheating of stored fuel, although unrealized, was a significant concern.

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Staff Approach

- Complete validation of spent fuel safety with respect to the Commission Safety Goals, considering past evaluations and results of spent fuel pool scoping study.
- Analyze information using NRC Regulatory Analysis Guidelines to inform a recommendation.
- Identify any inconsistencies or gaps that may need additional research.
- Gather stakeholder input on staff analysis of information.
- Recommend course of action to the Commission.

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Spent Fuel Pool Scoping Study

- Limited-scope consequence assessment
  - Specific to a single site configuration
  - Seismic initiator based on results of past studies
- Considers:
  - Configuration through 5 stages of operating cycle
  - High and low density fuel storage (racks unchanged)
  - Event progression with and without mitigation
- Supports:
  - Validation of seismic modeling
  - Validation of event progression modeling
  - Validation of consequence modeling

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Identified Gaps

- Issues that increase value of transfer
  - Criticality (e.g., degraded neutron absorbers)
  - Multi-unit issues
- Issues that decrease value of transfer
  - Cask drop hazard (i.e., increased cask movement with hot fuel in pool)
  - Operational risks (e.g., radiation dose)
  - Industry limitations (e.g., cask production)
  - Repackaging for transportation and disposal

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Related Issues

- Order EA 12-049: Mitigation Strategies
  - Enhances 10 CFR 50.54(hh) mitigation capabilities
  - SFP spray capabilities subject to further discussion
- Order EA 12-051: Spent Fuel Pool Instrumentation
- NTTF Recommendations 7.2-5 (Tier 2)
  - Safety-related makeup availability
  - Seismically-qualified spray capability

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Stakeholder Feedback

- Category 3 Public Meeting held on May 14
- NEI Used Fuel Management Conference on May 8
- No specific feedback on program plan
- Stakeholder comments included:
  - Requests for immediate NRC action to require transfer of spent fuel to dry casks
  - Proposed areas of consideration/research to address the issue, which is already in the plan
  - Concern that the NRC is over-regulating spent fuel storage

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Questions?

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Filtered Containment Venting Systems

Briefing to the
Advisory Committee on Reactor Safeguards
May 22, 2012

Topic Agenda

- Background
- Steering Committee Tasking
- Foreign Experience with FCVS
- Stakeholder Input

Background

- In SRM-SECY-11-0137, the Commission directed the staff to take certain actions related to reliable hardened vents.
  - Supported the NTTF recommendation to pursue an order to include a reliable hardened vent in BWR Mark I and Mark II containments (Tier 1).
  - Perform a long-term evaluation on reliable hardened vents for other containment designs (Tier 3).
  - "…quickly shift the issue of 'Filtration of Containment Vents' from the 'additional issues' category and merge it with the Tier 1 issue of hardened vents for Mark I and Mark II containments…"

Background

- In response, SECY-12-0025 included:
  - Proposed order to require a reliable hardened vent for BWR Mark I and Mark II containment designs
    - Prevention of core damage
    - No requirements for severe accident service
  - Severe accident service and filtration treated as a separate issue from proposed order
  - July 2012 Commission Paper

Staff Actions

- Reliable Hardened Vent Order issued March 12, 2012
- Staff is currently reviewing issues relating to severe accident service and filtration
  - Review Past Regulatory Actions
  - Insights from Fukushima
  - Evaluate Under Existing Regulatory Framework
  - Foreign Experience Insights

Foreign Experience with FCVS

Organizations and Sites Visited

- Sweden
  - Swedish Radiation Safety Authority (SSM)
  - Forsmark Unit 2 (Vattenfall) – similar to Mark II
  - Ringhals Unit 1 (Vattenfall) – similar to Mark II
- Switzerland
  - Swiss Federal Nuclear Safety Inspectorate (ENSI/HSK)
  - Leibstadt (KKL) – Mark III
  - Mühleberg (BKW) – similar to Mark I

