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1 UNITED STATES OF AMERICA

2 NUCLEAR REGULATORY COMMISSION

3 + + + + +

4 ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

5 (ACRS)

6 + + + + +

7 FUKUSHIMA SUBCOMMITTEE

8 + + + + +

9 PRELIMINARY PLANS FOR DISPOSITION OF

10 NEAR-TERM TASK FORCE TIER 3 RECOMMENDATIONS

11 AS WELL AS HARDENED AND FILTERED VENTS

12 + + + + +

13 TUESDAY

14 MAY 22, 2012

15 + + + + +

16 ROCKVILLE, MARYLAND

17 + + + + +

18 The Subcommittee met at the Nuclear  
19 Regulatory Commission, Two White Flint North, Room T2B1,  
20 11545 Rockville Pike, at 1:00 p.m., Stephen P. Schultz,  
21 Chairman, presiding.

22 SUBCOMMITTEE MEMBERS PRESENT:

23 STEPHEN P. SCHULTZ, Chair

24 J. SAM ARMIJO

25 SANJOY BANERJEE

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2 MICHAEL CORRADINI  
3 HAROLD B. RAY  
4 JOY REMPE  
5 MICHAEL T. RYAN  
6 WILLIAM J. SHACK  
7 JOHN D. SIEBER  
8 GORDON R. SKILLMAN  
9 JOHN W. STETKAR  
10

1 NRC STAFF PRESENT:

2 ANTONIO DIAS, Designated Federal Official

3 JOHN MONNINGER

4 DAVID BROWN

5 ROBERT FRETZ

6 ROBERT DENNIG

7 TIMOTHY COLLINS

8 RICHARD LEE

9 DON DUBE

10 JENISE THOMPSON

11 NILESH CHOKSHI

12 DOUG COE

13 KEVIN COYNE

14  
15 ALSO PRESENT:

16 PAUL GUNTER

17 STEVEN KRAFT

18 BOB LEYSE (present via telephone)

19 ADRIAN HEYMER

20  
21  
22  
23  
24  
  
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## 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

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

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

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

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

18 My name is John Monninger. I am the  
19 Associate Director for the NRC's Japan Lessons Learned  
20 Directorate. I am leading up our efforts on the Tier  
21 3 activities which is the focus of today's discussion.

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

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

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

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

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

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

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

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

15           So, if I could please have the second slide?

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

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

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1 et cetera.

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

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

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

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

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

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

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

16             If I could have the next slide?

17             Then, the Commission, in March,  
18      approximately two weeks after the event, the Commission  
19      issued directions to the staff to establish the  
20      Near-Term Task Force. The Task Force and the report  
21      was led up by Charlie Miller, and it was to conduct a  
22      systematic review of the lessons learned from the event.

23      It is from this Task Force report that we begin to pick  
24      up on our Tier 3 items that are going to be the focus  
25      of the next day-and-a-half discussions.

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1 If I could have the next slide?

2 Where are we? This is, on here, this is  
3 the conclusion from the Task Force, and this is also  
4 a conclusion that the Commission reached: that a  
5 similar sequence of events that had occurred in Japan  
6 was unlikely to occur within the U.S., within the nuclear  
7 power plants within the U.S. And that, also, we had  
8 confidence that there are existing mitigation measures  
9 that could be used to reduce and mitigate the potential  
10 of a severe accident. As a result, there was no imminent  
11 risk from continued operation and licensing activities.

12 Nevertheless, the Near-Term Task Force and the  
13 Commission highlighted a significant list of areas that  
14 warranted further enhancements in our safety posture  
15 for U.S. nuclear power plants.

16 So, if we could have the next slide?

17 The Task Force issued the report last July.

18 The Commission directed the staff to evaluate that  
19 report, evaluate the recommendations within the report,  
20 and propose a disposition. The staff came up with  
21 something they called the Tiers, the Tier 1, the Tier  
22 2, the Tier 3. Today, we will chat about the Tier 3.

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

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

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

11 And the third group is the Tier 3 items.

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

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

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

6           So, then, we have three orders, three Tier  
7           1 orders that did go out in the March timeframe. The  
8           first one was the need to develop strategies and procure  
9           additional equipment to address beyond-design-basis  
10          external events and multi-unit events. The staff is  
11          working, not only for this one, but for all of the orders,  
12          is working on the guidance development and engaging with  
13          all our stakeholders out there on these particular  
14          technical topics.

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

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

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

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

8 So, the next slide.

9 Requests for information. We issued  
10 three-four requests for information. The first one,  
11 the focus was on seismic and flooding hazard  
12 reevaluation. The notion was that the standards  
13 throughout the years have changed, and for licensees  
14 to do an assessment of their current plants against the  
15 most recent flooding and seismic standards out there.

16 In addition to that, licensees were to do walkdowns  
17 of their facilities, to once again verify compliance  
18 with the design basis at their plant.

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

24 The next slide.

25 Rulemaking. The staff has issued two

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

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

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

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

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

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

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1 charter. Within that charter was the establishment of  
2 a Steering Committee, a Steering Committee composed of  
3 the various Office Directors, the Program Office  
4 Directors, plus two Regional Administrators. They were  
5 to oversee the implementation of the Tier 1 and Tier  
6 2 activities and, also, guide the Tier 3 activities  
7 underway.

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

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

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

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

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

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

14 So, the question is, in pulling together  
15 these plans, what is within the scope of these plans?

16 What is the purpose of these plans? What we tried to  
17 do is really define what are the key issues that need  
18 to be addressed and what are the real information needs  
19 out there to support a recommendation on the need for  
20 regulatory action. We are not trying to pull together  
21 a 10-year research program on a particular technical  
22 topic. We are driving towards a plan that will support  
23 our needs for a regulatory decision, a regulatory  
24 decision meaning additional orders or a decision meaning  
25 no action is needed.

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1           So, that is what we want our plans to do,  
2           is drive us to a clear decision where we can come back  
3           to you individuals and we can engage back with the  
4           Commission and say we have thought about this issue.

5           We have pulled together a plan. We have pulled together  
6           the information. We did whatever research analysis  
7           testing is needed. And as a result of that, we recommend  
8           rulemaking order or we recommend this particular topic  
9           can be closed out, based on the following technical  
10          assessment.

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

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

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

3                   (Laughter.)

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

14                 MEMBER CORRADINI: Since you picked that  
15                 example --

16                 MR. MONNINGER: Shall I pick a different  
17                 one?

18                 (Laughter.)

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

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

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

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

8 For hydrogen -- and hydrogen will be a very  
9 good discussion, and Fred will lead it up to us -- but  
10 we are going to look at it, various issues, as just  
11 starting out with the basic how is hydrogen produced.

12 Is it consistent with our understanding? How much  
13 hydrogen is produced? Is it consistent with our  
14 understanding? Is the timing of hydrogen produced  
15 consistent with our understanding? What is the threat  
16 of hydrogen and the potential pathways in which it can  
17 be migrated?

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

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

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

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

11 MR. MONNINGER: Yes.

12 MEMBER CORRADINI: It is pretty clear it  
13 got out.

14 MR. MONNINGER: Yes.

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

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

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1 MR. MONNINGER: Right.

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

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

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

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

21 And hydrogen, again, is a good example.  
22 If I look at some of the information for Recommendation  
23 6, it talks about getting insights if the seals leak,  
24 data that are needed to go forward. And I don't see  
25 anything about that explicitly in the packages that have

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

7               MR. MONNINGER: Right, right.

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

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

12              MEMBER REMPE: Uh-hum.

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

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

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

20              (Laughter.)

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

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

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

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

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

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

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1 example, came from ACRS, but that one is not listed here.

2 Is there a reason?

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

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

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

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

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

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

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

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

16 Does that --

17 MEMBER REMPE: I understand.

18 MR. MONNINGER: Yes.

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

21 MEMBER CORRADINI: It doesn't get lost --

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

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

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1 MR. MONNINGER: Yes.

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

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

11 MEMBER ARMIJO: Yes, in unit --

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

13 MEMBER ARMIJO: Right.

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

16 MEMBER ARMIJO: It was in that?

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

22 MEMBER ARMIJO: Okay.

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

25 MEMBER ARMIJO: Okay. Okay. So, it is

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

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

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

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

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

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

15 MEMBER ARMIJO: But it is being addressed?

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

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

23 MR. MONNINGER: Right.

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

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

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

7 Okay. Initially, we tried to come up with  
8 a flowchart as to how we would look at these issues.

9 And the notion was that we could come out in one of  
10 three different paths. It didn't quite turn out exactly  
11 this way. There are some hybrids between them.

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

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

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1 closeout of that particular issue.

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

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

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

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

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

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

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

4 MR. MONNINGER: Yes.

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

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

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

18 MEMBER CORRADINI: Okay.

19 MR. MONNINGER: But, regardless of that,  
20 the Commission basically said proceed with  
21 Recommendations 2 through 12 and have Recommendation  
22 1 on a separate track.

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

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

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

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

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

15 MR. MONNINGER: Yes.

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

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

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

25 MR. MONNINGER: You are going to talk about

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1       that today.

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

7                   So, that is an existing tool that the staff  
8       would use.   If the staff wanted to proceed with any of  
9       these items here, if they want to pursue regulatory  
10      action, they have to try two things:   adequate  
11      protection or the cost-beneficial safety enhancement.

12                  And the cost-beneficial safety is heavily influenced  
13      or heavily based on PRA.   It is based on the safety goals,  
14      based on risk-informed regulation.

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

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

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

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

7 MEMBER ARMIJO: All of these --

8 MR. MONNINGER: -- core damage.

9 MEMBER ARMIJO: -- all of Tier 3.

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

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

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

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

8           MEMBER CORRADINI: Okay.

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

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

15          MR. MONNINGER: Yes.

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

18          MR. MONNINGER: No.

19          MEMBER SHACK: No, that is a separate  
20          thing.

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

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1 July timeframe.

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

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

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

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1 to go back to our existing regulatory framework.

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

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

12 MR. BROWN: Which includes consideration  
13 of land contamination.

14 MR. MONNINGER: Which includes  
15 consideration in a way.

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

18 MR. MONNINGER: Yes, I do. It is this  
19 Thursday, the 24th, from 1:30 to 3:30. And it is  
20 probably in your room. It is in Two White Flint 2B3.

21 So, whether it is this room or it is the next one --

22 MEMBER RYAN: Thank you.

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

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1 MR. MONNINGER: Right.

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

5 MR. MONNINGER: Right.

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

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

10 MEMBER RAY: Okay.

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

14 MEMBER BLEY: They have wrapped up?

15 MR. MONNINGER: Well --

16 MEMBER BLEY: Or put them in package?

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

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

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

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

25 MEMBER RAY: Yes, that is what I was trying

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

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

7 MEMBER RAY: Okay.

8 MR. MONNINGER: And then, just getting back  
9 to our flowchart, the majority of the items came to the  
10 big rectangular box at the bottom, the program plan.

11 And that is the majority of the plans that were pulled  
12 together.

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

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

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

23 MR. MONNINGER: Yes, yes.

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

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1 out.

2 MR. MONNINGER: Yes.

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

6 MR. MONNINGER: Right, right.

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

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

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

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

5 I am not sure if that helps.

6 MEMBER SKILLMAN: It does. Thank you.

7 MR. MONNINGER: Yes.

8 MEMBER SKILLMAN: Thanks.

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

11 MEMBER SKILLMAN: Thank you.

12 MEMBER CORRADINI: And I guess just to  
13 follow up on Dick's question, so, then, that decision  
14 would be based on -- maybe you said it and I missed it.

15 What is the criteria that is going to decide between  
16 developing an implementation plan and recommended  
17 closeout? In other words, it could be risk-informed,  
18 but it is not going to be risk-based. So, that isn't  
19 it.

20 MR. MONNINGER: Right.

21 MEMBER CORRADINI: So, what is it?

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

25 MEMBER SHACK: The greater decisionmaking

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1 process, no doubt.

2 MR. MONNINGER: Yes.

3 MEMBER CORRADINI: Oh, that helps a lot.

4 (Laughter.)

