

# **Official Transcript of Proceedings**

## **NUCLEAR REGULATORY COMMISSION**

Title: In the Matter of:  
629th Meeting of the Advisory Committee on  
Reactor Safeguards

Docket Number: N/A

Location: Rockville, Maryland

Date: November 5, 2015

Work Order No.: NRC-2011

Pages 1-165

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

DISCLAIMER

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

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

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

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS

1323 RHODE ISLAND AVE., N.W.

WASHINGTON, D.C. 20005-3701

(202) 234-4433

[www.nealrgross.com](http://www.nealrgross.com)

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

+ + + + +

629TH MEETING

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

+ + + + +

THURSDAY,

NOVEMBER 5, 2015

+ + + + +

ROCKVILLE, MARYLAND

+ + + + +

The Advisory Committee met at the Nuclear  
Regulatory Commission, Two White Flint North, Room  
T2B1, 11545 Rockville Pike, at 8:30 a.m., John W.  
Stetkar, Chairman, presiding.

COMMITTEE MEMBERS:

JOHN W. STETKAR, Chairman

DENNIS C. BLEY, Vice Chairman

MICHAEL L. CORRADINI, Member-at-Large

RONALD G. BALLINGER, Member

CHARLES H. BROWN, JR. Member

DANA A. POWERS, Member

HAROLD B. RAY, Member

JOY L. REMPE, Member

PETER RICCARDELLA, Member

STEPHEN P. SCHULTZ, Member

GORDON R. SKILLMAN, Member

DESIGNATED FEDERAL OFFICIALS:

GIRIJA SHUKLA

KATHY WEAVER

ALSO PRESENT:

JEREMY BOWEN, NRR/JLD/PPSD

GREGORY BOWMAN, NRR/JLD/PPSD/JPSB

DENNIS DAMON, NMSS/FCSE

EDWARD FULLER, RES/DSA

MICHAEL FRANOVICH, NRR/JLD

ACE HOFFMAN \*

MARGARET A. KOTZALAS, NMSS/FCSE/PORB

STEVEN KRAFT, NEI

MARVIN LEWIS \*

OMAR LOPEZ, R-II, DFFI, SB

KEVIN RAMSEY, NMSS/FCSE/FMB

WILLIAM RECKLEY, NRR/JLD/PPSD

EDWARD SIEGEL \*

APRIL SMITH, NMSS/FCSE/PORB

RUSSELL SYDNOR, RES/DE/ICEEB

CHRIS TRIPP, NMSS/FCSE/PORB

MILTON VALENTIN, NRR/JLD/PPSD/JPSB

\*Present via telephone

T A B L E   O F   C O N T E N T S

Opening Remarks and Objectives:

John W. Stetkar, Chairman ..... 4

Fukushima Tier 2/3

Remarks by Subcommittee Chairman:

Stephen P. Schultz ..... 5

NRC Staff Discussion ..... 8

NEI Comments/Discussion - Steven Kraft, NEI ..... 96

Public Comment ..... 117

Lunch Recess ..... 118

Status of the Revised Fuel Cycle Oversight Process

(RFCOP) Cornerstones:

Remarks by Dana A. Powers.. . . . . 119

NRC Staff Discussion. . . . . 121

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

## P R O C E E D I N G S

8:32 a.m.

CHAIR STETKAR: The meeting will now come to order. This is the second day of the 629th meeting of the Advisory Committee on Reactor Safeguards.

During today's meeting, the Committee will consider the following; Fukushima Tier 2 and Tier 3, the status of the Revised Fuel Cycle Oversight Process, Cornerstones and preparation of ACRS reports.

This meeting is being conducted in accordance with the provisions of the Federal Advisory Committee Act. Ms. Kathy Weaver is the Designated Federal Official for the initial portion of the meeting.

We have received no written comments or requests to make oral statements from members of the public regarding today's sessions.

There will be a phone bridge line. To preclude interruption of the meeting, the phone will be placed in listen-in mode during the presentations and committee discussion.

For those of you on the bridge line, could you please put your phones in mute mode so that we don't have problems with crosstalk? It's an open line and we've had some problems in the past.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

(202) 234-4433

(202) 234-4433

1           Also, I'd like to alert members of the  
2 public who might be out there on the bridge line that  
3 effective this Full Committee meeting, you can follow  
4 us on the web and see video of our presentation slides  
5 and hear audio. And for your reference, the link is  
6 <http://video.nrc.gov>. And you'll see a link that you  
7 can click on and follow our meetings that way.

8           And I've been told that the audio may be  
9 better through that portal than it is through what you  
10 can hear now.

11           A transcript of portions of this meeting  
12 is being kept and it's requested that speakers use one  
13 of the microphones, identify themselves and speak with  
14 sufficient clarity and volume so that they can be  
15 readily heard. And I'll remind everyone in the room  
16 to check and silence all of your little communications  
17 devices.

18           With that, do any of the members have any  
19 items that you'd like to discuss?

20           (No audible response.)

21           CHAIR STETKAR: If not, the first item on  
22 our agenda today is Fukushima Tier 2/Tier 3 actions.  
23 And Steve Schultz will lead us through this session.

24           Steve.

25           MEMBER SCHULTZ: Thank you, Mr. Chairman.

1 Good morning. The purpose of this morning's meeting  
2 is for the Full Committee to review and discuss the  
3 NRC staff's closure plans for the Open Tier 2 and Tier  
4 3 Near-Term Task Force recommendations.

5 These plans are the subject of the NRC  
6 staff paper SECY-15-0137, which was just sent to the  
7 Commission last Thursday on October 29th and has been  
8 made public just this morning.

9 The staff will discuss them in the  
10 upcoming Commission meeting with the Commissioners on  
11 November 17th.

12 We had the benefit of reviewing the  
13 staff's closure plans during our October 6th, 2015  
14 Fukushima Subcommittee meeting. This was the only  
15 subcommittee we had on this topic.

16 Today we'll hear presentations by the NRC  
17 staff and by representatives from the Nuclear Energy  
18 Institute regarding their evaluations and conclusions  
19 on these matters.

20 I will make a few remarks for the Full  
21 Committee coming from the Subcommittee meeting. I  
22 will note that the staff's initial and current  
23 recommendations provided for each of the remaining  
24 Tier 2 and Tier 3 recommendations are that the NRC's  
25 existing regulatory framework and requirements are



1 adequate and that no further regulatory action or  
2 analysis is warranted.

3 I will also note that the recommendations  
4 that are under discussion today are separated into  
5 three groups.

6 A large number of the recommendations are  
7 being proposed to the Commissioners' foreclosure at  
8 this point in time. And those will be presented to  
9 the Commissioners in the November meeting and are  
10 discussed in that light in the SECY paper.

11 In two other groups, Groups 2 and Group 3  
12 of the recommendations, the staff has indicated that  
13 for the Group 2 recommendations additional  
14 interactions with the ACRS and with members of the  
15 public are warranted. And that interaction is  
16 scheduled for early next year. And the staff intends  
17 to communicate again with the Commission in March of  
18 2016.

19 Group 3 is a category in which the staff  
20 believes that other activities need to be completed by  
21 the end of 2016. And, again, they will communicate  
22 with the Commission on those items and we will be  
23 working with the staff on those items through 2016.

24 There are also some recommendations that  
25 have been transferred from the activities associated

1 with this SECY paper to the rulemaking on mitigating  
2 strategies.

3 I will note for the record that ACRS  
4 member Joy Rempe has a conflict regarding discussions  
5 related to some aspects of Enclosure 5 in the document  
6 on reactor containment instrumentation enhancements  
7 and will limit her participation accordingly.

8 We will now proceed with the staff  
9 presentations. I'll first call upon Jeremy Bowen of  
10 the Office of Nuclear Reactor Regulation, Japan  
11 Lessons Learned Division to open the presentations  
12 today.

13 Jeremy.

14 MR. BOWEN: Thanks, Steve. Good morning,  
15 Mr. Chairman, members of the Committee. My name is  
16 Jeremy Bowen. I'm the Associate Director in the Japan  
17 Lessons Learned Division. We're happy to be with you  
18 this morning and appreciate the opportunity to present  
19 to the Committee.

20 As Steve mentioned, we were with you all  
21 back in October to discuss our plans for the  
22 disposition of the remaining Tier 2 and Tier 3  
23 Fukushima action items.

24 This is an activity that we began in  
25 midsummer of this year and have been working to

1 resolution to get to the Commission meeting coming up  
2 here on November 17th.

3 I recognize it's somewhat of an aggressive  
4 schedule. So, we appreciate the Committee's  
5 flexibility and support with helping us get through  
6 that schedule.

7 I would like to note that we've made a  
8 lot of progress on the Tier 1 Fukushima activities to  
9 date.

10 The plants are coming into compliance with  
11 the three orders that were issued one year following  
12 the accident.

13 The reevaluation of the external seismic  
14 and flooding events are well under way. Plants have  
15 good understanding of those and we're providing some  
16 feedback to licensees so that they can take the next  
17 step in that process.

18 There's been a lot of activity on the  
19 rulemaking to codify the orders and move forward.  
20 That activity is actually, as Steve mentioned, has  
21 subsumed a lot of the Tier 2 and Tier 3 activities  
22 within it.

23 We've learned a lot in the nearly five  
24 years since the accident. And that's kind of  
25 reflected in the progress we've made in Tier 1 and in

1 our recommendations for how to proceed in Tier 2 and  
2 Tier 3.

3 We had proposed some initial  
4 recommendations for how we would disposition these  
5 back in 2012. And based on the lessons learned since  
6 then, we've kind of refined those plans.

7 So, Greg Bowman here from the - from our  
8 Policy and Support Branch will be going through those  
9 shortly.

10 I would like to note that the context of  
11 how we approach this was along the lines of taking  
12 into account all the activities we've done, all the  
13 lessons that we've learned and information from our  
14 international counterparts, have we captured  
15 everything that needs an immediate action, and is  
16 there any short-term regulatory action that needs to  
17 be taken, or does the NRC's normal processes allow us  
18 to continue in that vein?

19 So, I mentioned our international  
20 counterparts. We did recently receive the  
21 International Atomic Energy Association, their report  
22 on the accident.

23 We have done an analysis of that report  
24 and determined there's really no new insights, no  
25 significant lessons learned that we've missed. And

1 the approach that the Agency has taken over the past  
2 five years is well in alignment with that report.

3 So, with that, I'll turn it over to Greg  
4 and he'll walk you through what our proposals are.

5 MR. BOWMAN: Thank you, Jeremy. So, my  
6 plan for today is to start off by providing some  
7 background on the recommendations and the approach we  
8 used for developing the plans. And then I'll go  
9 through each of the recommendations individually to  
10 discuss our proposed disposition path.