Foreign Experience with FCVS

Sweden – Regulatory and Technical Bases

- In response to TMI, Sweden issued "Report by the Swedish Government Committee On Nuclear Reactor Safety"
  - Mitigate the consequences of a severe accident by strengthening containment.
  - Reduce risks that could result in radiation fatalities or high radiation dose from ground contamination
- FILTRA Research Project – a joint regulator and industry effort

Foreign Experience with FCVS

Sweden – Regulatory and Technical Bases

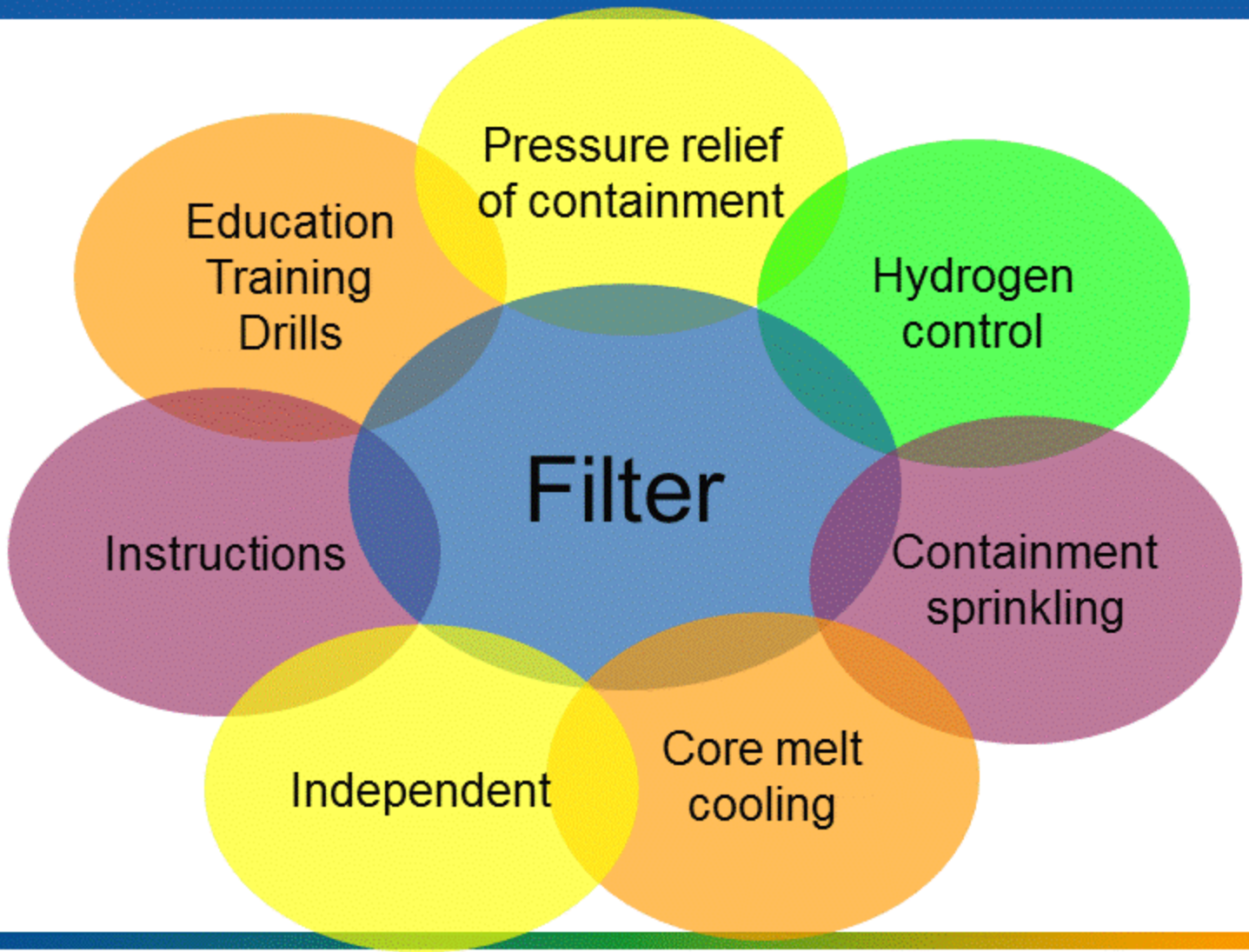
- Energy Bill 1980/1981
  - Expedite FCVS for Barseback (Located near Copenhagen)
  - Consider FCVS for Forsmark, Ringhals and Oskarshamn and identify any alternatives to FCVS
  - Cost/benefit not applicable to ground contamination
- Outcome
  - Barseback “First-of-a-kind” FCVS (1980 – 1985)
  - “Second Generation FCVS” for Forsmark, Ringhals and Oskarshamn