5 MR. MONNINGER: And all these issues, I  
6 would assume that we will come back to the ACRS. Whether  
7 we are proposing an order, a rulemaking, or if we are  
8 proposing to close it out, the intent is to clearly  
9 document our assessment and our basis. So, for one  
10 reason or another, if we do recommend closeout and the  
11 Commission approves that, someone can come back in 10,  
12 15, 20 years and determine what was the regulatory basis  
13 for that. Whether it is a risk-informed approach or  
14 some other criteria, you know, we would have to pull  
15 together that logic.

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

19 MEMBER CORRADINI: So, let me ask about  
20 orders and Mark I and Mark II. Is there a basis there?

21 I mean, the legalities of it escape me. So, let's put  
22 those aside. Is there a basis there that one can look  
23 at and say, "Gee, that basis made sense. We should apply  
24 that sort of approach to develop criteria to decide that  
25 you have to go forth with orders for these things that

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

3 MR. MONNINGER: Yes.

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

6 MR. MONNINGER: Yes.

7 MEMBER CORRADINI: It sounds a bit fuzzy,  
8 but, of course, everything is a bit fuzzy at this point.

9 I am just trying to work back to what you have already  
10 done, and under the assumption it wasn't done in haste,  
11 what is the criteria you used so that you could replicate  
12 it or the protocol you used to replicate it?

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

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

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

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

7 MEMBER CORRADINI: Okay.

8 MEMBER SHACK: For an AC-powered unit.

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

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

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

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

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

3 MR. MONNINGER: Yes.

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

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

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

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

11 (Laughter.)

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

14 CHAIR SCHULTZ: Go ahead.

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

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

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

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

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

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

25                  So, this particular first issue is the

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1 remains of one of the Tier 1 issues.

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

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

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

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

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

15 MEMBER SHACK: Well --

16 MEMBER RAY: Ultimately?

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

22 MR. MONNINGER: The current order.

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

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

7 The question is, should we go the next step  
8 in potentially changing that design for however it may  
9 be changed for the source-term and the hydrogen, and  
10 everything else to come out following a severe accident?

11 Or should we potentially consider putting a filter on  
12 the end of it? So, that is the piece that is still  
13 underway. And that is also recommendations to the  
14 Commission in the July timeframe.

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

19 MR. MONNINGER: Right now, we are looking  
20 at it just for the Mark Is and Mark IIs. Recommendation  
21 5.2, which is a Tier 3 issue, asks the staff to look  
22 at other containment designs. And I don't want to steal  
23 the group's thunder, but the notion is the bang for the  
24 buck is probably upfront with the Mark Is and IIs. So,  
25 that is where the current focus is, on the Mark Is and

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

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

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

9 MR. FRETZ: Good afternoon. Good  
10 afternoon, Dr. Schultz and the Committee. Thank you  
11 for having us here to talk about the issue that John  
12 Monninger I guess did a great job of helping introduce.

13 And that is the topic of filtered containment venting  
14 systems.

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

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

25 So, we are here to discuss the Tier 1 issue

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

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

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

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

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

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

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

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

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

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

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

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

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

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

14 MEMBER ARMIJO: Well, yes.

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

18 MEMBER ARMIJO: Yes.

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

21 MR. DENNIG: We are looking at the options,  
22 but we have got to start someplace and go someplace.

23 But we are aware of the different configurations. The  
24 fact that Mark IIs are starting from scratch, they could  
25 put a vent wherever they would like. Some Mark IIs have

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

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

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

16 MR. DENNIG: They vented in an undesirable  
17 way.

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

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

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

3 MEMBER BANERJEE: Or could they?

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

6 MEMBER BANERJEE: Right. But they had  
7 hardened vents.

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

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

18 MR. DENNIG: They tried to manually open  
19 it.

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

25 MR. DENNIG: Well, that is not the

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1 intention. The Tier 1 is Mark Is and Mark IIs. And  
2 your Tier 1, because of Mark I failure at Fukushima and  
3 there is a significant amount of research on Mark Is  
4 that basically says that they are very highly likely  
5 not to contain severe core damage; and that, thus, the  
6 original hardened vent. And so, you have a sense from  
7 the analytical side that this is probable or possible.

8 And now, you have operating experience that says yes,  
9 indeed, you are right in terms of your postulations.

10 And that is why that is Tier 1.

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

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

15 MR. COLLINS: No, it is Tier 1 to consider  
16 filters, not necessarily put filters on. It is Tier  
17 1 to put in an unfiltered vent. That is the order.  
18 Okay? That is Tier 1. But it is also Tier 1 to examine  
19 filters.

20 MEMBER CORRADINI: For the BWR?

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

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

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1 with, but is it really --

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

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

15 MR. DENNIG: It does make for additional --

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

18 MEMBER SHACK: Right.

19 MR. COLLINS: Right?

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

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

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1 maintain the containment integrity at the same time.

2 You maintain the integrity by capturing the fission  
3 products in the filter. Okay?

4 Remember, the containment is there not to  
5 contain heat. It is there to contain fission products.

6 So, it is very confusing when you talk about these two  
7 different vent concepts. One removes the heat; the  
8 other one removes the heat and maintains the containment  
9 integrity at the same time. That is why the second one  
10 is being considered to filter it. Do we really want  
11 to strengthen the containment or do we just want to  
12 remove the heat, hoping to prevent core damage?

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

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

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

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1 and which are the ones that need upgrading?

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

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

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

13 MEMBER CORRADINI: For the order? For the  
14 order?

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

19 MEMBER CORRADINI: Okay.

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

22 MEMBER CORRADINI: Right. Okay. Thank  
23 you.

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

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1 (Laughter.)

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

5 MR. DENNIG: These are all good questions.

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

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

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

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

2 Okay. Slide 4, please.

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

8 MR. DENNIG: Not today.

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

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

14 MEMBER CORRADINI: Okay. Fine. Thank  
15 you.

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

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

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

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

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

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

10 Next slide, please, slide 5.

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

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

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

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

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

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

13 MR. FRETZ: Sure. Please.

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

16 MR. FRETZ: Okay.

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

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

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

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1 means --

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

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

8 MR. DENNIG: Yes.

9 MR. FRETZ: I think it is yes.

10 MEMBER STETKAR: Okay.

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

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

21 MR. FRETZ: I believe the answer is yes.

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

25 CHAIR SCHULTZ: Go ahead.

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1 MR. FRETZ: Okay. Thanks.

2 In addition, part of our review will be  
3 taking a look at some of the past regulatory actions.

4 You know, Containment Performance Improvement Program  
5 is, indeed, among the many items we will be looking at.

6 We will also be looking at establishing insights from  
7 Fukushima and, then, informing our recommendations and  
8 decisions under that.

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

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

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1 over here.

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

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

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

17 My name is Tony Dias.

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

21 MEMBER ARMIJO: Okay. The date?

22 MR. DIAS: June 20th.

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

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

12 MEMBER ARMIJO: You say Europe, and you  
13 have got two countries there, Sweden and Switzerland.

14 Do you know if the Germans --

15 MR. DENNIG: Yes.

16 MEMBER ARMIJO: And the Finns?

17 MR. DENNIG: Yes.

18 MEMBER ARMIJO: All of them?

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

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

6                   MEMBER BANERJEE: They are all ABB plants?

7                   MR. FRETZ: Yes.

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

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

12                  MEMBER BANERJEE: Leibstadt is?

13                  MR. DENNIG: A GE Mark III.

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

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

18                  MR. DENNIG: No.

19                  MEMBER ARMIJO: In Nuclenor and --

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

22                  MEMBER ARMIJO: That is Nuclenor.

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

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

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

5 MR. DENNIG: Yes.

6 MEMBER ARMIJO: Okay.

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

17 Next slide, please.

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

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

6 Next slide, please.

7 In the energy bill of 1980 and 1981, the  
8 government specified, basically, a two-step process.

9 First, that they expedite a filtered containment  
10 venting system for Barseback, which is located near  
11 Copenhagen, and consider filtered containment venting  
12 systems for Forsmark, Ringhals, and Oskarshamn, and,  
13 also, identify any alternatives to filtered containment  
14 venting systems that would accomplish the same purposes  
15 of strengthening the containment and reducing the risks,  
16 as I mentioned on the previous slide.

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

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

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1 Ringhals, and Oskarshamn.

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

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

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

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

16 MEMBER BANERJEE: But cost was not?

17 MR. DENNIG: It was not.

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

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

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

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

4               MR. DENNIG: No.

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

9               MR. DENNIG: Oh, yes. Yes.

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

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

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

20              MEMBER CORRADINI: Okay. Thank you.

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

23              MR. DENNIG: Yes.

24              MEMBER BANERJEE: For five years? Is that  
25       it?

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

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

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

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

9 MEMBER BANERJEE: Okay. And full of  
10 gravel?

11 MR. DENNIG: Full of gravel.

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

14 MR. DENNIG: The ones that are used now?

15 MEMBER BANERJEE: Yes.

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

18 MEMBER SKILLMAN: The gravel was resin of  
19 some sort?

20 MR. COLLINS: I think it was plain gravel.

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

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

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

4 Question two is, I read through the history.

5 Is the Swedish regulatory emphasis to deal with severe  
6 accidents or to deal with design-basis events that could  
7 lead to severe accidents? In other words, you were very  
8 clear in operating, removing heat, and then,  
9 essentially, looking at the venting system if it goes  
10 into the realm of severe accidents, and then looking  
11 at its capability and then filtering for fission  
12 products. What was the history here?

13 MR. DENNIG: They addressed severe  
14 accidents.

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

17 MR. DENNIG: Yes.

18 MEMBER CORRADINI: Okay. Fine. Thank  
19 you.

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

22 MEMBER CORRADINI: Okay.

23 MR. DENNIG: -- for mitigation purposes.

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

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1 and not force the flow through the wetwell?

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

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

15 MR. DENNIG: Again, for pressure control.

16 MR. COLLINS: Right.

17 MEMBER CORRADINI: Okay. Thank you.

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

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

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

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

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

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

18 MR. FRETZ: It is a rupture disc.

19 MEMBER BANERJEE: Okay.

20 MR. FRETZ: Go ahead.

21 MR. COLLINS: The valves in the line, there  
22 are motor-operated valves that are normally open in that  
23 line. And the rupture disc will rupture on a  
24 very-high-pressure signal, and the valves will close  
25 10 minutes later.

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

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

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

10                  MR. FRETZ: The protective filters?

11                  MEMBER CORRADINI: Yes.

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

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

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

22                  MEMBER BANERJEE: They are external,  
23 right?

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

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1 MEMBER CORRADINI: Okay.

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

7 MEMBER CORRADINI: All right. Thank you.

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

11 MR. DENNIG: To test the filters  
12 themselves?

13 MEMBER BANERJEE: Yes. And the whole  
14 system.

15 MR. DENNIG: The whole system?

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

22 MEMBER BANERJEE: They do the whole flow  
23 path?

24 MR. DENNIG: Yes?

25 MEMBER BANERJEE: Everything?

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1 MR. DENNIG: Yes.

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

4 MR. DENNIG: Yes.

5 MEMBER BANERJEE: How often do they do  
6 that?

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

10 MEMBER SKILLMAN: What is the filter media?

11 MR. DENNIG: It is chemically-treated  
12 water.

13 MEMBER SKILLMAN: Okay. Thank you.

14 MEMBER BANERJEE: The stuff just bubbles  
15 through the sparger.

16 MR. FRETZ: Using the multi-venturi  
17 effects.

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

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

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

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

13          MEMBER BANERJEE: It just evaporates? Is  
14          that --

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

17          MEMBER BANERJEE: It evaporates?

18          MR. DENNIG: Yes.

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

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

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

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

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

7 MR. FRETZ: Yes.

8 MEMBER BANERJEE: Just a sparger with  
9 venturi?

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

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

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

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

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

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

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1 efficient way to scrub the effluent from the  
2 containment.