11 Before I do that, though, I wanted to echo  
12 something Jeremy mentioned, and that's our thanks to  
13 you all for adjusting your schedule to meet with us on  
14 Tier 2 and Tier 3.

15 I'll go through this a little more at the  
16 end of my presentation, but we definitely benefitted  
17 from our meeting with the Subcommittee last month.  
18 And the assessment that we sent to the Commission,  
19 we're certainly improved as a result of that  
20 interaction.

21 So, next slide, Milton. So, for  
22 background, this slide provides the criteria we  
23 initially used to tier each of the post-Fukushima  
24 recommendations whether they came from the Near-Term  
25 Task Force, the staff, the ACRS or other stakeholders.

1           The rationale behind the assignment of  
2       recommendation to Tier 2 or Tier 3 advice Tier 1 vary  
3       from one recommendation to the next, but they're  
4       largely recommendations which either had a tie to a  
5       Tier 1 activity, so something where we needed to make  
6       progress on a related Tier 1 recommendation before we  
7       could proceed to Tier 2 or Tier 3 recommendation,  
8       there were recommendations where further research or  
9       assessment was needed before we could make a  
10      conclusion on whether regulatory action should be  
11      taken, and then there were ones where resources or  
12      critical skillsets weren't available to move forward  
13      with the recommendation at that time.

14           Along with assigning each of the open  
15      recommendations to a tier, as Jeremy mentioned, we did  
16      develop initial plans for disposition to each of them  
17      and provided those plans to the Commission about three  
18      years ago in SECY-12-0095.

19           Most of the Tier 2 recommendations and  
20      some of the Tier 3 recommendations have been subsumed  
21      by the mitigation of Beyond-Design-Basis Events  
22      Rulemaking. And in addition, one of the Tier 3  
23      recommendations as to expedited transfer of spent fuel  
24      was completed in 2014.

25           So, I'll discuss this more for each

1 recommendation, but we have been making progress on  
2 many of them consistent with the plans we sent to the  
3 Commission three years ago.

4 For others, though, our focus has really  
5 been on the Tier 1 activities and those cases we have  
6 not made much progress up until recently.

7 Next slide. So, as Jeremy mentioned, we  
8 initiated a project earlier this year to reevaluate  
9 those initial resolution plans for the Tier 2 and Tier  
10 3 recommendations. And the objective of that plan was  
11 to resolve those recommendations ahead of the  
12 schedules that we gave to the Commission three years  
13 ago.

14 Our focus as part of that activity was to  
15 determine if a sufficient basis exists to take a  
16 regulatory action such as issuance of an order or  
17 initiation of a rulemaking to further enhance safety  
18 based on the recommendation.

19 As Jeremy also mentioned, we recognized as  
20 we started this activity that things have evolved  
21 significantly since those initial plans were put  
22 together.

23 For example, we have much better clarity  
24 now on what the specific safety benefits of the Tier  
25 1 recommendations will ultimately be. We have

1 Commission decisions that bear on our assessment of  
2 those recommendations such as the Commission's  
3 decision on Near-Term Task Force Recommendation 1 and  
4 on the post-Fukushima rulemakings.

5 So, we established working groups. And  
6 those working groups assessed each recommendation  
7 considering the existing requirements, the safety  
8 benefit gained from Tier 1.

9 We did strive for efficiency by leveraging  
10 the work and the previous analyses we had done both  
11 for the Tier 1 recommendations and also past -  
12 analyses that were done in the past.

13 We also recognize the importance of input  
14 from our stakeholders. And that interaction is an  
15 integral part of the plans for some of the  
16 recommendations. That includes, as Steve mentioned,  
17 engagement with the ACRS and also with the public.

18 So, our goal is to resolve all the Tier  
19 2 and Tier 3 recommendations as soon as possible and  
20 by no later than the end of 2016. Although, we do  
21 recognize that if as part of completing the  
22 recommendations we identify that an order needs to be  
23 issued or rulemaking would need to be started, that  
24 that would take us out past the end of 2016.

25 The one thing I do want to note is that



1 our highest priority as we worked through this, was to  
2 ensure that we maintain an appropriate level of  
3 technical rigor in our assessment of these  
4 recommendations. And I think we've achieved that in  
5 the paper we sent to the Commission.

6 MEMBER SKILLMAN: How do you gauge an  
7 appropriate level of rigor?

8 MR. BOWMAN: I mean, I guess it would be,  
9 you know, subjective based on the Steering Committee.  
10 We have a Steering Committee that oversees us, you  
11 know, office directors from all the offices and, you  
12 know, they essentially judge us, judge our  
13 assessments.

14 I mean, that's, I guess, how I would  
15 largely characterize it. I don't know if you -

16 MR. BOWEN: Yes, I appreciate the  
17 question. There's been a lot of different  
18 organizations involved in this activity and a lot of  
19 diverse views.

20 So, the approach that we've taken has  
21 really been trying to make sure that if - the  
22 collective knowledge within the Agency, making sure  
23 that we've considered all the different possibilities,  
24 all the different aspects of it.

25 And then if the argument holds up that

1 there's merit in what we're recommending moving  
2 forward, we've addressed the potential issues and  
3 everything going forward. So, as Greg mentioned,  
4 there's the Senior Steering Committee members with all  
5 the office directors.

6 So, we've - our recommendations have  
7 evolved since we started this, you know. There was  
8 certain proposals in the late summer time frame and we  
9 had to - there was questions about, well, you missed  
10 an aspect, or I don't quite understand that technical  
11 argument.

12 So, we had to either adjust and add to  
13 that, or in some cases we adjusted where we'd put the  
14 recommendation itself.

15 MEMBER SKILLMAN: Greg, you mentioned that  
16 part of the process that you used was to set up  
17 working groups to address the issues and to discuss  
18 and then work them through.

19 Does that also lend into - do you choose  
20 that process to lend into getting to the point where  
21 you had what you felt was an appropriate level of  
22 technical rigor?

23 MR. BOWMAN: Yes. Yes. I mean, we - as  
24 part of forming these working groups, we really - we  
25 tried to be as inclusive of staff with technical

1 expertise as we could.

2 We, we had - every working group, I think,  
3 had staff from at least two or three different  
4 offices. Many of whom have been - or who are the  
5 Agency subject matter experts on the areas that were  
6 being assessed. So, yes, I think that was a big part  
7 of our approach.

8 MR. BOWEN: And in addition to that, too,  
9 I mean, we've leveraged every piece of information  
10 available to us, international activities that were  
11 ongoing, you know, like Greg mentioned, all the work  
12 from the Tier 1 stuff, but we really looked beyond  
13 what was immediately in front of us. Tried to find  
14 out everything that we could pull into us and, like I  
15 said, question ourselves as we went along the way to  
16 make sure that we were really thinking through all the  
17 aspects of what we were proposing.

18 MR. BOWMAN: Next slide. So, I mentioned  
19 that implementation of the Tier 1 recommendations was  
20 considered in our assessments and it plays a large  
21 part in many of them. So, I wanted to take a minute  
22 to go into a little more detail on implementation  
23 status.

24 As Jeremy mentioned, a significant number  
25 of plants are actually coming into compliance with the

1 mitigating and spent fuel pool instrumentation orders  
2 now. We'll perform post-compliance inspections once  
3 all the units at a given site are in compliance. We  
4 started those inspections with the majority scheduled  
5 to be completed in 2016 and '17.

6 We've done great work so far on the  
7 hardened vent order. We -

8 MEMBER CORRADINI: Can I just stop you?

9 MR. BOWMAN: Yes. Sure.

10 MEMBER CORRADINI: So, for the spent fuel  
11 instrumentation, have they followed the order and  
12 looked at strictly level, or have some of the  
13 licensees gone beyond that?

14 Because the ACRS letter on this part, if  
15 I remember correctly, and I'm sure somebody will -- I  
16 have it on. Is it not working?

17 I'm sorry. I'll speak louder. So, spent  
18 fuel instrumentation. So, my question is, have they  
19 gone beyond level indication?

20 MR. BOWEN: So, the order only, as you  
21 mentioned, the order only requires level indication,  
22 but there are licensees that have gone beyond just  
23 level indications. There are some that provide  
24 temperature and other, you know, parameters.

25 And I think that kind of - that's a little

1 illustrative of the previous questioning about the  
2 level of technical rigor and everything.

3 Many of these activities even in Tier 1,  
4 there was a certain requirement put in place or a  
5 certain expectation of what would happen. And as we  
6 went through it, we made adjustments. Mitigating  
7 strategies became much more than what the original  
8 NTTF recommendation was.

9 Spent fuel pool level instrumentation,  
10 like you said, there are plants that have - in  
11 addition to having the installed instrument required  
12 by the order, they're the ones that have portable  
13 instrumentation that they can add to the pool if  
14 necessary.

15 So, the - all of the - I would say all of  
16 the Tier 1 activities evolved and became much more  
17 than we originally intended. And I think that's due  
18 to the fact that as we went through the process, we  
19 learned and we got more information and were able to  
20 add efficiencies or improvements as the process  
21 proceeded.

22 MEMBER CORRADINI: Okay. Thank you.

23 MR. BOWMAN: With respect to the hardened  
24 vent order we are - we did benefit greatly from our  
25 interactions with the ACRS on the guidance for that

1 order. I'd like to point that out.

2 We are expecting Phase 2 submittals of  
3 overall integrated plans by the end of December of  
4 this year. That will provide us with more specific  
5 details on how licensees intend to comply with that  
6 order.

7 One of our primary focus areas in Tier 1  
8 has been resolving issues associated with seismic and  
9 flooding hazard reevaluations. And we have made good  
10 progress on that as well.

11 And then finally, the mitigation to  
12 Beyond-Design-Basis Events Rulemaking will be out for  
13 public comment shortly with the final rule due to the  
14 Commission by the end of 2016.

15 As we've discussed, overall the work we've  
16 done on Tier 1 has resulted in enhancement of the  
17 ability of nuclear power plants to respond to Beyond-  
18 Design-Basis Events. And we expect continued  
19 implementation of those recommendations to further  
20 strengthen those capabilities.

21 The progress we've made on Tier 1 as we've  
22 seen it realized over the years since SECY-12-0095,  
23 have influenced our thinking on how we should  
24 disposition the Tier 2 and Tier 3 recommendations.