Foreign Experience with FCVS

Sweden – BWR FCVS at Ringhals 1, Forsmark and Oskarshamn

- Regulator and industry alignment to thoroughly evaluate ways to strengthen containment
- SSM required defense-in-depth for acknowledged uncertainties in PRA
  - FCVS from drywell was required for slow over-pressurization, feed/bleed and flood up by additional independent containment spray
  - Reliable drywell spray to flood up containment
  - Reliable means to flood under pedestal
  - Separate early overpressure mitigation

Concept



VATTENFALL

Foreign Experience with FCVS

Sweden – FCVS DF Requirements

- No acute fatalities
- Limited area of first year dose from ground contamination (with rain) of greater than 50 mSv
  - 5 Rem, natural background in some areas of Europe, annual radiation worker dose
- Considered met if release of no more than 0.1% core inventory Cs-134, Cs-137, and Iodine of 1,800 MWth reactor, similar for other nuclides important to land contamination
- Required demonstrated minimum DF 100; MVSS designed for 500, tested at 1,000

Foreign Experience with FCVS

Sweden – BWR FCVS Design Summary

- Passive filter, inerted w/ N_2, achieved DF of 1,000.
- Heat removal capability 1%, vents hydrogen.
- Seismic design – same as containment.
- Single train, 24 hour passive operation, active operation for early venting.
- Valves operable from control room with independent electrical and pneumatic supplies. Forsmark has local manual operation from shielded station.
- Instrumentation with independent batteries
- Drywell connection