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

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

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

10 Next slide, please.

11 Let's kind of start at the bottom, if you  
12 will, in terms of the decontamination factor  
13 requirements. To get a DF of 100 for aerosols and a  
14 comparable figure for iodine, if you have that, then  
15 you are considered to have met the criteria that is above  
16 that, which is that there is no release, no more than  
17 .1 percent core inventory cesium-134, -137, and iodine  
18 from the equivalent of an 1800-megawatt thermal reactor.

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

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

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

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

10          MR. FRETZ:  No, this was tested.

11          MEMBER SIEBER:  Oh, it is tested?

12          MR. FRETZ:  Yes.

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

17          MEMBER BLEY:  You have not seen those yet?

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

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

24          MR. DENNIG:  Yes.

25          MEMBER STETKAR:  You didn't ask them what

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

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

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

8 MR. DENNIG: Uh-hum.

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

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

15 MEMBER STETKAR: They hadn't done it?

16 MR. DENNIG: Right.

17 MEMBER ARMIJO: Why? That is hard to  
18 understand.

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

21 (Laughter.)

22 MEMBER CORRADINI: Why? Did you do them?

23 MEMBER STETKAR: Back in the nineties, yes.

24 MEMBER ARMIJO: Sure.

25 MEMBER STETKAR: But they have redone them.

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

3                   MEMBER STETKAR: Nope.

4                   (Laughter.)

5                   MR. DENNIG: Next slide, please.

6                   Okay. A summary of the design. It is  
7 passive filter. It is inerted with nitrogen. The  
8 achieved decontamination factor for aerosols is 1,000.

9                   The heat-removal capability is calculated to be 1  
10 percent. It is acknowledged as a vent for hydrogen.

11                  So, there are no ignition sources, and it is vented  
12 to a safe location.

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

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

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

25                  MEMBER SHACK: And the pressure they vent

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1 at? Or the pressure for the rupture disc?

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

4 MEMBER SHACK: Design?

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

7 Next slide, please.

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

12 The bottom line is the one that has the  
13 rupture disc in it, and then followed by two  
14 normally-opened valves. The top line is for active  
15 control. That valve is normally closed, and there are  
16 additional control valves to the left off of the picture.

17 And then, you can obviously close these normally-open  
18 valves to stop the flow through the rupture-disc line.

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

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

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

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1 MR. DENNIG: Uh-hum.

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

4 MR. DENNIG: Yes.

5 MEMBER BANERJEE: Right?

6 MR. DENNIG: Uh-hum.

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

9 MR. DENNIG: You can actively vent --

10 MEMBER BANERJEE: For control vent?

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

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

17 MR. DENNIG: Air.

18 MEMBER BANERJEE: Yes, but air comes --

19 MR. DENNIG: And then, the nitrogen  
20 bottles.

21 MEMBER BANERJEE: Oh, off nitrogen  
22 bottles?

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

25 MEMBER BANERJEE: Okay.

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

4 MEMBER BANERJEE: So, just solenoids have  
5 to open?

6 MR. DENNIG: Right. Uh-hum.

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

10 MR. DENNIG: Yes. Yes.

11 MEMBER ARMIJO: Okay.

12 MEMBER SHACK: And how big is that vent  
13 line?

14 MR. DENNIG: It's 10 inches?

15 MR. FRETZ: Ten inches, something like  
16 that.

17 MEMBER BANERJEE: These are  
18 seismically-qualified and everything?

19 MR. DENNIG: Yes.

20 MEMBER SKILLMAN: That is a Monroe shock  
21 absorber.

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

24 MR. DENNIG: Okay. Next slide.

25 MEMBER BANERJEE: And to what sort of

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1 earthquakes is this supposed to be?

2 MR. DENNIG: Whatever the containment is.

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

5 MR. DENNIG: Next slide, please.

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

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

24 Next slide, please.

25 Again, Forsmark. On the left you see

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

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

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

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

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

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

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

9 MEMBER SIEBER: It is a pretty old truck.

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

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

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

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

20 MEMBER SIEBER: Twenty-six years ago.

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

25 These costs are not in 2012 dollars. So,

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

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

6               MR. FRETZ:   How long ago?

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

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

11               (Laughter.)

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

14               MR. FRETZ:   They didn't say.

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

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

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

23               MEMBER ARMIJO:   I know they can open a  
24       valve.

25               MR. DENNIG:   Right.

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

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

5                   MEMBER ARMIJO: Yes, yes.

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

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

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

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

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1 environment."

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

6 Next slide, please.

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

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

14 MR. DENNIG: No, Muhleberg --

15 MEMBER BANERJEE: Mark I.

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

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

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

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

23 MR. DENNIG: Yes. They have this --

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

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

6 MEMBER ARMIJO: The torus, yes.

7 MR. DENNIG: Well, into their --

8 MEMBER ARMIJO: Outer torus.

9 MR. DENNIG: -- outer torus.

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

12 MR. DENNIG: The they have two toruses.

13 MEMBER ARMIJO: Two?

14 MR. DENNIG: Yes.

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

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

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

22 MR. DENNIG: Goes to.

23 MEMBER CORRADINI: Okay.

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

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

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

5                   MEMBER CORRADINI: Okay. Thank you.

6                   MR. DENNIG: Next slide, please.

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

10                  Next slide, please.

11                  Some more pictures. This is Leibstadt.  
12 Again, you see this branching. You have an inboard  
13 valve that is open, an outboard valve that is closed  
14 on the bottom line, and then the rupture disc is in the  
15 top segment that bypasses the closed outboard valve.

16                  The rupture disc is the containment boundary, and then  
17 you can open and close the vent outboard valve and the  
18 vent inboard valve to control the flow actively or shut  
19 off the flow after the rupture disc has ruptured and  
20 you don't want it anymore.

21                  The filter itself you can see at the right.

22                  Those are turbine building and reactor building  
23 buildings. They have two filters, basically, two wet  
24 filters. They are 9 feet by -- what? -- 27 feet high.

25                  They are located there because it is a location that

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

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

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

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

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

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

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

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

4               MEMBER BANERJEE:   Compared to what else?

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

7               MR. DENNIG:   At the what

8               MEMBER STETKAR:   You were hosted by ENSI --

9               MR. DENNIG:   Yes.

10              MEMBER STETKAR:   -- not the utilities?

11              MR. DENNIG:   Yes.

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

15              (Laughter.)

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

18              MEMBER BANERJEE:   It says "utility  
19       representatives".

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

23              (Laughter.)

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

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

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

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

11 MEMBER ARMIJO: -- the benefit in that --

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

14 MEMBER ARMIJO: Okay. All right.

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

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

18 MEMBER ARMIJO: Muhleberg is fine.

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

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1 to that. But they said they had done one.

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

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

7 MR. DENNIG: Okay. Next slide, please.

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

10 And then, I am going to turn it back over  
11 to Bob Fretz for discussion of stakeholder input and  
12 5.2.

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

16 MR. DENNIG: Uh-hum.

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

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

25 MEMBER ARMIJO: Okay.

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1 MEMBER SIEBER: Interesting.

2 MR. FRETZ: Okay. I guess next slide.

3 As part of our process for evaluating  
4 whether or not we should impose requirements related  
5 to severe accident service as well as filtration of these  
6 hardened vents, we have held a number of public meetings.

7 Specifically relating to this issue, we held two public  
8 meetings during the month of May to discuss the issue  
9 of filter vents.

10 In addition, I know the Nuclear Energy  
11 Institute has sent Chairman Jaczko a letter. It was  
12 actually dated the 15th of May. That is a typo on there.

13 But it was dated the 15th of May, asking consideration  
14 for other alternatives relating to that. And now we  
15 are looking at that letter, and we hope to inform our  
16 decision based upon some of the ideas that are being  
17 presented to us from the industry.

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

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1 Next slide.

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

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

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

10 MR. FRETZ: Yes.

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

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

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

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

25 And again, you, the Commission, we provide

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

6               Next slide.

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

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

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

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

5 Next slide, please.

6 So, with that, again, with our focus on the  
7 Tier 1 activities, there are just limited resources  
8 within the staff. That includes Research as well as  
9 the Office of Nuclear Reactor Regulation in this area.

10 So, we are going to recommend that further  
11 consideration of venting for designs other than the BWR  
12 Mark I and Mark II be deferred, at least at this time,  
13 until a decision is essentially made on the Mark I and  
14 Mark II filter issue, severe accident service issue,  
15 that we hope to get settled really this summer or later  
16 on.

17 Next slide, please.

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

21 CHAIR SCHULTZ: Other comments or  
22 questions by the Committee?

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

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

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

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

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

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

16 MEMBER ARMIJO: Yes?

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

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1           MEMBER ARMIJO:   Well, I don't want to  
2       debate it, but I was in Japan a few weeks ago, and the  
3       utility guys had a different view of that, who said what.

4       But I just was looking for a technical reason.   Is there  
5       something fundamentally-good about a big containment  
6       that somehow takes out particles in the aerosols, so  
7       you wouldn't benefit from a filtered --

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

12          MEMBER ARMIJO:   Right.

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

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

25          MR. MONNINGER:   Dr. Armijo, this is John

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1 Monninger from the staff.

2 MEMBER ARMIJO: Yes.

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

9 MEMBER ARMIJO: Right.

10 MR. MONNINGER: Right? What do our PWRs  
11 do? Within the PWRs for these equivalent-type  
12 sequences, you are running your aux feedwater into your  
13 steam generator and you are dumping to the environment.

14 So, there is a fundamental difference in the management  
15 of decay heat between the BWRs and the PWRs for these  
16 equivalent accident sequences. BWRs are bottled up.

17 You are dumping it into your suppression pool and you  
18 are heating it up. The PWRs, through aux feedwater,  
19 you are dumping it to the environment.

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

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

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

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

7 MEMBER ARMIJO: Okay.

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

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

12 CHAIR SCHULTZ: Other comments from the  
13 Committee?

14 (No response.)

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

20 (No response.)

21 Hearing no comments, we have a comment here.

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

25 And Dr. Shack was kind of hinting at this

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

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

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

25 So, it is just some consideration for the

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

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

6 CHAIR SCHULTZ: Other comments? Yes?

7 MR. GUNTER: Thank you.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

20 MR. GUNTER: It is excluded, right.

21 MR. DENNIG: It is excluded, yes.

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

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

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

8 MR. DENNIG: Yes.

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

11 Hearing no other comments at this time --

12 MR. KRAFT: Excuse me. Sorry.

13 CHAIR SCHULTZ: Yes? Go ahead.

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

16 There is a reference that Robert made to  
17 our letter that we sent in the other day. Here it is.

18 If you don't have copies of it, I am more than happy  
19 to make it available to you.

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

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

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

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

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

18 MR. KRAFT: Thanks very much.

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

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

6 Thank you.

7 MR. LEYSE: Can you hear me?

8 CHAIR SCHULTZ: Yes, we can.

9 MR. LEYSE: Am I on?

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

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

15 In terms of a holistic approach, this  
16 2200-degree Fahrenheit criterion that many plants run  
17 under, for example, Palo Verde, the Baker-Just equation  
18 is based on specimens, zircaloy specimens, that you can  
19 handle, walk around with in your pocket as pocket change.

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

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1 End of comment.

2 CHAIR SCHULTZ: Thank you, Bob.

3 Other comments?

4 MR. MONNINGER: Dr. Schultz?

5 CHAIR SCHULTZ: Yes?

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

9 CHAIR SCHULTZ: Yes.

10 MR. MONNINGER: The staff's desire is, of  
11 course, a letter from the ACRS, preferably a positive  
12 letter, at this time or in the near future on the Tier  
13 3 items. So, that would not include our discussion at  
14 the current time on the filter vents.

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

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

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1 CHAIR SCHULTZ: We should discuss that  
2 schedule --

3 MR. MONNINGER: Okay.

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

7 MR. MONNINGER: Right.

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

12 MR. MONNINGER: Yes. Thank you.

13 CHAIR SCHULTZ: Thank you.

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

17 (Whereupon, the foregoing matter went off  
18 the record at 3:40 p.m. and went back on the record at  
19 3:53 p.m.)

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

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

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1 Jenise, welcome.