25 Next slide. With respect to the Tier 2

1 and Tier 3 recommendations I mentioned that we form  
2 working groups. As the working groups work through  
3 the recommendations, as Steve mentioned, there are  
4 three primary resolution groups of those  
5 recommendations.

6 There are Group 1 recommendations that we  
7 believe can be closed now. There are Group 2  
8 recommendations where our initial assessment would  
9 support closure of the recommendation, but we believe  
10 there's benefit to some additional stakeholder  
11 interactions including the ACRS and members of the  
12 public. And our goal for those recommendations is to  
13 have them completed by the end of March 2016.

14 And then there are Group 3 recommendations  
15 where we need additional assessment and analysis  
16 before we're ready to make a proposal to the  
17 Commission for resolution.

18 So, the primary factors that led to an  
19 individual recommendation being either Group 1 or  
20 Group 2 included the strong regulatory framework that  
21 existed in the US before the accident, the  
22 enhancements we've made as a result of the Fukushima  
23 accident, the enhancements to the strategies, the  
24 mitigating strategies as a result of the seismic and  
25 flooding hazard reevaluations, the analyses that we

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 completed for the post-Fukushima rulemakings, and then  
2 the fact that we have existing processes in place that  
3 would assess new information that may come to light in  
4 the future.

5 So, regarding that last point, the paper  
6 discusses that notwithstanding where we end up with  
7 the Tier 2 and Tier 3 recommendations, there will be  
8 a number of related activities ongoing for many years.  
9 For many, many years.

10 For example, we'll continue engagement  
11 with the international community on lessons learned to  
12 share what we're doing in the US and learn from them.  
13 We'll continue our involvement in the longer term  
14 health effect studies that will be going on around  
15 Fukushima for many years.

16 And as we discussed at the Subcommittee  
17 meeting last month, there will be ongoing research  
18 into severe accident phenomenology that will be taking  
19 place for many years as we learn more from the  
20 accident.

21 MEMBER CORRADINI: So, can I ask a  
22 question?

23 MR. BOWMAN: Sure.

24 MEMBER CORRADINI: Maybe it's going to  
25 come when you go through these. So, was there some



1 sort of risk determination so that if, we'll say,  
2 Action X could be chosen, you decided that if one were  
3 to do Action X, it was of not large risk significance?

4 MR. BOWMAN: It depends on the  
5 recommendation. For some, for example, the ones where  
6 we relied on analyses for the CPRR rulemaking or the  
7 MBDBE rulemaking where we had a concrete, you know,  
8 basis to judge we're a fit against the QHOs, then  
9 that's there.

10 For others, it's more of a deterministic  
11 or qualitative assessment.

12 MEMBER CORRADINI: Okay.

13 MR. BOWMAN: The one thing I guess I  
14 should point out is that most of the Tier 3  
15 recommendations, there are exceptions, but most of  
16 them are in and of themselves analyses rather than a  
17 recommendation to take a specific action.

18 So, in Tier 1 we had a recommendation to  
19 install hardened - reliable hardened vents on Mark Is  
20 and Mark II containments, but associated Tier 3  
21 recommendation would be assessed whether there's a  
22 need to do the same for other containments.

23 So, in many cases that's - yes.

24 MEMBER CORRADINI: Okay.

25 MR. BOWMAN: And then, again, Group 3

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 recommendations we discussed are those that we largely  
2 hadn't made significant progress on up until our  
3 recent initiative.

4 And they were complex or involved enough  
5 that we didn't have time to do a detailed assessment  
6 by the time this paper was due.

7 So, next slide. So, this slide - and I'll  
8 go into much more detail on each of these individual  
9 recommendations as we work through the presentation,  
10 but this summarizes the grouping.

11 The green and the purple recommendations  
12 are those that are in Group 1 with the purple color  
13 representing the ones that are - have been subsumed  
14 into the MBDBE rulemaking. And the green being the  
15 ones that we've assessed as part of our current  
16 initiative.

17 The orange recommendations are those that  
18 are in Group 2. And those are ones that we plan on,  
19 again, interacting with stakeholders before finalizing  
20 our assessment. And then the Group 3 recommendations  
21 are the ones in light blue. And then of course black  
22 at the top is the expedited transfer, which I  
23 mentioned earlier was closed.

24 So, are there any discussions before - any  
25 questions or discussion on the overall approach before

1 we move into the individual recommendations?

2 It's actually supposed to be orange, but  
3 those are the Group 2. So, those are the one we'll  
4 interact with more over the next few months and then  
5 the goal of closing in March.

6 Okay. So, the recommendation slides as I  
7 work through them just for a little bit of background,  
8 each slide is going to be in a similar format.

9 The top block is the recommendation. The  
10 next block provides information on the tiering of the  
11 information.

12 And the bottom left block is you see the  
13 primary factors that went into our assessment,  
14 although there are other factors that are in the paper  
15 that are discussed. And then the result of our  
16 assessment is listed on the right.

17 So, the first recommendation is  
18 Recommendation 3. This came from the Near-Term Task  
19 Force and would have us evaluate potential  
20 enhancements to protect against and mitigate  
21 seismically-induced fires and floods.

22 The Commission directed us to initiate a  
23 PRA methodology to support this recommendation as part  
24 of Tier 1. And our Office of Research has been  
25 working on that actively with Brookhaven over the last

1 several years.

2 We do have a draft feasibility study  
3 that's been prepared and is currently under review for  
4 the PRA method.

5 Then the Tier 3 component of the  
6 recommendation would have us use that PRA method to  
7 determine if there's a need to impose a regulatory  
8 requirement in response to Recommendation 3.

9 So, the draft feasibility study that's out  
10 for comment identifies some significant challenges  
11 associated with the development of a PRA method that  
12 would make it unlikely that the cost of doing so would  
13 warrant the benefit.

14 CHAIR STETKAR: Greg.

15 MR. BOWMAN: Yes.

16 CHAIR STETKAR: How do you make that  
17 determination that the cost doesn't warrant the  
18 benefit?

19 MR. BOWMAN: Part of it is the Tier 3  
20 assessment - a large part of that is the Tier 3 -

21 CHAIR STETKAR: Okay.

22 MR. BOWMAN: -- assessment that we did.  
23 So, the deterministic assessment that shows, you know,  
24 the -

25 CHAIR STETKAR: I'll wait for you to

1 finish -

2 MR. BOWMAN: Okay.

3 CHAIR STETKAR: -- this slide then.

4 MR. BOWMAN: Okay. The challenges  
5 associated with development of a PRA method would lead  
6 to significant delay in completing it. We would need  
7 to likely do a pilot study.

8 So, we decided that we would go ahead and  
9 do a deterministic evaluation given the information we  
10 have now to conclude if actions should be taken while  
11 the feasibility study is completed.

12 So, our October paper discusses the  
13 results of that assessment and we believe the  
14 recommendation should be closed based on that  
15 assessment.

16 The primary factors that fed into that  
17 were the existing robust fire and flood protection  
18 measures in our regulations; the voluntary  
19 enhancements the licensees are making based on  
20 transition to NFP 805; the seismic and flooding  
21 walkdown - or the seismic walkdowns, rather, that were  
22 done after the accident, those walkdowns specifically  
23 looked for vulnerabilities in the area of seismically-  
24 induced fires and floods, and licensees then identify  
25 some corrective actions which are being addressed as

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 part of the - their corrective action programs.

2 Mitigating strategies of course provides  
3 another layer of defense-in-depth. And then we did a  
4 review of international and domestic operating  
5 experience associated with seismically-induced fires  
6 and floods and did not identify any vulnerabilities  
7 based on those that would require regulatory action.

8 So, our plan if the Commission approves  
9 it, would be to complete the PRA feasibility study by  
10 the end of December as an activity sort of separate  
11 from the Recommendation 3.

12 CHAIR STETKAR: We had quite a bit of  
13 discussion over this issue in the Subcommittee  
14 meeting, but wanted to raise a couple of questions.

15 In your so-called deterministic evaluation  
16 you've made conclusions that says the staff has  
17 confidence that the risk from seismically-induced  
18 fires and floods would be a small fraction of the  
19 total seismic risk.

20 How did you reach that conclusion?

21 MR. BOWMAN: I'm looking for someone from  
22 Research who might want to help us with that.

23 CHAIR STETKAR: Well, it's just drawing a  
24 conclusion. So, I'd kind of like to know how you  
25 reached it.

1 MR. BOWMAN: Well, I mean, I think the  
2 risk of a seismic event, I think we agree, is low.

3 CHAIR STETKAR: Have you ever done a  
4 seismic risk assessment?

5 MR. BOWMAN: Not me personally, no.

6 CHAIR STETKAR: Okay. The risk from  
7 seismic events where you have seismic damage to robust  
8 safety-related equipment is typically small.

9 Seismic events that have lower  
10 accelerations, much higher frequencies, can damage  
11 non-seismically-qualified equipment.

12 Is typical fire protection, detection,  
13 suppression equipment in a nuclear power plant  
14 seismically-qualified?

15 MR. BOWMAN: No, it's not.

16 CHAIR STETKAR: It's not. So, we can have  
17 higher frequency events of smaller accelerations that  
18 don't have much contribution at all to the so-called  
19 seismic risk cause failures of non-seismically-  
20 qualified equipment, which could be non-seismically-  
21 qualified cables, electrical systems, and it could  
22 fail the fire protection systems to detect and  
23 extinguish those fires.

24 So, how do we know that the conditional  
25 consequences of fire given a, I'll call it, medium

1 frequency/medium acceleration seismic event, are  
2 deterministically small?

3 MR. BOWMAN: Well, I think from our  
4 perspective, the goal of our assessment was to look at  
5 the totality of the, you know, regulatory framework  
6 that exists and decide whether we have justification  
7 to impose a new requirement based on that.

8 So, I think if you look at all the  
9 different factors that fed into our assessment, the  
10 totality of that would indicate that we don't need to  
11 take additional regulatory action.

12 We have operating experience that shows  
13 that you have a significant seismic event, the plant  
14 safety systems manage through the event.

15 CHAIR STETKAR: We've had significant  
16 seismic events at our nuclear power plants?

17 MR. BOWMAN: Yes. Onagawa, Kashiwazaki-  
18 Kariwa -

19 CHAIR STETKAR: No, no, no. At our  
20 nuclear power plants.

21 MR. BOWMAN: Well, we -

22 CHAIR STETKAR: The Japanese nuclear power  
23 plants are designed for seismic events that far exceed  
24 the United States. So, I'm saying our nuclear power  
25 plants.