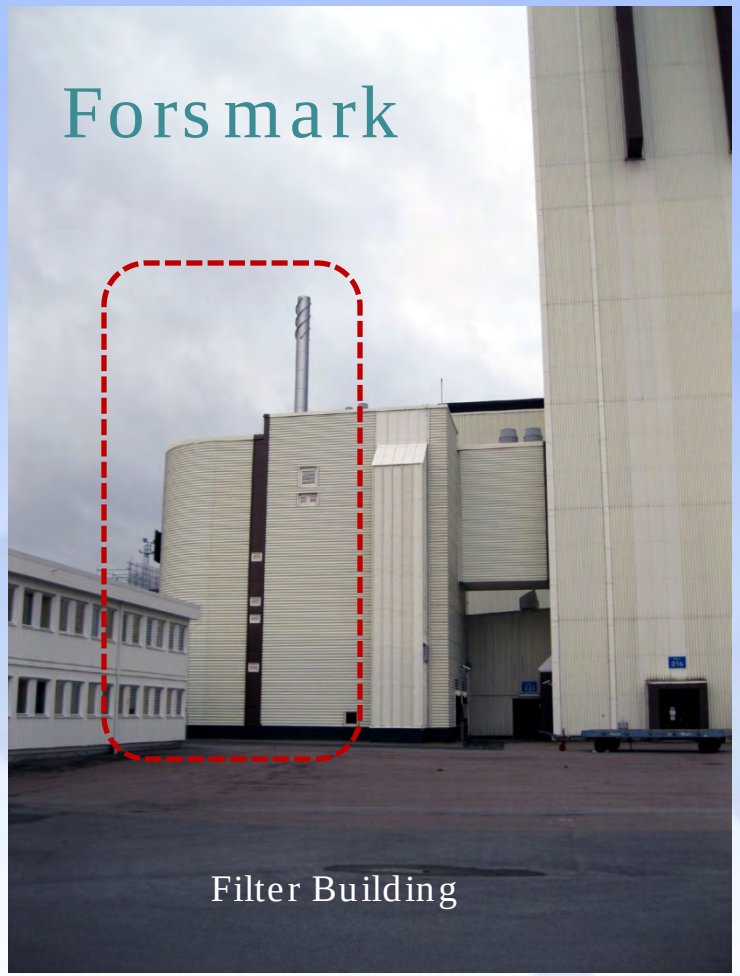
Foreign Experience with FCVS

Top right to left, containment penetration, seismic support, inboard low pressure early venting line. Lower right to left – penetration, passive rupture disk, 2 normally open valves.

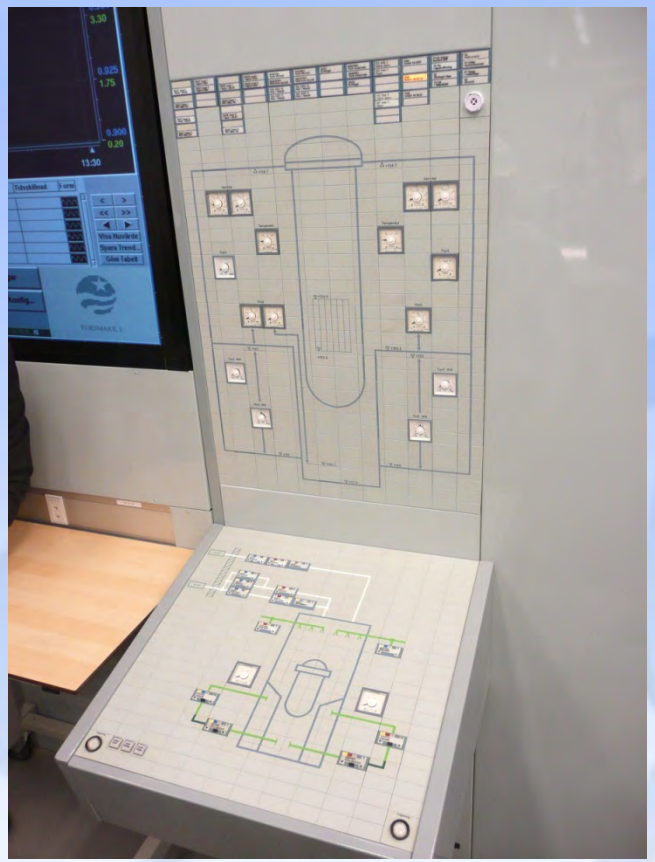
Local manual pneumatic supply operating station for containment vent valves and system inerting.

Forsmark

Foreign Experience with FCVS



Foreign Experience with FCVS



Control Room Panel for FCVS, Under-Vessel Flooding System and Spray Controls

Forsmark

Containment Flooding System Temporary Equipment Connections.

Foreign Experience with FCVS

Ringhals

Mobile Unit for Containment Spray and PMR (Electrical System Power)

Foreign Experience with FCVS

Sweden – BWR FCVS Industry Experience

- Final SSM guidance 1986 – all required backfits, including FCVS, completed 1988
- Majority of work done at power, used outages for tie-in with no impact on production
- FCVS installation considered “not difficult”
- Installation costs (1988) estimated $12.5 million per unit at Forsmark; Approximately $9 million per unit at Ringhals
- Annual maintenance, testing, inspection not significant - estimate $10,000-$30,000
- FCVS in technical specifications; 30-Day AOT
- FCVS mature technology, no safety issues with use
- Utility representatives considered FCVS cost-beneficial

Foreign Experience with FCVS

Switzerland – FCVS Regulatory and Technical Bases

- Swiss Nuclear Energy Act requires licensees to backfit, as appropriate, in response to operating experience and consistent with available technology, to further reduce risk to people and the environment.
- Following TMI Swiss plants were required to install severe accident mitigation systems (e.g., SUSAN at Mühleberg).
- In response to the Chernobyl accident in 1986, HSK requested licensees to evaluate FCVS.