2 MS. THOMPSON: Thank you.

3 Good afternoon.

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

11 As I am sure you are all probably sick of  
12 hearing, the Near-Term Task Force Report identified a  
13 set of recommendations to be undertaken by the staff.

14 Recommendation 2.2 reads that, "The staff should  
15 initiate rulemaking to require licensees to confirm  
16 seismic hazards and flooding hazards every 10 years and  
17 address any new and significant information; if  
18 necessary, update the design basis for SSCs important  
19 to safety to protect against the updated hazards." So,  
20 that is the text of Recommendation 2.2.

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

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

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

10 So, with respect to Recommendation 2.2, the  
11 staff's approach, as of today, is to define and begin  
12 some initial pre-rulemaking activities that we feel are  
13 necessary to position us for a future rulemaking  
14 activity to implement this recommendation. And that  
15 would only be done as resources become available because  
16 the staff is very heavily engaged with Recommendations  
17 2.1 and 2.3 in the Tier 1 activities at this point.  
18 So, we don't want to take away any resources, either  
19 staff or contractor resources, for a Tier 3 item at this  
20 point.

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

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1 included other natural external hazards. So, the staff  
2 is also assuming that those other natural external  
3 hazards would be included in the scope of Recommendation  
4 2.2 as well.

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

11 MEMBER SKILLMAN: Jenise?

12 MS. THOMPSON: Yes?

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

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

18 MEMBER SKILLMAN: Natural.

19 MS. THOMPSON: I'm sorry?

20 MEMBER SKILLMAN: Natural.

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

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

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

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

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

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

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

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

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

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

13 MEMBER BANERJEE: No, no, the --

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

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

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

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

23 MR. CHOKSHI: Yes, flooding --

24 MEMBER RYAN: Rain, tornadoes, hurricanes?

25 MS. THOMPSON: Right.

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

3 MEMBER RYAN: Oh, okay, yes.

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

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

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

25 MEMBER SKILLMAN: Thank you.

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

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

11                  MEMBER SKILLMAN:   Right.   Okay.

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

16                  MEMBER SKILLMAN:   Thank you.

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

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

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1 stakeholders as well. So, trying to capture those  
2 interactions as well to see how they would feed into  
3 Recommendation 2.2. So, as you were bringing up some  
4 of the examples of other natural or man-related external  
5 hazards, that is something that will be addressed as  
6 part of Recommendation 2.1. So, we want to make sure  
7 that we are not making two different decisions, one for  
8 2.1 and one for 2.2.

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

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

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

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

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

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

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

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

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1 end-product to be at the end of it.

2 And then, finally, there is a lot of  
3 information from international practices, as well as  
4 our own experience here in the U.S. We would like to  
5 harness that information. We want to look at the ROP.

6 We want to look at the experience that international  
7 regulators had with similar approaches.

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

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

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1 Recommendations 2.1 and 2.3.

2 But some of the questions that we received  
3 from the public were: the nexus to Fukushima for the  
4 inclusion of the other man-related external hazards.

5 This was something that we had discussed internally  
6 pretty extensively with the Steering Committee as well.

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

16 There were also some concerns from the  
17 public about old information that is newly-discovered.

18 The staff's opinion of that is that, if the information  
19 has been previously identified and dispositioned, that  
20 you wouldn't have to go back and rehash something. But  
21 if the information is older information that has never  
22 been assessed and dispositioned for the site, then that  
23 may be included, if it meets the threshold for new and  
24 significant information.

25 The date of the information isn't

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1 necessarily the focus, but it is the newly-discovered.

2 So, if it is newly discovered or recently brought to  
3 their attention, then that may be something to consider.

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

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

9 MEMBER STETKAR: Okay.

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

11 MEMBER STETKAR: Thanks.

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

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

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1 have to determine what is new and significant, and if  
2 the information meets that criterion, then, yes, it  
3 would be included within the scope of Recommendation  
4 2.2.

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

15 And then, also, as I keep mentioning, the  
16 staff is heavily engaged with Recommendation 2.1 and  
17 2.3. There has always been a schedule concern that are  
18 we going to start Recommendation 2.2 too soon. We may  
19 get into schedule concerns where people are still so  
20 busy with the work for Recommendation 2.1 and 2.3 that  
21 we may not have the staff resources to start the work  
22 on Recommendation 2.2. And that may be true for other  
23 external stakeholders as well. So, that is something  
24 that we are trying to be mindful of going forward, that  
25 the schedule does play into this quite heavily.

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1 MEMBER STETKAR: Jenise?

2 MS. THOMPSON: Yes?

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

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

12 I can go back to the text, but --

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

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

21 MEMBER STETKAR: I understand. I  
22 understand.

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

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

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

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

7 MR. CHOKSHI: Exactly.

8 MS. THOMPSON: Right.

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

11 MR. CHOKSHI: Yes.

12 MS. THOMPSON: Right.

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

19 MS. THOMPSON: Yes.

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

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

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

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

9 MR. CHOKSHI: Exactly.

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

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

18 I think that was the presentation, right?

19 MS. THOMPSON: Yes. We went for brevity.

20 (Laughter.)

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

23 CHAIR SCHULTZ: Oh, excuse me.

24 MR. MONNINGER: John Monninger.

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

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

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

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

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

24 CHAIR SCHULTZ: Thank you, John.

25 MEMBER SKILLMAN: Could I ask you to go back

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1 to slide 19 for a minute, please?

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

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

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

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

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

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1 question.

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

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

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

16 MEMBER SKILLMAN: To whom will you report  
17 this output?

18 MR. CHOKSHI: Once we do this study?

19 MEMBER SKILLMAN: Uh-hum.

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

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

3 MEMBER SKILLMAN: Okay. Thank you.  
4 Thank you.

5 MR. CHOKSHI: Does that answer your  
6 question?

7 MEMBER SKILLMAN: Thank you. Uh-hum.

8 CHAIR SCHULTZ: Other comments from the  
9 Committee or questions?

10 (No response.)

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

13 John, we will change out for the next  
14 presentation?

15 MR. MONNINGER: Yes.

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

18 Jenise, are you going to be here?

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

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

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

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1 Mitigate Seismically-Induced Fires and Floods.

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

7 CHAIR SCHULTZ: Thank you, Doug.

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

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

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

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1 potential flooding hazard in the plant.

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

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

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

19 In the SECY-11-0137 that came out in the  
20 fall, the staff prioritized Recommendation 3 as a Tier  
21 3 item. In the SRM that the Commission issued in  
22 response to that SECY paper, the Commission agreed with  
23 the Tier 3 prioritization of the overall recommendation,  
24 but also directed the staff to initiate development of  
25 a PRA method to evaluate potential enhancements as part

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1 of the Tier 1 activities.

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

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

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

21 MEMBER STETKAR: Kevin, before you flip,  
22 I am trying to keep all of the bits and pieces straight.

23 Seismically-induced external floods are treated where?

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

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1 would be treated under Recommendation 2.1, is my  
2 understanding.

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

7 MR. COYNE: Right.

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

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

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

20 MR. COYNE: I am looking at --

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

24 (Laughter.)

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

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

7                   MEMBER   STETKAR:       Knitting the two  
8       together.

9                   MR. COYNE: Right.

10                  Nilesh has a comment.

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

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

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

25                  MEMBER   STETKAR:       We talked about

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1 fragmented earlier.

2 (Laughter.)

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

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

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

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

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

18 MEMBER SHACK: It is all site-specific.

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

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

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

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

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

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

16           MEMBER SKILLMAN: Thank you.

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

21           So, I think everyone understands we have  
22 seismic PRAs; we have fire PRAs; we have flooding PRAs.

23           The challenge here is that we are looking at concurrent  
24 and coupled events, the seismic event that leads to fires  
25 that also leads to flooding.

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

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

15          The modeling of concurrent and subsequent  
16          initiating events, including the combinatorial effects  
17          you could have. If you could get a seismically-induced  
18          fire in one breaker cubicle, you could imagine getting  
19          it in another breaker cubicle and another in another  
20          location throughout the plant; similar with flooding.

21          So, getting a handle on these combination of events  
22          that could be happening concurrently through the plant  
23          and how to model them within the existing framework that  
24          we use.

25          System interactions, obviously, could be

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

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

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

16 And that includes things like what would  
17 be the overall objective of a PRA method. This is  
18 focusing mainly on the Tier 1 portion. The Commission  
19 directed development of a PRA method. So, defining  
20 objectives of the method: who would use the method?

21 Is it intended for NRC use, licensee use, or both?  
22 Stakeholders that should be involved in the development  
23 of the method and the review of the method.  
24 Information-gathering activities, that includes the  
25 traditional literature searches, but also interacting

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

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

11 And then, finally, the last portion of that  
12 plan was develop some resource and schedule estimates.

13 The staff is currently drafting that plan. Our intent  
14 is to make it available in a publicly-available memo  
15 that will be referenced in the upcoming July SECY paper.

16 So, it wouldn't necessarily be part of the SECY paper  
17 itself, but it would be available to anyone who was  
18 interested to see what was in there.

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

25 So, I was curious whether an active decision

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1 had been made to depart from that scope or --

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

5 MEMBER STETKAR: Of 2.1 --

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

10 MEMBER STETKAR: Okay. Okay.

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

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

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1 methods have been applied to non-nuclear facilities.

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

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

16 And then, finally, recognition of other  
17 Tier 1 activities will provide substantial information  
18 relevant to the issue. Some examples: obviously, the  
19 2.1 and 2.3 issues; to some extent, the 4.2 mitigation  
20 strategies issues, and probably of lesser importance  
21 are the 5.1 and 7.1 issues that are currently working  
22 their way through the process.

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

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

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

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

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

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

7 MR. COYNE: Right.

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

15 MR. COYNE: Right.

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

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

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

4 CHAIR SCHULTZ: The initiation part?

5 MR. COYNE: The initiation of that.

6 The NTF recommendations, the Tier 1, the  
7 schedule is fairly well-known from, say, the orders for  
8 2.1. We are cognizant of that, but we think the  
9 advantage we would have from getting some of the  
10 information back from the sites on seismic and flooding  
11 hazard information would be very valuable for the  
12 development of the PRA method and knowing what the  
13 current status of the information available to plants  
14 would be. And that would speak to the feasibility and  
15 practicality of any method we come up with through any  
16 Recommendation 3 activities.

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

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1 CHAIR SCHULTZ: Thank you.

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

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

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

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

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

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

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

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

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

25 MEMBER STETKAR: It can be done because

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

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

9 As far as feasibility, you know, the  
10 question of, is it practical and efficient to use the  
11 existing framework to look at events where timing may  
12 be very important, where you may have a potential -- I  
13 don't want to use the word "explosion" -- but you have  
14 this combination of events that could be more than just  
15 ones and twos, depending on the dependency you have.

16 You could imagine if you had a breaker fire caused by  
17 a seismic event, there would be a dependency among  
18 multiple breakers throughout the plant, that it would  
19 be more likely to see multiples potentially. I mean,  
20 it is very early in this method development to get at  
21 that, but it is to look at those issues.

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

25 MR. COYNE: That's right.

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

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

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

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

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

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

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

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1           MR. COE:   Actually, one way to phrase it  
2   is -- and I know this is a topic that has been debated  
3   already -- and that is, do you take a seismic PRA and  
4   you burn it or do you take a fire PRA and you shake it?

5       I mean, in simple terms, you are using the same  
6   methodology that Kevin is suggesting is the current  
7   state of practice.

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

14          So, as Kevin has tried to point out, it is  
15   an exceedingly-complex task to try to envision how to  
16   create a model that addresses all of these dependencies.

17       And so, that may lead us outside of what the current  
18   event tree/fault tree approach is. We don't know yet.

19          MR. COYNE:   But hopefully not.

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

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

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

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

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

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

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

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

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

25 MEMBER BANERJEE: Maybe more qualitative.

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

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

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

14 MEMBER ARMIJO: Jump in.

15 MEMBER BLEY: -- start moving.

16 (Laughter.)

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

20 (Laughter.)