1 MR. BOWMAN: Well, we had the North Anna  
2 earthquake, of course.

3 CHAIR STETKAR: Oh, that was slightly  
4 above their design basis in the high frequency  
5 spectrum.

6 I'm talking about now events that are  
7 above the safe shutdown earthquake, but not severe  
8 enough to physically damage robust safety systems.

9 Do we have any of those events?

10 MR. BOWMAN: The answer to that question  
11 is no.

12 CHAIR STETKAR: I'll answer the no. It's  
13 a rhetorical question.

14 I'm concerned about the staff drawing very  
15 clear conclusions in a paper that's being sent to the  
16 Commission that says things like the staff knows that  
17 the risk from seismically-induced fires is a small  
18 fraction of; A, the total plant risk and; B, the risk  
19 from seismic events.

20 Because I've been evaluating fires and  
21 seismic events for the last 20 years of my career, I  
22 have not evaluated seismically-induced fires, but I  
23 can't make that conclusion.

24 So, I'm curious how the staff can reach  
25 it.

1 MR. BOWEN: So, I think the - it's  
2 important to go back and reflect on one of the points  
3 Greg was making about the approach, again, was is  
4 there a need for regulatory action at this point in  
5 time based on the information that the staff currently  
6 has available?

7 And the conclusion is based on that - the  
8 conclusion of no, no action is needed at this point in  
9 time, is based on a totality of information.

10 Part of that is the fact that there is  
11 additional - there is layers of defense-in-depth  
12 provided for safety of the plants, there are  
13 additional enhancements that were put in place as part  
14 of the post-Fukushima actions, and there is currently  
15 ongoing work for the more significant seismic concern  
16 - seismic risk concerns at certain plants that -- to  
17 evaluate whether there is a need for further  
18 enhancements.

19 There is - there are approximately 20  
20 plants that are currently planned to go -- undergo a  
21 seismic PRA to evaluate the specific impacts of - let  
22 me backup.

23 Plants reevaluated their seismic hazardous  
24 part of the 50.54(f) Tier 1 activity and identified  
25 whether there was a difference between their safe

1 shutdown earthquake and the new ground motion response  
2 spectrum.

3           Given that information and all the other  
4 information that Greg mentioned, the staff feels  
5 confident that there is sufficient margin, there is  
6 inherent margin in the equipment for seismic events  
7 that - and there has been other activities that have  
8 taken place that give us confidence, there's time to  
9 go do a further detailed analysis on a certain subset  
10 of plants.

11           So, the need, again, coming back to the  
12 objective with the Tier 2 and Tier 3 recommendations,  
13 is there a need for regulatory action at this point in  
14 time? The staff believes, no, based on all that  
15 information.

16           VICE CHAIR BLEY: That's an argument that  
17 may well hold up. But when you anchor that argument  
18 to conclusions that you can't justify, it certainly  
19 calls into question your overall process.

20           CHAIR STETKAR: And before you respond to  
21 that, and I'll note for the record the folks doing  
22 those reevaluated seismic analyses whether it's a  
23 margin study or a seismic PRA, will not look at  
24 seismically-induced fires. They will not do that.

25           MEMBER SCHULTZ: And that's a concern with

1 what's being recommended here. In other words, if  
2 this item is closed, one can say, well, we've got  
3 other items that are going to be looking at seismic or  
4 looking at fires or -- the combination is what we're  
5 interested in examination.

6 MR. BOWMAN: So, I understand that some of  
7 you have the view that we should continue with the  
8 feasibility study and take - that's an insight that  
9 we'd be looking forward to getting from the Committee  
10 and that we'll factor into our - the finalization of  
11 the assessment. I understand.

12 Recommendation - the next recommendation  
13 is - these two recommendations, actually were staff  
14 generated. So, they didn't come from the Task Force  
15 or from other stakeholders.

16 They would have us reassess the emergency  
17 planning zone size and practices associated with pre-  
18 staging of potassium iodide in light of the accident.

19 The initial plan in SECY-12-0095 would  
20 have had us await the completion of longer term health  
21 effect studies before moving forward with these  
22 recommendations.

23 While studies in, as I mentioned earlier,  
24 there are studies that will be going on for many, many  
25 years.

1           We do have some studies currently  
2           available to us. Specifically studies from the United  
3           Nations and from the World Health Organization. And  
4           so, we believe it's appropriate to move forward with  
5           these two recommendations now.

6           Our current policies were described in a  
7           2014 denial of the Petition for Rulemaking that  
8           concluded that the current requirements and practices  
9           are adequate. The Commission ultimately approved the  
10          staff's position in that denial.

11          Since the time of the Petition denial  
12          we've assessed the information from the reports I  
13          mentioned which provide new data on public exposure in  
14          the areas around the Fukushima Daiichi site.

15          The information from those reports  
16          supports the staff's position provided in the denial.  
17          And so, we believe these two recommendations should be  
18          closed now.

19          We will maintain engagement in the longer  
20          term health effect studies that are going on around  
21          Fukushima. And if new information comes to light,  
22          we'll use existing processes to evaluate that  
23          information.

24          MEMBER SCHULTZ: Jeremy, here you have on  
25          the slide cost-benefit considerations. Could you

1 speak to -

2 MR. BOWMAN: I think you're on a different  
3 - you might be on a different slide than we are.

4 MEMBER SCHULTZ: I am on the next slide.

5 MR. BOWMAN: Which slide are you - we're  
6 on Slide 8.

7 MEMBER SCHULTZ: Go ahead. I'm sorry. Go  
8 ahead. I was looking -

9 MR. BOWMAN: Okay. Are there any  
10 questions on Slide 8 before we move to 9?

11 (No audible response.)

12 MR. BOWMAN: So, Slide 9, this slide  
13 provides four of the emergency preparedness  
14 recommendations that we believe should be closed now.

15 The first two deal with the capabilities  
16 of ERDS, the Emergency Response Data System, which, as  
17 you know, was used to provide information to the NRC  
18 on parameters at the site during an accident. And the  
19 second two deal with emergency preparedness  
20 enhancements being led by FEMA with support from the  
21 NRC.

22 So, these recommendations, we believe, are  
23 ready to be closed for a variety of reasons. With  
24 respect to the first two enhancements, the  
25 recommendations included ones to make the ERDS capable

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 of operating under Beyond-Design-Basis event  
2 conditions, establishing means of transmitting ERDS  
3 that would be independent of hard-wired  
4 infrastructure, a reassessment of ERDS to ensure that  
5 it meets NRC's information needs, and then a  
6 requirement that ERDS transmit on a continuous basis.

7 So, our assessment concludes that these  
8 enhancements are not justified based on cost, as Steve  
9 mentioned, and the fact that some of the recommended  
10 enhancements might not even be technically feasible.

11 Given that the NRC is in an advisory role  
12 during an emergency, we don't really have any  
13 operational responsibility along with the fact that we  
14 have alternate means of obtaining the information from  
15 ERDS during an event and we actually have experience  
16 doing drills and exercises without ERDS being  
17 available, we feel that the benefit of these  
18 enhancements would not warrant the cost.

19 With respect to the second two  
20 recommendations, FEMA is actively working on  
21 activities associated with them. They actually have  
22 the lead for those two activities.

23 They have put in place training  
24 enhancements in light of the accident and they're  
25 nearly complete with an update to the nuclear

1 radiological incident annex of the national response  
2 framework. That should be done by the end of this  
3 year and incorporates lessons learned from the  
4 Fukushima accident.

5 So, given our progress to date and the  
6 factors I've discussed, we believe these four  
7 recommendations should be closed.

8 Now, Steve, with respect to your question  
9 on cost, the benefit of ERDS - so, the ERDS system was  
10 put in place a number of years ago. It's not a  
11 safety-related system.

12 So, requiring ERDS to be capable for  
13 Beyond-Design-Basis event conditions would be very,  
14 very costly and might require a complete essential  
15 replacement of the ERDS system.

16 So, it would be very expensive and  
17 difficult to justify the cost of that in light of the  
18 benefit that we gain from getting that information.

19 We do have other methods in place;  
20 satellite phones, the ENS line.

21 MEMBER SCHULTZ: There are also other  
22 proposed modifications or enhancements to ERDS that  
23 fit into that same category?

24 MR. BOWMAN: Right. So, the - I mentioned  
25 the four enhancements that are in that group. With



1       respect to continuous transmission, we've been  
2       voluntarily working with licensees to encourage them  
3       to transmit information voluntarily. A number of them  
4       do already and our proposal will be to continue doing  
5       that.

6               With respect to reassessing our  
7       information needs, which was one of the  
8       recommendations, we've fairly recently expanded ERDS  
9       to include additional data points.

10              And so, we think that that's a good step  
11       and that we are where we need to be based on that.

12              MR. BOWEN: And that one is a good example  
13       of the Agency's processes like always doing an  
14       evaluation from that standpoint.

15              So, the normal process would drive us to  
16       reevaluate that if it were necessary anyway. So,  
17       that's one where there's no need for another - a  
18       separate action as part of this activity.

19              MEMBER CORRADINI: So, let me ask the  
20       question a little differently. So, what you're saying  
21       is there are other opportunities or other ways to do  
22       it.

23              Does this generate a user need and  
24       resource to actually look beyond what is currently the  
25       technology to something that's different?

1 MR. BOWMAN: We think the cost would be  
2 prohibitive and it's not worth the effort to do that.

3 MEMBER CORRADINI: But that's based on an  
4 analysis?

5 MR. BOWMAN: It's based on a qualitative  
6 analysis. Also, given the benefit that we would  
7 obtain if we were to do the recommendation - if the  
8 recommendation were to be implemented.

9 And as I've mentioned, we've had drills  
10 and exercises fairly frequently where we don't have  
11 ERDS available to us and we were successfully able to  
12 get the information we need, make recommendations.

13 MR. BOWEN: With the fundamental  
14 understanding that ERDS is information for the Agency,  
15 it is not a safety - not necessarily for the plants  
16 and there is no safety value to ERDS from that  
17 standpoint, but is information for the Agency to help  
18 us support in our emergency - in our EP role.

19 But, as Greg mentioned, it's not necessary  
20 for us to have that information to still fulfill that  
21 role.

22 MEMBER CORRADINI: So, why even have it  
23 then?

24 MR. BOWEN: It's a tool. To use the term  
25 from the plant, it's an operator aid.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 MR. BOWMAN: And we think what we have now  
2 is sufficient.

3 CHAIR STETKAR: If ERDS didn't function or  
4 if ERDS functioned strangely, would there be  
5 additional burden on plant responders because of the  
6 need to institute alternate communications to the NRC.  
7 I think we stress in time and allocation of, you know,  
8 one or more individuals to that function?