Accident Management & Containment Filtered Venting Timeline (example Mühleberg)

BKW

1990/00/05/10
Severe accident analysis part of probabilistic safety analysis (PSA)

SAMG

1980 | **1990** | **2000** | **2010**

- 1980's: SAM international research
- 1990's : development of owners'group general guidance
- 2000: Swiss Authority requirement for SAMGs
- 2001: commitment to implementation
- 2002: concept report
- 2004 verification & validation emergency drill
- 2007: extended SAMGs to address shutdown

Containment Filtered Venting

1992 | **2000**

- 1992: commissioning of containment filtered venting system
- 1993: part of emergency procedures
- 1994: specific accident management procedure
- 2004: fully embedded in SAMG & other procedures

Foreign Experience with FCVS

Switzerland – FCVS Regulatory and Technical Bases (continued)

- HSK deterministic decision on FCVS based on need for defense-in-depth
- Regulator/industry developed draft guidance by 1988; installation 1989-1993; final regulatory guideline HSK R-40 1993
  - Heat removal capacity - 1% thermal power
  - Passive actuation via rupture disc; 24 hours
  - Operation from control room and manual local
  - Dedicated power for instrumentation and valve operation
  - Seismic Class 1
  - DF of 1,000 for aerosols, 100 for elemental/organic iodine (based on available technology)

Foreign Experience with FCVS

Leibstadt

(BWR-6, MK-III, ~1200 MWe)

Foreign Experience with FCVS

Switzerland – FCVS Industry Experience

- Leibstadt - $11 million in 1993
- Mühleberg $6 million in 1990 excludes filter vessel (not needed because MVS in unique secondary containment suppression pool)
- Majority of installation work performed at power, used outages for tie-in with no impact on production
- Maintenance Costs Considered “Not significant”
  - Estimated at $50,000 to $100,000/year
- Adopting new chemistry to improve iodine retention
- FCVS in Technical Specifications; 10-Day AOT
- No stated negatives for FCVS – Utility Representatives considered FCVS Cost-beneficial as designed

Foreign Experience with FCVS

Summary

- Mitigation of Severe Accidents required in Sweden and Switzerland
- FCVS required to preserve containment function
- No technical difficulties to install and maintain FCVS
- Counterparts emphasized that the installations did not extend scheduled refueling outage times
- Completed within 2 to 3 years
- FCVS considered cost-beneficial as designed

Stakeholder Input

- Public meetings held May 2nd and May 14th
- Nuclear Energy Institute letter May 25, 2012
- Public is very engaged – over 5 hours of input and comments received during public meetings.

Next Steps for FCVS Decision

- Staff Actions
  - Assess results of RES analyses of Fukushima
  - Finalize options and recommendations
  - Consider stakeholder input
  - Japan Lessons Learned Steering Committee review and approval
- ACRS Review
- July 2012
  - Response to Commission SRM due
  - SECY Paper to the Commission with options and staff recommendations

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NTTF Recommendation 5.2: Reliable Hardened Vents for Other Containment Designs

Briefing to the
Advisory Committee on Reactor Safeguards
May 22, 2012

Background

- The NTTF recommended that the Commission direct the staff to reevaluate the need for hardened vents for other containment designs (other than BWR Mark I and Mark II containments)
- Prioritized as Tier 3 in SECY-11-0137
- Commission agreed with Tier 3 prioritization

Staff Assessment - Recommendation 5.2

- Historically, concern with containment venting has been on Mark I and II containment designs.
- Mark I and II designs are susceptible to over-pressurization if a means to remove heat from containment are lost.
- Other containment designs are less susceptible to over-pressurization.

Staff Assessment - Recommendation 5.2 (cont'd)

- There are limited resources (staff with specialized expertise) in this area.
- Staff recommends that further consideration of venting for other containment designs be deferred.
- Consideration of hardened reliable vents for other containment designs will resume when issues for Mark I and II designs are resolved.