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

23 MEMBER STETKAR: Yes.

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

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

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

15 We have had one public meeting to discuss  
16 this approach to Recommendation. That was on May 3rd.

17 There was, I will say, general agreement because after  
18 the meeting we got a letter from Citizens' Environmental  
19 Coalition with an additional comment on this, but  
20 general agreement on the prioritization of the issue  
21 as Tier 3. The Citizens' Environmental Coalition, in  
22 a May 17th letter, noted that they felt that this issue  
23 really should be included in Recommendation 2 items.

24 So, their feeling was that this should all be resolved  
25 under Recommendation 2, and Recommendation 3 would be

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1 focused on a stronger qualitative assessment of the  
2 plant relative to this issue.

3 They also noted that developing a PRA method  
4 could be an outcome, but the focus should be on  
5 qualitative methods. And they noted their belief that  
6 sometimes PRA focuses too early on quantification and  
7 not enough on a more qualitative assessment. So, I am  
8 not sure how to read that, whether that was an agreement  
9 on the prioritization of Tier 3 or whether they felt  
10 that this would really be covered by, felt that it should  
11 be covered by some of the higher-priority items.

12 MEMBER BANERJEE: Do you know the source  
13 of that comment?

14 MR. COYNE: It was a letter from Barbara  
15 Warren, I believe, from Citizens' Environmental  
16 Coalition. She was at our public meeting, but this  
17 comment came in after the public meeting.

18 We did get a comment at the public meeting,  
19 and I think it is echoed by those earlier comments, that  
20 a qualitative risk assessment approach should also be  
21 considered. And I think that is not inconsistent with  
22 the Commission's direction on developing the PRA method,  
23 that one of the motivations was to understand the  
24 accident context that the equipment would be operating  
25 in, and a PRA method is a good way to systematically

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1 do that. So, in my mind, that wouldn't rule out,  
2 certainly, looking at qualitative approaches for this  
3 resolution or for this method development activity.

4 And then, finally, ensuring that the PRA  
5 method and its application include documentation of key  
6 assumptions. And this came from a public comment that  
7 the PRA can often be viewed -- and these are my  
8 words -- as a black box, and some of the things going  
9 on in the calculation aren't necessarily readily  
10 available to a member of the public, but what is is the  
11 assumptions that are made supporting that PRA  
12 evaluation. So, a desire that whatever method we use  
13 for the PRA would include good documentation of the  
14 assumptions underpinning the method and the application  
15 of the method.

16 MEMBER SKILLMAN: I would like to offer an  
17 observation, then ask a question. In the older plants,  
18 those that were granted construction permits through  
19 the seventies, they were generally governed by emergent  
20 Reg Guides, 1.26, 1.29, and a bunch of others. And the  
21 Safety System Components, the SSCs, were commonly  
22 reactor coolant system, pressure boundary, emergency  
23 core cooling, that type of component. Fire equipment  
24 was not part of that. Fire equipment was left to the  
25 architect/engineers, and they basically went out and

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1 bought commercial grade. Just if you would hold that  
2 thought for a minute.

3 In 2007, at KK7, the earthquake toppled part  
4 of the transformers, set them on fire. The station was  
5 unable to fight those fires, and they had to bring  
6 offsite firefighting onsite.

7 A couple of years ago, D.C. Cook had a STAT  
8 rotor explosion. The ground motion was so great, it  
9 severed the fire service system. And they had to fight  
10 that fire with alternate means, a hydrogen fire.

11 So, my question is, how much of the  
12 complexity, Kevin, that you point to is the result of  
13 an inadequacy on our part, industry's part, to make sure  
14 that fire equipment is basically at that same  
15 qualification level, the same mechanical robustness  
16 level as emergency core cooling?

17 Do we have hardware deficiencies that we  
18 are now trying to compensate for because we never really  
19 buckled down and said, "By golly, firefighting is as  
20 important as core cooling."?

21 MR. COE: If I may try to start, the current  
22 plant design bases don't necessarily account for  
23 multiple concurrent initiating events. That is an  
24 artifact of the historical design and licensing process.

25 And so, today we are examining these kinds

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1 of complexities as an enhancement beyond that which the  
2 plants have been licensed to. So, we are quite aware  
3 of and sensitive to the fact that fire protection systems  
4 are not seismically-qualified in general.

5 And so, that will go into the modeling that  
6 we end up doing in terms of the fragilities and the  
7 likelihoods of those failures. The challenges in terms  
8 of modeling that Kevin has spoken of relate to this.

9 There are fire systems that will break, but may not  
10 be needed. There are fire systems that will become  
11 unavailable that are needed. And there are likelihoods  
12 associated with all of that.

13 Proximities are also -- I mean, a fire  
14 system is segmented. So, part of it could break and  
15 part of it could not. And the part that broke might  
16 be needed and it might not.

17 So, I mean, it is a multitude of  
18 complexities here that the original design bases never  
19 even envisioned. Or maybe they envisioned it, but they  
20 chose to --

21 MEMBER SKILLMAN: Did not accommodate.

22 MR. COE: -- not address it because of the  
23 low likelihood that was expected at that time.

24 Did you want to add to that?

25 MR. COYNE: Yes.

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1           MEMBER SIEBER: This is also driven by the  
2 fire protection insurance companies who demanded a  
3 commercial standard. You meet this and we will give  
4 you the insurance.

5           And a lot of the difficulties with  
6 separation on fire protection were solved by NRC action.

7       You know, for example, all the aux feed pumps in one  
8 room, that required the addition of a separate aux feed  
9 pump for a lot of plants, including our plants, and tie  
10 wraps on cable trays, and so forth.

11           This has been going on for a long time.  
12 So, there have been upgrades. On the other hand, you  
13 still have cast fire mains, even though they are  
14 loop-type that a break can be isolated, but they still  
15 exist that way.

16           So, there are some deficiencies, but I think  
17 the history behind where that all came from has left  
18 us the artifact of meeting National Fire Protection  
19 Association codes, but not necessarily safety-grade  
20 nuclear standards. So, someplace along the line, the  
21 staff and the insurance companies have decided that is  
22 good enough.

23           MR. COYNE: Just to add, I am not in a  
24 position to really say whether the design-basis fire  
25 protection requirements we have are adequate or not.

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1 But the state that you had mentioned, that they are  
2 subject to a different level of quality -- for instance,  
3 Appendix R has its own quality assurance requirements  
4 for fire protection equipment. That does make it  
5 challenging for the analysis and getting things like  
6 the fragilities for the fire protection piping and  
7 factoring that in the PRA.

8 An observation is PRA is a good, systematic  
9 technique for trying to evaluate these types of  
10 beyond-design-basis issues of multiple things happening  
11 or multiple equipment failures or fires with a degraded  
12 fire suppression system. So, to me -- of course, I am  
13 speaking to you as PRA Branch Chief -- to me, it seems  
14 like a natural thing to use a PRA to look at this type  
15 of issue for those kinds of concerns.

16 MEMBER SIEBER: Yes, the PRA can analyze  
17 it and tell you roughly what that risk really is. I  
18 mean, that is up to the licensee and the staff to decide  
19 whether that risk is tolerable or not.

20 MR. COE: And I would add, exactly right,  
21 but I would add, also, that the PRA will give us a better  
22 appreciation for what is important in terms of those  
23 interactions and what is not as important. We hope that  
24 that is even a more important value or benefit from even  
25 studying this from a PRA context than getting some kind

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1 of an endpoint or best-estimate risk number. It is more  
2 the insights that you draw from doing the modeling work  
3 that I think really benefits the staff in the end.

4 MEMBER SKILLMAN: Okay. Thank you.

5 MR. COE: Yes.

6 CHAIR SCHULTZ: Dennis?

7 MEMBER BLEY: Let me ask you one thing.  
8 I mean, what you are talking about is modeling. But  
9 I remember -- I have been spending the last half-hour  
10 trying to remember the name of the guy -- a guy ran a  
11 seismic consulting firm up in San Francisco, a pretty  
12 famous guy. And that group, whose name I forget, for  
13 many years went all over the world investigating  
14 earthquakes and sent out reports on all of the  
15 earthquakes. And they especially looked at these kinds  
16 of things, at earthquake-induced fires and  
17 earthquake-induced floods, and identified when they  
18 happened.

19 My memory from all this stuff I looked at  
20 from them was that they were a lot more rare than we  
21 think when we think about all the possibilities for how  
22 they can happen.

23 They had quite a database and they shared  
24 it publicly. Oh, Peter Yanev, yes. What was the name  
25 of -- is he still around?

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1 PARTICIPANT: No, he is not around anymore.  
2 Peter is around.

3 MEMBER STETKAR: EQU still --

4 MEMBER BLEY: Is EQU still maintaining the  
5 data?

6 PARTICIPANT: No, EQU is no longer in  
7 existence.

8 MR. CHOKSHI: EQU has --

9 MEMBER BLEY: Well, they are part -- yes,  
10 but they are still there?

11 MR. CHOKSHI: Yes. And Peter has a new  
12 company, and he is active. So, we can get --

13 MEMBER BLEY: I mean, it is worth looking  
14 at real data a little bit to scope this problem, rather  
15 than starting with high-powered analysis. We might get  
16 a pretty good idea from looking at that data, and they  
17 really had worked at keeping that pretty complete, and  
18 especially on these kinds of issues. Their reports were  
19 really nice on this stuff.

20 MR. CHOKSHI: This is Nilesh Chokshi,  
21 Office of New Reactors.

22 MR. COE: And as part of the literature  
23 review for this in addressing this recommendation, we  
24 will pull the string on that. That could be valuable.  
25 Thank you.

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1 MR. COYNE: That is very useful. There's  
2 a handful of events that we are aware of, but that is  
3 really what we wanted to look at.

4 MEMBER BLEY: Somewhere I have got a box  
5 of all their old reports.

6 CHAIR SCHULTZ: And that is what I was  
7 taking from Dick Skillman's remarks as well, not only  
8 here, but other events that he mentioned earlier. These  
9 are at least precursor events that ought to be mined  
10 from the database that we currently have --

11 MEMBER SKILLMAN: Thank you.

12 CHAIR SCHULTZ: -- to determine how much  
13 information that really provides to either support or  
14 at least document any decisionmaking you might do in  
15 terms of the complex analyses that could result, where  
16 you are trying to answer should we move in that direction  
17 or is there an alternative. As you had on the public  
18 comment slide, there have been other alternatives  
19 recommended or suggested.

20 MR. COE: Any other questions?

21 CHAIR SCHULTZ: Other comments from the  
22 Committee?

23 (No response.)

24 I want to thank you very much for this  
25 segment in the presentation.

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1 And I do want to at this point ask if there  
2 are any other comments from the public related to the  
3 last two presentations or any other items that have been  
4 brought to the Committee in this afternoon's session.

5 Yes?

6 MR. HEYMER: Good afternoon.

7 Adrian Heymer from NEI.

8 I will take the discussion on 2.2 first,  
9 and the topic in the discussion about new and significant  
10 information. That is a term that is used in the  
11 environmental, in NEPA space. We believe that is the  
12 right approach. Not only is it new, but is it  
13 significant?

14 Now the NRC staff were quite right to say,  
15 "Well, okay, what does that mean? And we need to work  
16 on that." But the industry really would lean towards  
17 that approach rather than a rote, 10-year sort of  
18 standard-review approach.

19 If you go back over 20 years and look at  
20 what actions have been taken, both in response to  
21 regulatory action initiatives as well as industry  
22 action, you see that we have over time reduced the risk  
23 from the plants as we have gone forward in time, without  
24 the need for a 10-year sort of update, safety assessment,  
25 or whatever.

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1 But we agree, and I think one of the lessons  
2 learned from Fukushima is that there is new and  
3 significant information. Not only should you start  
4 evaluating it, but you should make people aware of it,  
5 so that everybody in the structure, certainly within  
6 a company, is aware of what is going on, and is aware  
7 of what could be the potential significance of that.

8 So, I think that is one comment I had.

9 As regards the man-made hazards, that is  
10 considered in the initial licensing. I think, as new  
11 facilities are built in the vicinity of a nuclear power  
12 plant, there needs to be at least a look at that from  
13 the nuclear side as well as from the evacuation and what  
14 threat that presents. So, I mean, I think we would  
15 understand that, but it is considered in the licensing.