9 MR. BOWEN: It would depend on the -  
10 potentially, yes. I will acknowledge that  
11 potentially. But as Greg mentioned, there have been  
12 some examples we can point to from drills and  
13 exercises where we've actually used communication  
14 through the resident inspectors to get the information  
15 where the licensees are already providing information  
16 in sheets and stuff to their Technical Support Center.

17 So, it's the - they just kind of copy us  
18 on that information, if you will. So, it's, to your  
19 point, yes, it's a possibility. We've seen - we've  
20 had real-life examples.

21 It's not an over - it's not an extreme  
22 burden for -

23 MR. BOWMAN: So, I've been a resident  
24 inspector during events where we have not activated  
25 ERDS, because they weren't at that level.

1 And I've been on the phone. It is a  
2 burden, but it's a burden that we were able to manage.  
3 I mean, there are -

4 CHAIR STETKAR: Do you get it through the  
5 Technical Support Center or -

6 MR. BOWMAN: Yes, that would largely be  
7 how.

8 CHAIR STETKAR: Because they're typically  
9 not designed to survive a - I mean, they're powered by  
10 non-safety power systems. They, you know, they're not  
11 designed to survive a Beyond-Design-Basis event.

12 MR. BOWMAN: I mean, I don't think anyone  
13 is arguing that these - that for many of these, they  
14 are enhancements.

15 CHAIR STETKAR: Okay.

16 MR. BOWMAN: They would be enhancements,  
17 but we don't think they're necessary based on the  
18 cost.

19 MEMBER SCHULTZ: Greg, what prompts some  
20 licensees to voluntarily -

21 MR. BOWMAN: There are some benefits to  
22 licensees to continuously transmit ERDS. There's a  
23 quarterly test that they have to do if they don't  
24 transmit voluntarily. With voluntary transmission, we  
25 do that test ourselves.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1           And then also they wouldn't need to be,  
2           you know, burdened by activating ERDS during an event.  
3           So, those are the primary benefits to the licensee.

4           MEMBER SCHULTZ:   And what fraction of  
5           licensees do transmit voluntarily?

6           MR. BOWMAN:   I believe 20 sites.   So,  
7           about a third.

8           MEMBER SCHULTZ:   Thank you.

9           MR. BOWMAN:   Slide 10.   So, shown on this  
10          slide, Recommendation 12.1 came from the Near-Term  
11          Task Force.   It would have the NRC adjust the reactor  
12          oversight   process   self-assessment   and   biennial  
13          realignment processes to include defense-in-depth  
14          considerations.

15          So, this recommendation was put in Tier 3  
16          because it was dependent on Recommendation 1, which  
17          has been closed to the RMRF, Risk Management  
18          Regulatory Framework, Initiative.

19          At the Commission's direction from a year  
20          or so ago, the RMRF project is being treated outside  
21          the scope of Fukushima.   And we are, as you all know,  
22          we are planning to submit a paper to the Commission by  
23          the end of this year with some proposals related to  
24          RMRF.

25          Separately and also outside the scope of

1 Fukushima the staff has been working to enhance the  
2 ROP attributes that were the original focus of this  
3 recommendation, the self-assessment and realignment  
4 and an evaluation of defense-in-depth could be  
5 considerations depending on where the Commission -  
6 what the Commission directs us on our RMRF.

7 We do note in the paper that there are a  
8 number of ROP enhancements that have already been made  
9 not related to this recommendation, such as  
10 improvements to the flood protection inspection  
11 procedures.

12 And we have post-compliance inspections of  
13 the mitigating strategies or in spent fuel pool  
14 instrumentation order underway right now as part of  
15 Temporary Instruction 191.

16 We plan on making additional enhancements  
17 to the ROP based on insights from the TI inspections  
18 over the next several years using the ROP feedback  
19 process. So, we have a process in place for handling  
20 enhancements like that.

21 Given the fact that Recommendation 1 is  
22 closed, that we've already made enhancements and that  
23 we have a well-established process for future  
24 enhancements, we believe this recommendation can also  
25 be closed now.

1 MEMBER REMPE: Excuse me.

2 MR. BOWMAN: Yes.

3 MEMBER REMPE: Recently the Commission  
4 stated that the SAMG oversight should be under the ROP  
5 process. Could you elaborate on how you're  
6 accommodating that recommendation?

7 We've had some discussions about the ROP  
8 and how it's risk-based. And so, I'm kind of  
9 wondering how much attention that oversight will get.

10 MR. BOWMAN: Yes, I don't know if we're  
11 ready to talk about specific enhancements for SAMGs.  
12 It's one of the - we are definitely in the process of  
13 thinking through that, but it's a little ways off  
14 before we actually put in place the framework for it.

15 MR. BOWEN: Yes, the staff's begun a  
16 process of laying out a schedule, if you will, for  
17 when we got to identify the frequency of evaluating  
18 SAMGs and scope and everything and such an inspection  
19 and how that would be handled as far as issues that  
20 were identified and everything, but the specifics have  
21 not been identified yet.

22 As Greg mentioned, there's really -  
23 there's a bunch of activities going on in parallel  
24 that would kind of inform what that inspection  
25 procedure were to look like, how the issues would be

1 processed in the ROP.

2 There's a long-term thought that some of  
3 the - that many of the post-Fukushima  
4 actions/activities there's a need for a long-term  
5 inspection procedure to oversee all those activities.  
6 The SAMGs may be part of that inspection procedure.

7 But as far as the scope, the frequency,  
8 how the issues would be dispositioned, that hasn't  
9 been identified yet. That's a plan for probably - I  
10 don't know.

11 MEMBER CORRADINI: So, can I ask the  
12 question differently? Does the staff observe like -  
13 because I know that the industry does have revised  
14 SAMGs and are going through what I'll call tabletop  
15 exercises on how one would postulate certain scenarios  
16 and how then the SAMGs would enter in how you'd go  
17 into FLEX, come out of FLEX, et cetera, et cetera.

18 Does the staff or do the inspectors when  
19 there's a tabletop such as that, observe the exercise?

20 MR. BOWEN: I don't think that we have  
21 been actively engaged to that level of detail. We  
22 have the, as you mentioned, both owners groups are in  
23 the process of revising their SAMG guidance and then  
24 that being incorporated into each of the plants.

25 We've been provided drafts and are made



1 aware of the plans and their progress on those  
2 activities, but I don't think that we're necessarily  
3 engaged or - and I'm not even quite sure that the  
4 individual licensees are at that point yet to -

5 MEMBER CORRADINI: But I know the owners  
6 groups are, right?

7 MR. BOWEN: Yes, the owners groups are  
8 working through that - those activities.

9 MEMBER CORRADINI: I can't remember - yes,  
10 I can't remember the Subcommittee meeting, but I  
11 remember the owners group folks were giving us  
12 examples up in front and then encouraging us to have  
13 some sort of tabletop demonstration here so we could  
14 appreciate how they've modified the SAMGs and have  
15 taken advantage of all this.

16 So, my curiosity is has staff observed any  
17 of these?

18 MR. BOWEN: I don't think we've observed  
19 any of those activities.

20 MEMBER CORRADINI: I mean, I personally  
21 don't think auditing them helps a lot. I think it's  
22 more a matter of the staff gaining confidence so they  
23 understand what the industry is doing and to observe  
24 it in some sort of tabletop exercise seems a lot - a  
25 bit more beneficial than necessarily auditing.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 MR. BOWEN: I understand. I think at this  
2 point we've been kind of - we've been keeping aware of  
3 what their - what the activities are. But because  
4 they are kind of in the middle of that process, if you  
5 will, we haven't engaged further.

6 MR. BOWMAN: Slide 11. So, Near-Term Task  
7 Force Recommendation 12.1 is associated with improved  
8 training for inspectors and staff in general and  
9 severe accidents and severe accident management  
10 guidelines.

11 Recommendation 12.1 was categorized as a  
12 Tier 3 recommendation because of its dependency on  
13 Recommendation 8, which involves strengthening and  
14 integration of emergency response capabilities. And  
15 that of course is included in the scope of the MBDDBE  
16 rulemaking.

17 We have completed a number of severe  
18 accident training initiatives, including development  
19 of new courses and updates to qualification programs  
20 based on insights from the accident.

21 The Office of Research has put in place  
22 quarterly training on severe accidents. And those  
23 courses are available to any NRC staff at iLearn.

24 Some of the existing training courses like  
25 the R-800 course, Perspectives on Reactor Safety, have

1       been updated to include a discussion of the accident.

2               And then we've been working on updating  
3       inspector qualification programs -

4               MEMBER POWERS:   Excuse me.

5               MR. BOWMAN:   Yes, sir.

6               MEMBER POWERS:   I know something about R-  
7       800.

8               (Laughter.)

9               MEMBER POWERS:   I'm not aware of any  
10       updating in that course.

11              MR. BOWMAN:   I believe we made updates.  
12       That's -

13              MR. VALENTIN:   This is Milton Valentin.  
14       I'm one of the project managers in Japan.   Good  
15       morning, everyone.   And, yes, we've been discussing  
16       with the staff who is responsible for putting these  
17       courses together and we were notified that the updates  
18       were done for the materials on this course.

19              MEMBER POWERS:   I am totally unaware of  
20       this.

21              (Laughter.)

22              MR. BOWMAN:   We've also been working on  
23       updating -

24              MR. BOWEN:   We'll go back and double-check  
25       on that.

1 MEMBER SKILLMAN: Let me ask this before  
2 we proceed: How often do the residents receive some  
3 training on SAMGs?

4 MR. BOWMAN: Right now I don't believe  
5 they have any training at this point. We don't - one  
6 of the things we will discuss is we are developing  
7 SAMG training specifically for the resident  
8 inspectors. So, that's something that will be done in  
9 2016.

10 Right now their training is focused on  
11 normal operating procedures, EOPs, that type of thing.

12 MEMBER REMPE: So, really that slide  
13 shouldn't say it's being developed. You're planning  
14 to develop, I mean, you have not started it yet.

15 MR. BOWMAN: No, SAMG training is being  
16 developed. It's due in the middle of next year.

17 MEMBER REMPE: Based on the old SAMGs, or  
18 the -

19 MR. BOWMAN: Yes.

20 MEMBER REMPE: -- new ones that you  
21 haven't seen yet?

22 MR. BOWMAN: Yes, based on the existing  
23 SAMGs. And if you're an inspector, your job is to  
24 understand how licensees use the SAMGs and integrate  
25 those with the EOPs and other response procedures.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1           So, changes to the SAMGs that take place  
2           in 2018, they might be a part of a change to the  
3           training program in those years, but what we're really  
4           shooting for with this training is to get the  
5           inspectors a knowledge of how the SAMGs work.

6           MEMBER REMPE:    So, they'll know what  
7           instrumentation when something is going haywire, that  
8           they would switch from an EOP to a SAMG.

9           MR. BOWMAN:   Right. They would know what  
10          the - yes, they would know how the licensee works  
11          through them, what their approach is, that type of  
12          thing.

13          MEMBER REMPE:    Okay.

14          MR. BOWEN:    And then the training would  
15          be, as Greg mentioned, the training would be updated  
16          based on that, any changes that come out of the owners  
17          group activities and everything.

18          MEMBER SKILLMAN:   My    name is Dick  
19          Skillman.

20          MR. BOWEN:    Okay.

21          MEMBER SKILLMAN:   Let me ask more  
22          pointedly, why isn't there a cadence where the NRC and  
23          the owners for the quarterlies, for the annuals, for  
24          the biennials that are evaluated, at least a  
25          smattering of SAMGs?

1           We all know a severe accident can happen.  
2           And we all know that there are a couple of very key  
3           actions that need to take place to reduce the  
4           consequence of a severe accident.

5           So, it isn't a mystery to the people who  
6           own and operate the plant, it's not a mystery to the  
7           operators, and it's certainly not a mystery to the  
8           residents.

9           So, why isn't there at least some at least  
10          initial testing of the SAMGs?

11          MR. BOWEN: So, the objective with this  
12          recommendation and the training is to roll that into  
13          the initial qualification program for inspectors. And  
14          then the inspectors go through a periodic  
15          requalification or maintenance activity, if you will,  
16          that they get through a series of training to  
17          operations understanding, that sort of thing.

18          I think to the - exactly what you're  
19          talking about is envisioned -- the SAMG training, to  
20          some degree, is envisioned to be part of that  
21          maintenance training, if you will, to maintain our  
22          inspector qualifications.

23          MR. BOWMAN: So, but licensees do use the  
24          SAMGs during exercises. And inspectors do go out and  
25          watch licensees work through the SAMGs as part of

1 their oversight rule.

2 This would enhance the inspector's  
3 understanding of the SAMG so they have a better base  
4 knowledge when they go in and watch those activities,  
5 or, God forbid, they ever actually have to oversee a  
6 real event.

7 MR. BOWEN: And I'd like to make an  
8 important distinction, too. This recommendation and  
9 the previous recommendation where we talked about  
10 oversight of SAMGs, two distinct functions.

11 Within this recommendation it's training  
12 the inspectors to help understand the SAMG so that the  
13 Agency can be better positioned to perform its EP  
14 function versus oversight of the SAMGs to ensure that  
15 they're being maintained from that standpoint. Two  
16 separate, distinct functions.

17 MR. FRANOVICH: Greg, if I can add, this  
18 is Mike Franovich. I'm the Deputy Director, JLD. A  
19 couple questions there about the SAMGs as to why  
20 they're not really formally part of the ROP today.

21 This is not an excuse or trying to defend  
22 the practice in the Agency, but rather from a  
23 fundamental understanding when the SAMGs were  
24 originally developed back in the late '80s/early'90s,  
25 there was a lot of initiative with industry and with

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 the regulator.

2 And there was an understanding that the  
3 industry would develop the SAMGs, licensees would have  
4 them, but that the NRC would not inspect the SAMGs.

5 Unfortunately, we went forward into the  
6 ROP, which was a performance-based program. That  
7 legacy decision was not really revisited. And so, we  
8 move forward in time and here we are with the accident  
9 of Fukushima and we go out and do the TI and we  
10 recognize that, you know, licensees weren't  
11 necessarily maintaining the SAMGs and so forth.

12 So, that's just from a historical  
13 standpoint. So, you kind of get the picture of where  
14 we wound up to where we are today trying to make these  
15 enhancements.

16 And then the second point, the residents  
17 do get some training on SAMGs when they go take the  
18 full series training down in TTC for the different  
19 technology series. In particular, the one I'm  
20 thinking of is the General Electric BWR training where  
21 the SAMGs are integrated with the emergency procedure  
22 guidelines.

23 So, there is a level of awareness and some  
24 simulation that they get part of their formal  
25 training, but they don't go out and do inspections on

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701



1 the SAMGs, per se, but they do have some cognizance of  
2 what the SAMGs are.

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

5 MR. BOWMAN: Next slide. So, this slide  
6 discusses several of the emergency preparedness  
7 recommendations that are being addressed as part of  
8 the mitigation of beyond-design-basis events  
9 rulemaking.

10 And so, for these recommendations the  
11 paper basically just discusses that we're not tracking  
12 these anymore as separate recommendations. That  
13 they're essentially being treated as subsumed into the  
14 MBDBE rulemaking.

15 Slide 13. So, this is the first of the  
16 Group 2 recommendations. And as a reminder, for these  
17 recommendations we have what we believe is sufficient  
18 information to recommend closure at this point, but we  
19 think there's benefits interacting with the ACRS and  
20 other external stakeholders before we finalize that  
21 assessment.

22 So, the recommendation on this slide came  
23 from the ACRS -

24 MEMBER SCHULTZ: Could we just pause here,  
25 because we've had a number of comments that kind of

1       pertain to this, the closure aspect. And it might be  
2       a good time for you or for Jeremy to describe what  
3       "close" means, your recommendation of close to the  
4       Commission, because that does not mean that activities  
5       cease in these areas at all. The program still  
6       continues.

7               MR. BOWEN:       Thanks, Steve.       Yes,  
8       appreciate that. Again, to reflect back to the  
9       beginning of the presentation, "close" really means -  
10      in this context means we're not recommending a  
11      specific regulatory action at this time, i.e., an  
12      order, initiation for rulemaking, a 50.54(f) letter,  
13      what have you.

14             To your point, the Agency's processes,  
15      there's always ongoing work, we have an entire office  
16      dedicated to research and activities associated with  
17      enhancing regulatory knowledge and everything. So,  
18      those activities will continue under normal agency  
19      processes.

20             What we're recommending - what "closure"  
21      means here is no regulatory action is needed at this  
22      point in time in the near term as a result of our  
23      analyses from the events of Fukushima.

24             MEMBER SCHULTZ: Thank you.

25             MR. BOWMAN: So, the recommendation on

1 this slide came from the ACRS. It would have us  
2 enhance - or assess the need to enhance and upgrade  
3 certain reactor and containment instrumentation to  
4 survive beyond-design-basis events.

5 We have interacted with domestic and  
6 international organizations in assessing this  
7 recommendation and determine that the additional  
8 safety benefit gained from imposing new requirements  
9 in this area would be justified based on the criteria  
10 in the NRC's backfit rule.

11 Our assessment discusses that the SAMGs  
12 include a process for treatment of instrumentation  
13 that can be challenged due to plant conditions. You  
14 use the instrumentations that you have available.  
15 Look for alternate means if a parameter isn't  
16 available. Use analytical means. And if those means  
17 don't work, you add water.

18 MEMBER CORRADINI: So, let's stop there.

19 MR. BOWMAN: Yes.

20 MEMBER CORRADINI: So, let's link that  
21 back to the SAMGs. It strikes me that I personally  
22 don't disagree with this, but it seems to me you need  
23 to test it. And where you test it, you would actually  
24 then look at the SAMGs, look at particular scenarios  
25 and show where I could get a false signal and I can

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 essentially survive a false signal or a set of false  
2 signals.

3 Is staff doing anything in this regard?

4 Is there a user need for research?

5 I mean, where I'm coming from is, I don't  
6 necessarily disagree with the logic or philosophy  
7 that's going forward here. This makes perfect sense  
8 in many ways, but it seems to me there is a residual  
9 that there's some activity that research can take upon  
10 themselves to essentially verify, confirm, if you want  
11 to use the word, confirmatory research that this is a  
12 good decision and I don't sense any sort of activity  
13 in this regard.

14 MR. BOWMAN: Yes, I don't know. Do we  
15 have anybody from Research who can speak to that?

16 Russ. Thank you, Russ.

17 MR. SYDNOR: Good morning. I was the lead  
18 for this Tier 3 item.

19 You are correct. I mean, there is not  
20 currently a request to the Office of Research for us  
21 to perform that confirmatory research.

22 We are following efforts. We're  
23 participating in an EPRI working group that is looking  
24 into these - the issues, the viability of the operator  
25 aids and things like that, trying to improve those

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 efforts.

2 So, we're still participating in efforts  
3 that will potentially bear fruit along those lines,  
4 but we don't have a specific user need or request to  
5 do confirmatory research at this time.

6 MEMBER SCHULTZ: But could you - there's  
7 participation, and then what might be participating in  
8 some discussions or some planning, but I think what  
9 Mike is talking about is technical work that's  
10 associated with a staff review of ongoing activities  
11 that industry is pursuing in this area.

12 MEMBER CORRADINI: Right. I guess where  
13 I'm coming from is - and I think industry has taken  
14 the tack as this, but, nevertheless, all of this seems  
15 to - again, maybe I'm misinterpreting. I'm sure NEI  
16 will come up and correct my misinterpretation.

17 It seems to me the SAMGs are - have been  
18 developed under the premise that if I enter into a  
19 scenario to mimic an accident, I can essentially  
20 successfully determine what's false signals so I don't  
21 have to pay attention to them, and find or do the  
22 appropriate actions.

23 And it seems to me I've got to test that  
24 based on a set of scenarios. And it would be very  
25 helpful if staff was part of it, observing it or at

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 least separately thinking through this so they confirm  
2 that they have the confidence that it all works out.

3 MR. BOWMAN: We understand.

4 MEMBER CORRADINI: Okay.

5 MEMBER REMPE: Russ, you mentioned the  
6 EPRI activities. Are they doing something like what  
7 Mike is describing?

8 MR. SYDNOR: Not - things like that are  
9 being discussed. I think you're aware of that. I  
10 mean, there's not a formal activity in the EPRI  
11 working group to do such a validation, but we are  
12 aware that the - a number of utilities are working on  
13 simulation capabilities, including a MELCOR severe  
14 accident simulation to run and, you know, try to  
15 verify the alternative means that they have developed  
16 for this, you know.

17 MEMBER CORRADINI: So, let me now totally  
18 turn on you and say that using a computational tool to  
19 mimic an accident is dangerous if that's the only  
20 thing you're doing. MAAP and MELCOR are not meant to  
21 be simulators of an accident. They can inform as one  
22 piece of information.