16 When we go on to the last discussion on  
17 seismic-induced fires and floods -- and this leads into  
18 sort of a more general comment overall -- that wasn't  
19 really a Fukushima issue. Even the Near-Term Task Force  
20 Report points to the fact that it was  
21 Kashiwazaki-Kariwa. In that case, it was associated  
22 with a non-safety-related transformer issue. And based  
23 on that, Tokyo Electric Power Company made sure that  
24 there were five trucks on each of its sites.

25 So, it wasn't safety-related. It didn't

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1 have a safety-related impact, but it was there. And  
2 so, from our perspective, I think we have got to be a  
3 bit careful with the amount of stuff we are stuffing  
4 in the Fukushima bag. If this is an issue, there are  
5 set processes that the NRC has in place today that it  
6 could evaluate that and determine, okay, that is an  
7 issue, whether it is a GSI or whatever, that we need  
8 to look at or we need to move forward.

9 Now, having said that, I think we would say,  
10 yes, if we are going to go forward and look at something  
11 in this area, that we need to look at development of  
12 the methodologies or refinement of the methodologies  
13 and build on some of the insights that were mentioned  
14 in the discussion today about the SQUG program and  
15 experience data to help inform our discussion.

16 So, as regards the development of a  
17 methodology, it probably is a longer-term issue. I  
18 think both of these, 2.2 and this later one on  
19 seismic-induced fires and floods, Recommendation 3, are  
20 appropriate to be a Tier 3. It is a long-term issue,  
21 though I think on the seismic-induced fires and floods,  
22 I don't think there is the Fukushima connection there.

23 So, I think that is where we stand on that as a comment.

24 But that leads to a broader statement that  
25 I think is worthwhile making. If you take the

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1 Fukushima, the list of all the Fukushima  
2 recommendations, both in the Near-Term Task Force Report  
3 and the recent SECY documents, and look at the other  
4 generic regulatory issues that are underway, there is  
5 over 50 of these on the plate in the current timeframe.

6 And in the current timeframe, I am looking between now  
7 and about 2017.

8 That presents the potential for a  
9 significant distraction, both here at the NRC and at  
10 the stations. Because a lot of these Fukushima issues  
11 are associated with the power block, and we really need  
12 to keep our focus on the safe operation of the 104 nuclear  
13 power plants.

14 So, I think as we look at this, and I would  
15 support some statements that were made, take a look at  
16 that list. I know we took a first cut and we put them  
17 into three bins of priority. But really take a look  
18 at these Fukushima-related items and say, what is the  
19 real safety significance associated with these? And  
20 is it something we really need to push ahead with in  
21 the next five years or not? And if it is not, then put  
22 it in a parking lot. I am not saying take it off the  
23 table entirely, but I think we have got to be careful  
24 what we are focused on and what we are trying to do.

25 We have got Tier 1. If we try to do too

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1 much beyond the Tier 1 issues, we are going to spread  
2 our resources, which is only going to extend the time  
3 that Tier 1 takes to implement. And it is the Tier 1  
4 that provides the major safety significance and safety  
5 improvement of these facilities.

6 So, with those three comments, Mr.  
7 Chairman, I thank you for the opportunity.

8 CHAIR SCHULTZ: Thank you for the comments.

9 Other comments from the public?

10 (No response.)

11 I am looking around the room. Any members  
12 of the public on the telephone who would like to make  
13 a comment? Is the line open?

14 MR. DIAS: It is open.

15 CHAIR SCHULTZ: The line is open.

16 (No response.)

17 Hearing none, I would like to take this  
18 opportunity to thank the staff for the presentations  
19 all through the meeting we have had this afternoon.  
20 The meeting will continue tomorrow.

21 So, we will recess until tomorrow morning.

22 If any of you have not yet picked up the  
23 agenda, there are copies on the back table. Those are  
24 the items that we will be discussing tomorrow as we  
25 continue our discussion on the Tier 3 activities.

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1                   So, with that, I will recess the meeting  
2                   until tomorrow morning at 8:30.

3                   Thank you.

4                   (Whereupon, at 5:05 p.m., the meeting was  
5                   adjourned, to reconvene the following day, Wednesday,  
6                   May 23, 2012, at 8:30 a.m.)

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# **Japan Lessons Learned Tier 3 Regulatory Actions**

**ACRS Meeting of the Fukushima  
Subcommittee**

**Rockville, Maryland**

**May 22-23, 2012**

# 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-TAIHEIYU-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-Taiheiyo-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-Taiheiyo-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.

ML11070432

**NRC INSPECTION MANUAL**

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-Taiheiyo-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, scrambled 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

Issue Date: 03/23/11 1 2515/183

**NRC INSPECTION MANUAL**

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:

- Determine that the severe accident management guidelines (SAMGs) are available and how they are being maintained.
- 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.

- 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.

Issue Date: 04/29/11 1 2515/184

OMB Control No.: 3150-0012

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:

- 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(h)(2).
- To notify addressees about the NRC staff's need for information associated with licensee mitigating strategies under 10 CFR 50.54(h)(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
- To require that addressees provide a written response to the NRC in accordance with 10 CFR 50.54(d).

**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 (CFC) 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(h)(2).

The NRC conducted a comprehensive inspection of the implementation of the mitigating strategies developed by licensees in 2008. Subsequently the NRC incorporated this inspecable area into the baseline reactor oversight process on a sample basis as part of the biennial fire protection inspection.

ML11250360

IN 2011-05

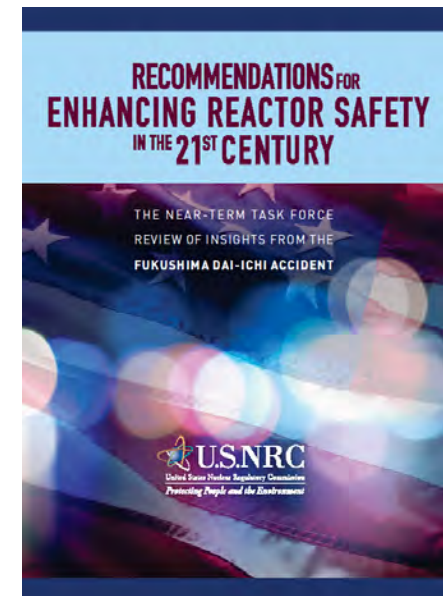
TI 2515/183

TI 2515/184

BL 2011-01

# 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](http://www.nrc.gov))



## **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

# 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

# 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

# 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



# 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

## **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.

## 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

## **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

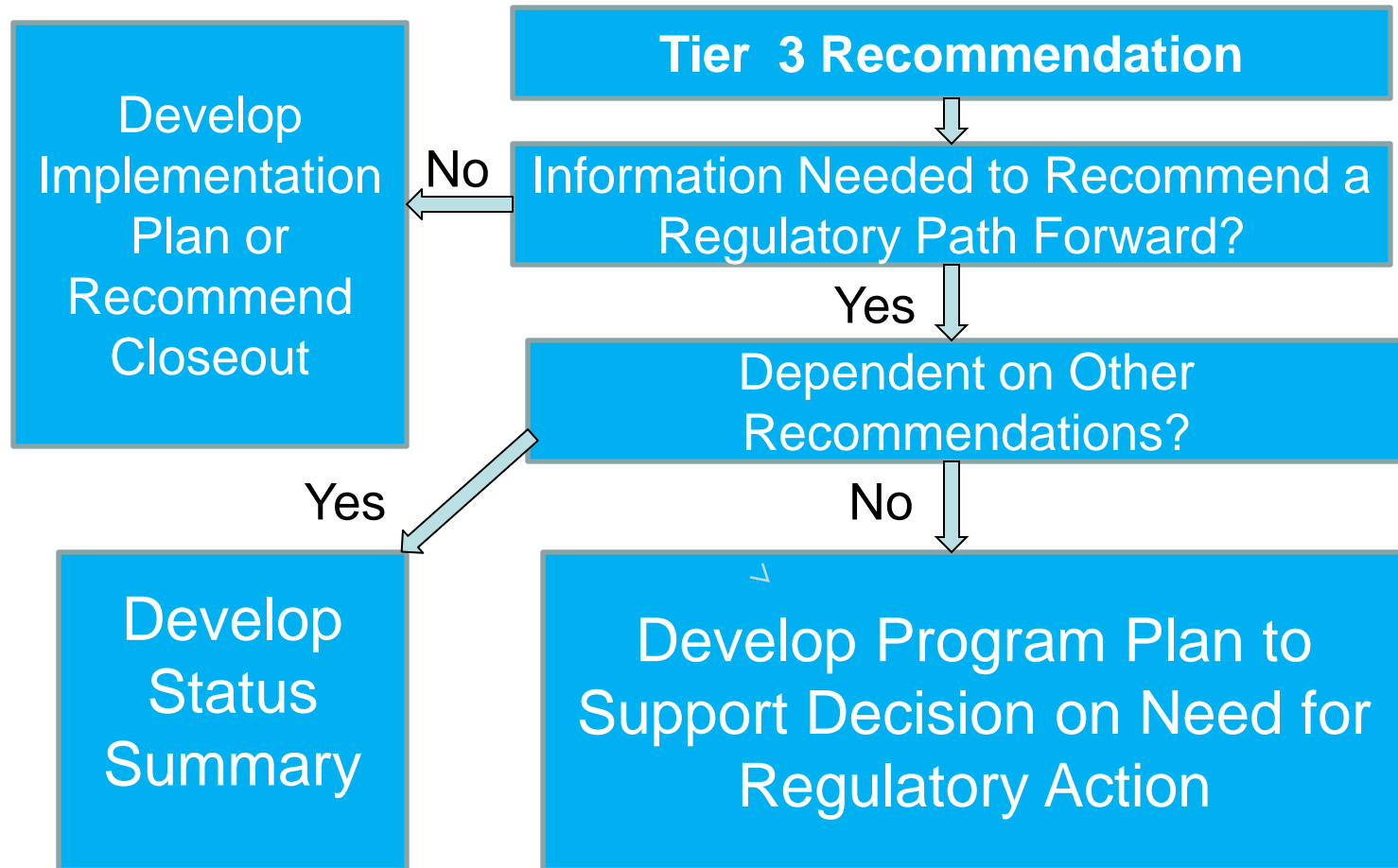
## **Tier 3 Recommendations**

- 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 Buildings
- 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

## **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

# Flow Chart for Tier 3 Recommendations



# Questions?





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# **Recommendation 2.2**

## **Periodic Reassessment of External Hazards**

Jenise Thompson

May 23, 2012

## 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.

# 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)**

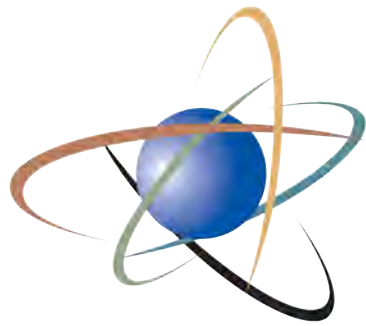
# Pre-rulemaking Activities

- 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

# 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

# Questions?



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# **NTTF Recommendation 3: Seismically Induced Fires and Floods**

May 22, 2012

Kevin Coyne, RES/DRA

# 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.



# 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

## 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

# 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

## 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

# 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.

## **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

## 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

## **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.



# Questions?



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## **Hydrogen Control and Mitigation (NTTF Recommendation 6)**