23 I'd rather see some sort of tabletop  
24 experiment to get some sort of set of potential  
25 responses, and then try to look through the logic with

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 the operators or past operators.

2 At least - because I will say I've been in  
3 meetings where EPRI has very specifically said that  
4 MAAP is not a severe accident simulator. And if it's  
5 starting to be used that way, I think that's a misuse.

6 MEMBER SCHULTZ: Yes, just to emphasize  
7 what you have said before, and that is you weren't  
8 talking about that when you were describing the  
9 tabletops and the -

10 MEMBER CORRADINI: Right.

11 MEMBER SCHULTZ: -- evaluations that the  
12 staff could perform and research could support.

13 MEMBER SKILLMAN: I would just opine this,  
14 to me, is an example where the discussion around  
15 sophistication is masking a very practical issue.

16 What really needs to happen is for you to  
17 talk with the people who have been through severe  
18 accidents and say, what did you need that you didn't  
19 have?

20 And I think you're going to find it's  
21 temperature, it's going to be radiation level, it's  
22 going to be water level. It may be two or three other  
23 parameters that are quite simple and they don't need  
24 multimillion dollar, highly sophisticated devices.

25 Most everything is available as long as it

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 will fit, if you will, the EQ profile for a severe  
2 accident. And most of the instrumentation leads are  
3 already there. So, the real question is, hey, is it  
4 good enough for an SAMG?

5 MEMBER BROWN: Well, the EQ requirements  
6 for severe accident aren't necessarily reflected in  
7 the requirements for developing it for design-basis  
8 performance.

9 So, that's - we've separated that issue  
10 out and we've had that discussion several other times.  
11 And, I mean, I don't necessarily agree that I - with  
12 this. You know I don't agree with this action. How  
13 many times do I have to say that?

14 But I do agree with Dick. You need some  
15 type, to me, some type of instrumentation to allow the  
16 operators to have - to make an assessment of what they  
17 may need to do.

18 Calculational aids running MELCOR in  
19 realtime while you're trying to fight an accident,  
20 seems, to me, a somewhat difficult task. MAAP in  
21 realtime, somewhat difficult task. And other types of  
22 models are difficult to do.

23 You're going to have to be making the  
24 assessments based on what you see and maybe hear, I  
25 don't know, in the - no, I'm very serious about that.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701



1 I was not being facetious when I said that.

2 And I guess my conclusions weren't - or my  
3 considerations weren't that we need to revamp every  
4 instrument in the plant. That is not the point, but  
5 that some amount, some number of critical parameters  
6 that people assess based on severe accident modeling  
7 and analysis that people need for information should  
8 be upgraded.

9 So, how you use these calculational tools  
10 is beyond me if you don't have data. How does a guy  
11 do a back-of-the-envelope, you know, handwritten, gee,  
12 pressure is going up, level is doing this, temperature  
13 is doing such and such, what does that mean to my  
14 saturation conditions, et cetera, if he doesn't have  
15 any data?

16 So, I just somewhere along the line, I'd  
17 like to see if we're going to - when you say you're  
18 going to assess and have additional interaction, it  
19 would seem to me that there ought to be a technical  
20 basis, as Mike noted, where you've assessed these  
21 parameters and said this is how you would have an  
22 alternate approach to getting the information  
23 necessary based on observations of things that don't  
24 get destroyed, damaged or compromised during the  
25 severe accident circumstance.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 MR. BOWEN: If I could, I think this  
2 discussion is indicative of why the staff put this in  
3 Group 2, if you will.

4 (Laughter.)

5 MR. BOWEN: We're trying to take the  
6 information that we current, you know, that we had  
7 from an understanding of what is available for  
8 instrumentation, what licensees would take - what  
9 actions they would take in a severe accident space to  
10 understand the necessary parameters that are needed to  
11 combat the accident.

12 Also recognizing that their regulatory  
13 footprint, if you will, the direction from the  
14 Commission that SAMGs are not - shouldn't be a  
15 regulatory requirement, but there should be some  
16 oversight of those.

17 So, that's one of the reasons we're  
18 proposing at least to the Commission that here's our  
19 current understanding, but there's benefit, there's  
20 value in having further discussion with stakeholders  
21 to see really, you know, there was mention at the  
22 Subcommittee meeting about having the owners group  
23 come in and give a little bit more information about  
24 the process that they would go through.

25 And I think that discussion, that

1 interaction would be beneficial to help us inform  
2 better recommendation to give to the Commission, you  
3 know, six months, seven months from now. That's our  
4 thinking.

5 MEMBER SCHULTZ: Thank you, Jeremy.

6 Ed.

7 MR. FULLER: This is Ed Fuller, the Senior  
8 Technical Advisor on severe accidents in the Office of  
9 Research.

10 I think that it's important to not dismiss  
11 the analytical tools MAAP and MELCOR so quickly,  
12 because they, in fact, can play very important roles  
13 in - in their analyses of severe accident progression  
14 they can play very important roles to assess the  
15 various operator actions that might be taking place to  
16 manage those accidents.

17 In fact, if you look back at the EPRI  
18 technical basis report when it first came out in the  
19 early '90s and then implemented by the owners groups,  
20 they used the MAAP code a lot to define what the SAMGs  
21 were.

22 Moreover as we got into things like the  
23 CPRR rulemaking, we looked at a lot of accident  
24 management activities as part of it and find that you  
25 can learn a lot, you know which instruments you really

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 need to have work properly and you - and where you  
2 might need to have some backup if those instruments  
3 aren't functioning properly.

4 So, to me, I believe they do have a role  
5 in simulators. I'm not advocating simulators, but  
6 they have a role in them. And they have a role - a  
7 very important role in training the plant staff, the  
8 inspectors, NRC inspectors, the staff at headquarters  
9 here so we have some cognizant of what on earth would  
10 be going on in a severe accident. So, to me, these  
11 are part of the picture and a very important part of  
12 the picture.

13 MEMBER SKILLMAN: I want to say I agree  
14 with Ed, but I would also offer that this is the  
15 instrumentation, perhaps, that your operators are  
16 going to make a decision to your emergency director  
17 and your emergency support director for PAR, for  
18 evacuation or for other actions that are following  
19 this scenario, a real scenario.

20 And so, it could be you're down to your K-  
21 mart instruments, it's the best you have, but you go  
22 with it because that is what you have.

23 And so, there needs to be a small set of  
24 key instruments that are recognized as appropriate for  
25 when you get to that point in your decision-making and

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 understand you don't have a whole lot of time.

2 You've got to make a call. You've got 15  
3 minutes. The bell rings and you've got to  
4 communicate.

5 It might not be a perfect decision, but  
6 it's the decision that you based on the information  
7 that you have at the time.

8 MEMBER BROWN: I'll just offer that there  
9 are two couple of categories. I'm not arguing that  
10 models aren't good for looking at downstream once  
11 something has happened, what may be the things we have  
12 to do to provide the long-term mitigation. I'm also  
13 very concerned that we're overlooking the immediate  
14 actions to prevent that circumstance from occurring.

15 And just kind of based on personal  
16 experience in one of my program plants, there was a  
17 circumstance where everything went dark. It was  
18 unbelievable, but there were a certain part that  
19 weren't a part of the basic instrumentation package  
20 that people looked at and the operators were able to  
21 recover and prevent any damage at all and actually  
22 start to operate the plant and bring it home so that  
23 we could assess what really went on.

24 So, you're never going to know everything,  
25 but you want to give the operators the best tools they

1 can to prevent the bad stuff from really happening.

2 I mean, it's a simple thing from TMI where  
3 they didn't know the relief valve was open. I'm  
4 trying to remember. It's been a long time since I  
5 looked at that, but that's - so, they were losing  
6 water and didn't realize it. Compromised - there was  
7 a real problem.

8 So, how many of those do we have and how  
9 simple are they and how hardened do they have to be?  
10 And I just haven't - we make these generalized  
11 statements about calculational aids and tools and guys  
12 are going to infer what they can do, operators are  
13 going to infer what they can do, and I just - it just  
14 seems to be out of the realm of reality to not have  
15 some type of basic information that they can rely on.

16 I'll stop. Thank you.

17 MEMBER SCHULTZ: Jeremy, just to set the  
18 further context for our discussions in 2016 here, you  
19 might recall that when the ACRS originally proposed  
20 this as an added recommendation, there was at least  
21 strong sentiment on the Committee that it should be a  
22 Tier 1 item.

23 It became - then we settled as a  
24 recommendation for Tier 2, but reluctantly agreed that  
25 it was alright to categorize it as a Tier 3 only

1 because resources weren't available to address it -  
2 the proper resources weren't available to address it,  
3 not because of its importance.

4 MR. BOWEN: Understood.

5 MEMBER SCHULTZ: Safety importance.

6 MR. BOWEN: We certainly understand and  
7 look forward to future discussions.

8 MR. BOWMAN: Slide 14. So, this is a  
9 recommendation that came from the Near-Term Task  
10 Force. It would have us evaluate the need for  
11 hardened vents for containments other than Mark Is and  
12 Mark IIs.

13 Up until recently we have largely deferred  
14 work on this recommendation while we focused on the  
15 CPRR rulemaking and on the implementation of Order EA-  
16 13-109 from Mark I and Mark II containments.

17 We have examined several studies. For  
18 example, the analyses that were done as part of the  
19 rulemaking and the order and the work that has been  
20 done on the SOARCA project. We've considered related  
21 Commission decisions. We've also considered past  
22 studies that focus on containment performance, and a  
23 summary of that is provided in the SECY paper.

24 The SECY paper basically provides a  
25 containment-by-containment assessment of this

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 recommendation and indicates that our initial  
2 conclusion is that no further action is warranted for  
3 non-Mark I and Mark II containments.

4 For other than Mark I and Mark II  
5 containments the objectives of the original hardened  
6 reliable containment vent order are being accomplished  
7 through the mitigating strategies order.

8 For example, for Mark III containments  
9 combined with the mitigating strategies order requires  
10 licensees to put in place measures to remove heat from  
11 the containment through, for example, for most of them  
12 re-powering suppression pool cooling equipment from  
13 portable power sources.

14 In addition to protecting the containment,  
15 the initial assessment of this recommendation also  
16 considers the benefit of the mitigating strategies  
17 order and preventing core damage in the first place.

18 And then finally, the studies that we  
19 completed for the CPRR draft regulatory basis show  
20 that the enhancements for vent capabilities of non-  
21 Mark I and II containments will likely be orders of  
22 magnitude below the QHOs. And so, they couldn't be  
23 justified as substantial safety benefits.