Brett Titus  
Office of Nuclear Reactor Regulation

# 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

## 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

## **Staff Assessment- Recommendation 6**

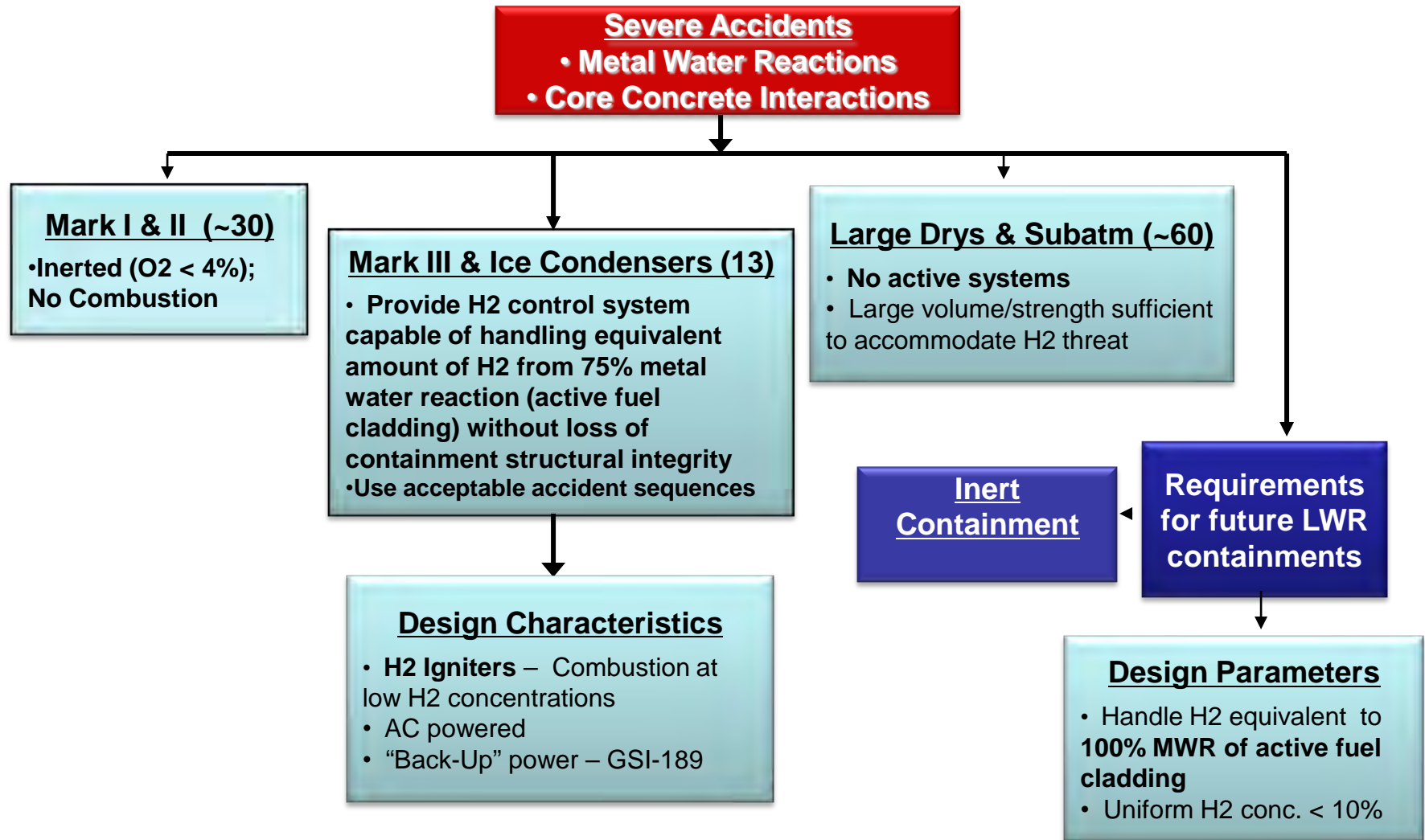
- Potential risk of hydrogen production and combustion is well known
  - Three Mile Island (1979)
  - Numerous Generic Issues and Generic Safety Issues
  - Many studies performed worldwide

## **Staff Assessment- Recommendation 6**

- 10 CFR 50.44, “Combustible Gas Control for Nuclear Power Reactors” revised in 2003
  - Eliminated requirements for H<sub>2</sub> recombiners and relaxed monitoring rules commensurate with risk significance
  - Retained requirements for mixed atmosphere, inert MK I&II containments, maintained 75% clad-water H<sub>2</sub> reaction criteria (100% for New Reactors) in MK III and Ice Condensers

## 10 CFR 50.44

# Combustible Gas Control for LWRs



# Staff Assessment - Recommendation 6

- Key Questions to be Investigated
  1. Is there new information regarding H<sub>2</sub> 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<sub>2</sub> gas?
  4. Is there new information which conflicts with the current technical basis?
  5. Has new technical information been revealed to necessitate regulatory action?



# Plan for Addressing Recommendation 6

1. Examine additional H<sub>2</sub> 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

# Plan for Addressing Recommendation 6

## 2. Evaluate the sources and timing of H<sub>2</sub> 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<sub>2</sub> to analytical predictions
- Assess implications of results on the existing state of knowledge

# 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

# 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

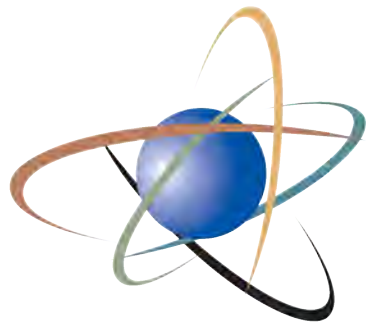
# Challenges

- Very little reliable empirical data on H<sub>2</sub> has been reported since the accident
- Verifiable information on chain of events may not be available for 10+ years
- H<sub>2</sub> generation and control following a severe accident is a highly specialized technical discipline

# Public comments

- Public meeting on May 14, 2012

# 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)

# 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.

# 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.

# 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.

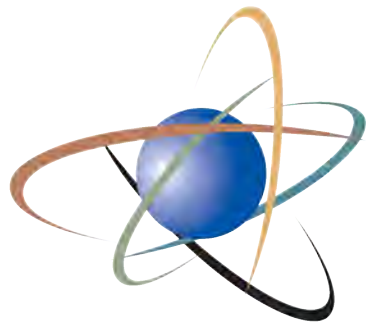
## Potassium Iodide (KI)

- 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.

# Public comments

- Public meeting on May 4, 2012

# Questions?



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# **Recommendation 12.1 Status**

May 23, 2012

Tim Kobetz,

Chief, Reactor Inspection Branch  
Office of Nuclear Reactor Regulation



## **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

# **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.

# 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.

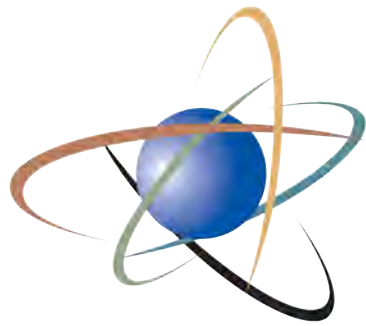
# Communications

- 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).

# Public Meeting on May 7<sup>th</sup>

- No questions or comments were received

# Questions?



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# **Staff Training on Severe Accidents and Severe Accident Management Guidelines**

May 23, 2012

Joseph G. Giitter

Travis L. Tate

# 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



# 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”

# 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

# 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)

# Qualification Training

- Senior Reactor Analyst
- Reactor Technical Reviewer
- Reactor Risk Analyst
- Nuclear Safety Professional Development Program

# 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

## **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

# Public comments

- Public meeting on May 7, 2012

# Questions?





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# **Reactor and Containment Instrumentation (ACRS Recommendation 2(e))**

Bill Kemper

Office of Nuclear Reactor Regulation

# 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

# 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

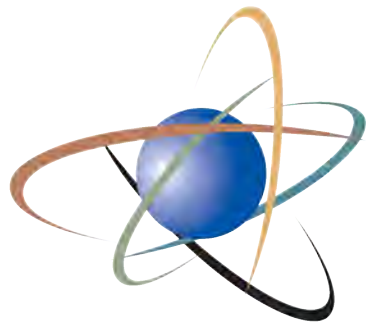
# Stakeholder Feedback

- Public Meeting held on May 7
- NEI Feedback
- Public question

# Public comments

- Public meeting on May 7, 2012

# Questions?



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# **Additional Recommendation 5 Expedited Transfer of Spent Fuel to Dry Casks**

Steve Jones

Office of Nuclear Reactor Regulation



## 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.

## **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.

# 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

## 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

## 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

## **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

# Questions?

# 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

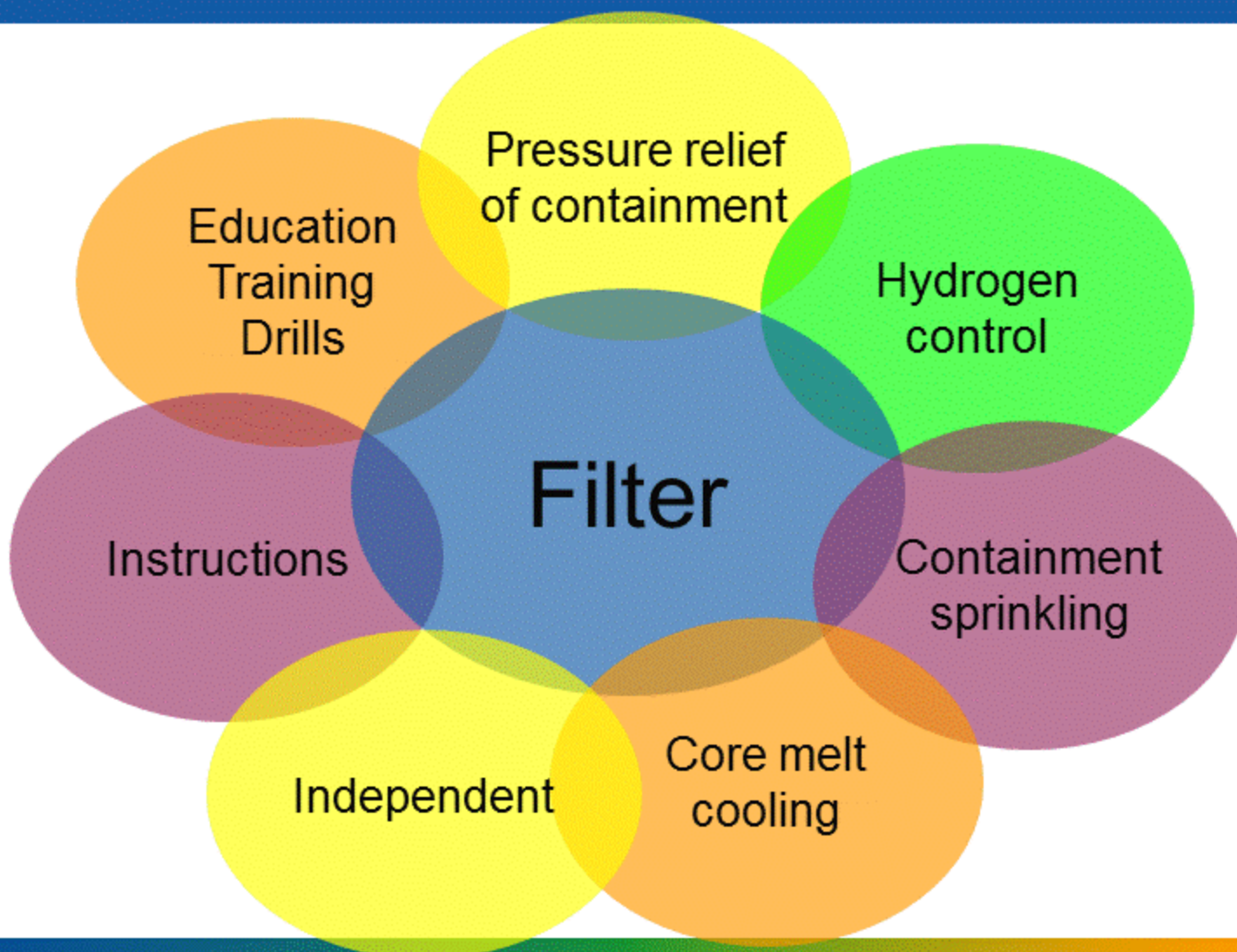
# Foreign Experience with FCVS

## *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



# 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.

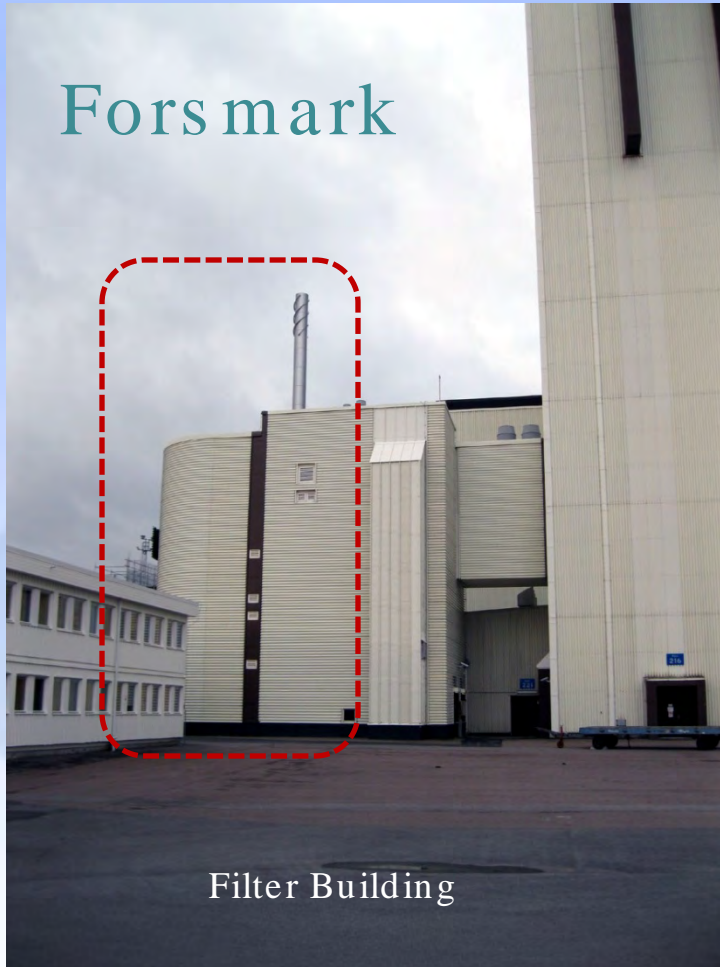


Local manual pneumatic supply operating station for containment vent valves and system inerting.

**Forsmark**

# Foreign Experience with FCVS

Forsmark



Filter Building

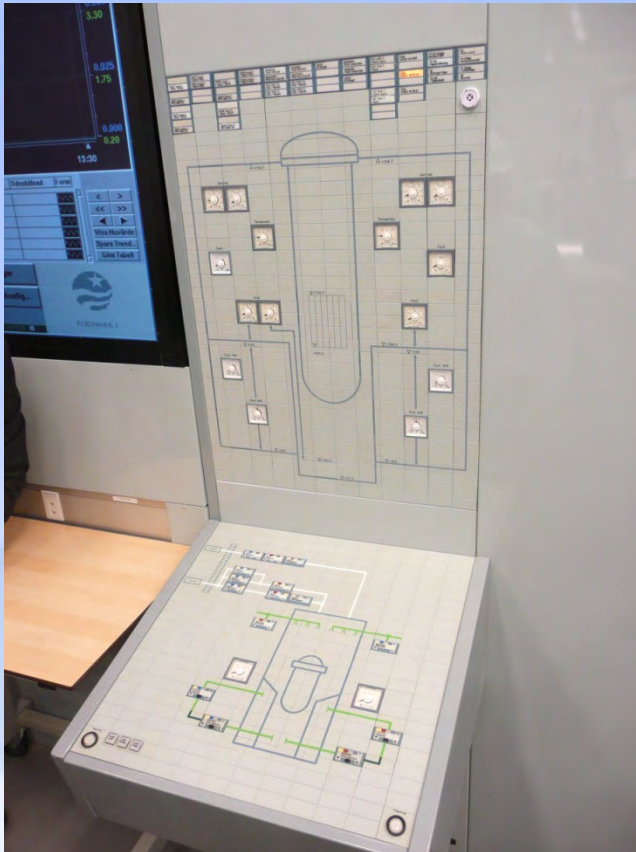


Moisture Separator above  
MVSS Filter



# Foreign Experience with FCVS

## Forsmark



Control Room Panel for FCVS,  
Under-Vessel Flooding System  
and Spray Controls



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

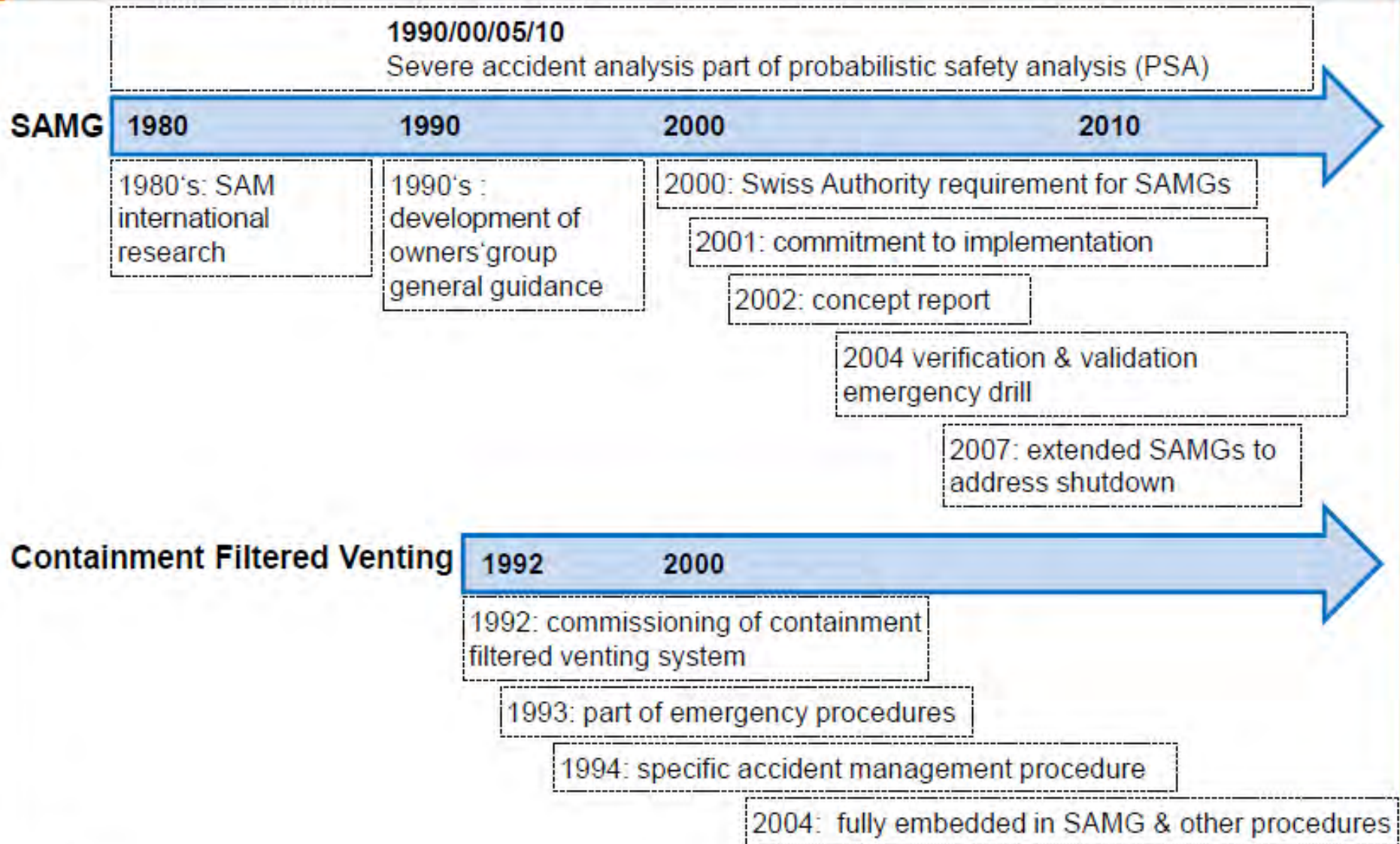


# Foreign Experience with FCVS

## *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)



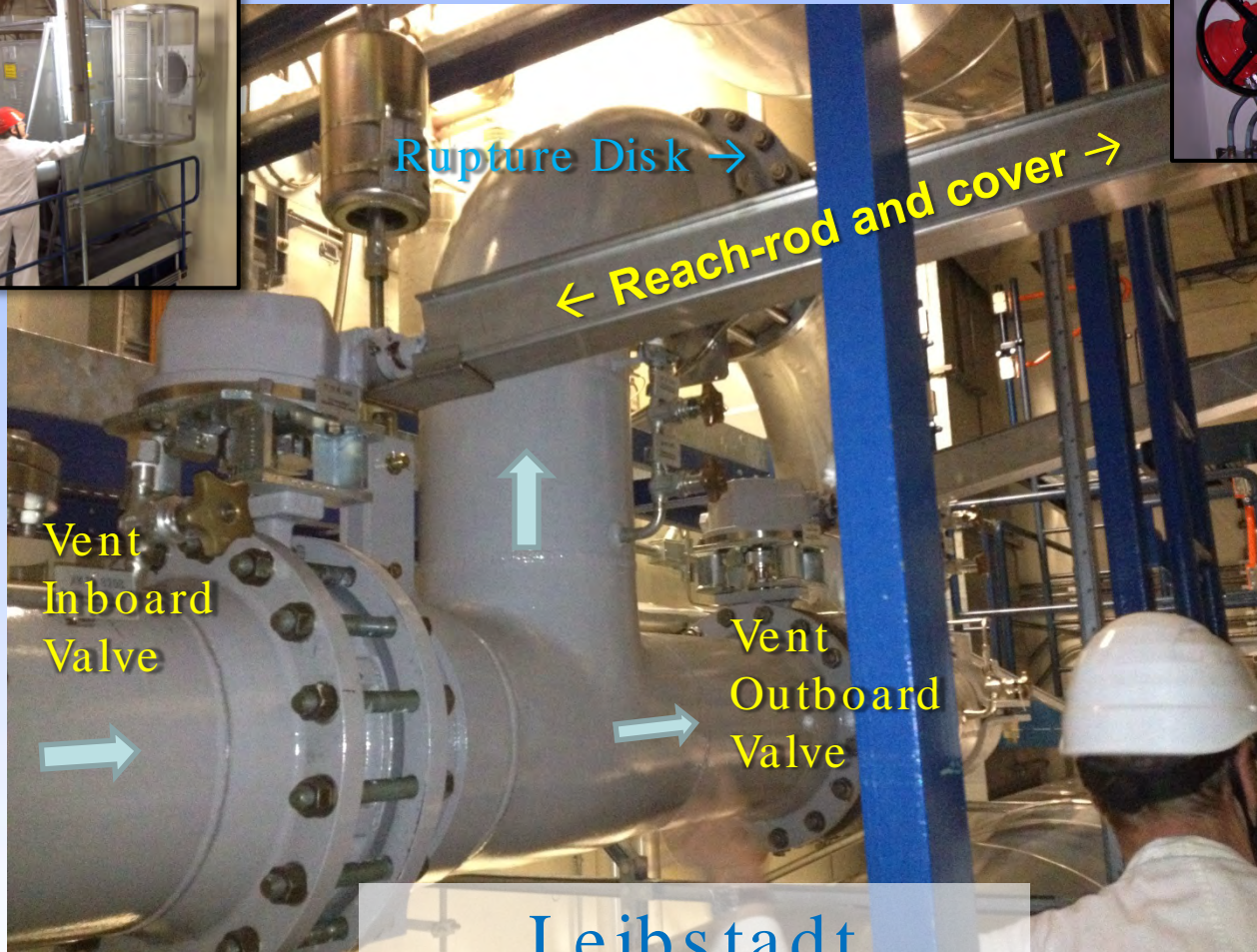
# Foreign Experience with FCVS

## *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



2 MVSS  
Filter  
Vessels in  
Parallel  
3 meter  
diameter,  
9 meters  
high

# 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



# NTTF Recommendation 5.2: Reliable Hardened Vents for Other Containment Designs

Briefing to the  
Advisory Committee on Reactor Safeguards  
May 22, 2012

# Background

- The NCTF 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.