24 And so, given that our initial assessment  
25 is that we should close this recommendation, but we do



1 plan on engaging further with the ACRS and the public  
2 over the next few months and finalizing that  
3 assessment in March.

4 MEMBER SCHULTZ: Greg, is a public meeting  
5 scheduled at this point in time?

6 MR. BOWMAN: It's not scheduled yet, but  
7 that will be something we do in advance of the ACRS  
8 meeting.

9 So, I think we have tentatively -

10 MEMBER SCHULTZ: Is there a framework for  
11 it in terms of time?

12 MR. BOWMAN: We tentatively have the ACRS  
13 meeting scheduled - the Subcommittee meeting scheduled  
14 for February. A Full Committee meeting in March, I  
15 believe.

16 MEMBER SCHULTZ: That's correct.

17 MR. BOWMAN: So, we would look for  
18 December/January to meet with the public.

19 MEMBER SCHULTZ: December or January.

20 MR. BOWMAN: December or January to meet  
21 with the public.

22 MEMBER SCHULTZ: Thank you.

23 MR. BOWMAN: So we can come to you with a  
24 summary of what we heard from the public.

25 MEMBER SCHULTZ: Appreciate that. Thank

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1       you.

2                   MR. BOWMAN:     The next recommendation,  
3       Recommendation 6, came from the Task Force. And that  
4       would have us evaluate the need for enhancements to  
5       protect from hydrogen based on insights in the  
6       accident.

7                   As with the previous recommendation, work  
8       on this was largely deferred based on our work, you  
9       know, so we could focus on the CPRR rulemaking and on  
10      the containment vent order, but we do have some  
11      information available that we've used in our  
12      assessment of this recommendation.

13                  We have significant information available  
14      from previous studies, as well as from international  
15      efforts that we have undertaken to sort of compare our  
16      practices with practices from the international  
17      community.

18                  As with the previous recommendation, the  
19      SECY paper goes containment by containment to provide  
20      an assessment and discusses that we think it's  
21      unlikely that we'd be able to justify further  
22      regulatory action under the backfit rule.

23                  And that's based largely on the existing  
24      requirements we have in 50.44 for hydrogen control,  
25      the fact that the mitigating strategies order provides

1 another layer of defense against core damage and  
2 hydrogen generation beyond what was in place before  
3 the Fukushima accident.

4 For Mark I and Mark II containments we  
5 discussed that the vent order will preclude over-  
6 pressurization of the containment, which would limit  
7 the likelihood of hydrogen migrating to other  
8 buildings.

9 For ice condenser in Mark III  
10 containments, the mitigating strategies order includes  
11 provisions that licensees re-power hydrogen igniters  
12 from portable power supplies to preclude hydrogen from  
13 building up in a level that damage the containment.

14 And then the mitigating strategies for  
15 those containments would also preclude over-  
16 pressurization by establishing alternate means of  
17 removing containment heat.

18 With respect to large dry containments,  
19 the paper discusses that the previous studies have  
20 confirmed that additional requirements for hydrogen  
21 control aren't needed for those containment types.  
22 And we discussed that nothing we've learned from the  
23 accident will call those conclusions into question.

24 And as with the previous recommendation -

25 MEMBER POWERS: I have a question about

1 when we had hydrogen combustion events in the  
2 Fukushima reactor, there was little information, lots  
3 of speculation.

4 And I was struck by how imaginative that  
5 speculation got on where - how you might get hydrogen  
6 into the reactor building.

7 I don't know that we know now for absolute  
8 certain how it got in there, but a huge number of  
9 suggestions came forth, flooding forth on how you  
10 might get hydrogen from the - where the metals were  
11 reacting with steam to the reactor building.

12 The hydrogen rule itself presupposes a  
13 certain regularity in how those systems for BWRs  
14 behave and, in fact, who cited them, but I don't know  
15 that they recognize all this imagination on how you  
16 might get hydrogen in there that involved deviations.

17 For instance, since we're talking about  
18 severe accidents, we can have failures, for instance,  
19 in the bellows on the reactor building that would  
20 allow venting. And you would not get to the criterion  
21 for activating your vent as a result so you could get  
22 hydrogen into the reactor building.

23 In thinking about this issue, hydrogen  
24 control and mitigation, did you take into account that  
25 deviation from regularity that is not supposed in the

1 existing hydrogen rule?

2 MR. BOWMAN: So, I'm going to look for  
3 Bill Reckley to help with that, but I think the one -  
4 the bullet I was getting ready to discuss before we  
5 got off on the question was, you know, as Jeremy  
6 mentioned, our goal in this assessment was to  
7 determine whether we need to take - we need to issue  
8 an order, initiate a rulemaking as part of the -

9 MEMBER POWERS: I understand. I  
10 understand.

11 MR. BOWMAN: So, we - that was our focus.  
12 So, we believe based on what we've learned from the  
13 accident based on the previous studies, that an order  
14 like that would be several orders of magnitude below  
15 where the QHOs - where we would need to be if we want  
16 to justify for the regulatory action, but we do have  
17 research activities that will be going on for many  
18 years looking at, you know, what happened at  
19 Fukushima.

20 And if there are lessons learned coming  
21 out of that research that tell us something that we  
22 didn't expect, then we have processes to deal with  
23 that information. So, I realize that was just a delay  
24 tactic to give Bill time to think about a response to  
25 your question.

1           MR. BOWEN: Before Bill responds, and he  
2           can elaborate, but the direct answer to your question,  
3           I don't think - I don't think that we considered the  
4           imagination - the way that it could progress.

5           MEMBER POWERS: I mean, it's the  
6           difficulty here in the challenge, and I appreciate  
7           your challenge here.

8           And had you come up and say, yes, we're  
9           going to go change the existing hydrogen rule in 600  
10          different ways and address these things, I would have  
11          asked you a slightly different question on the  
12          opposite side of the table, because I do appreciate  
13          these things.

14          But I do think that this is an area that  
15          perplexes the hell out of me, because I look at it and  
16          I freely admit had someone from Japan called me up  
17          prior to the event at Unit 1 and said, do we have a  
18          danger of hydrogen detonation in our reactor buildings  
19          as this accident progresses, I would say, oh, no, you  
20          don't have to worry about that at all, because I can't  
21          figure out how even if I get hydrogen in there, I get  
22          a deflagration to detonation transition. The spacing  
23          is just not right for it. Manifestly, we could and  
24          did.

25          And so, there's clearly things that I

1 don't understand about this and I don't feel like I am  
2 the only ignorant person in this world.

3 (Laughter.)

4 MR. BOWMAN: Did you have anything you  
5 wanted to add, Bill?

6 MR. RECKLEY: I will say the one nice  
7 thing about this recommendation is it got us to expand  
8 the look beyond the containment. The 50.44, you know,  
9 those are rules aimed at hydrogen in containment.

10 And this we have specifically -- we're  
11 looking at migration of the hydrogen into the reactor  
12 building and boilers or auxiliary building.

13 And going back to what Greg says, it's not  
14 to discount that there are scenarios that might lead  
15 to hydrogen going into those places, but you always  
16 got to come back to the fundamental question we were  
17 asking was, even though you do have those scenarios  
18 when you do a cost-benefit under the backfit process,  
19 does it warrant us taking an action to address those  
20 particular cases?

21 And the answer has been no in previous  
22 studies going back to the post-TMI studies up to the  
23 present. And we don't believe the information we got  
24 from Fukushima changes that conclusion.

25 MR. BOWMAN: But again this is a Group 2

1 recommendation. So, we will be engaging with you  
2 further over the next several months as we finalize  
3 our assessment.

4 MEMBER POWERS: Do we have an opportunity  
5 to understand what this continued engagement looks  
6 like?

7 MR. BOWMAN: Yes, we can -

8 MR. BOWEN: You mean on this specific  
9 recommendation?

10 MEMBER POWERS: Yes - well, I mean, the  
11 argument is, okay, we're going to continue to look at  
12 this thing because there's more information going to  
13 come, and why not. And I don't have any feeling for  
14 the timing on more information.

15 There are manifestly, as you accurately  
16 indicate, lots of international studies going on, on  
17 this, but is there a point where we understand in fair  
18 detail what the Agency's thinking is and participation  
19 looks like and what they're trying to get out of this  
20 stuff?

21 MR. BOWEN: Yes, I think in general our  
22 approach with these Group 2 recommendations kind of  
23 gets back to Dick Skillman's question at the  
24 beginning, what is appropriate technical rigor and all  
25 the questions you're asking and everything.



1           It gives us an opportunity to determine  
2           that our initial conclusion is correct and add  
3           additional technical basis for that conclusion based  
4           on these interactions, or to determine that based on  
5           those interactions we need to adjust our  
6           recommendation and propose something else.

7           So, the short answer, do we have a - do we  
8           know when we'll have a certain answer? No, but our  
9           plan with these Group 2 recommendations is to have an  
10          idea around the March-April time frame so that we can  
11          provide to the Commission either we think we should go  
12          left, or we should go right.

13          MR. BOWMAN: But I think in March - when  
14          we come back to meet with you in February and in  
15          March, I think we can come with better granularity, if  
16          you like, on what we plan on doing in the future for  
17          international -

18          MEMBER POWERS: Yes, I would - I'm not  
19          asking you for the - when are you going to have a  
20          final answer, because I don't think you'll ever have  
21          a final answer on this one, but I would certainly like  
22          to know, you know, how you're looking at it, what  
23          you're looking at, what you think you need and what  
24          you don't need here and how you get to Bill's judgment  
25          on cost-benefit analysis for these things, because did

1 the challenge you have here, it seems to me, and one  
2 that you have to come just face up to, is you have a  
3 variety of international plants saying, oh, my God,  
4 and running off and doing lots and lots of stuff with  
5 respect to hydrogen. And the NRC comes back and says,  
6 we're not going to do squat.

7 That's a discontinuity that may be very  
8 well justified, but it's a discontinuity you have to  
9 confront. Somebody has to confront. Maybe not you  
10 personally.

11 But if I were a Commissioner, I would say,  
12 boy, I want to be armed not just a little bit on this  
13 one, because I have my European counterparts going  
14 with amazing vigor to address this, because they think  
15 they know how to address it and they say, this is a  
16 cheap one.

17 The other things they're thinking about  
18 are really expensive, but this is a cheap one.

19 MR. FRANOVICH: I was going to say - this  
20 is Mike Franovich again. That point is well taken.  
21 Because as we've engaged with our EU colleagues, we  
22 have seen some pretty aggressive measures on hydrogen  
23 mitigation with the passive autocatalytic recombiners,  
24 peppering containments in different countries.

25 Not all the EU countries have moved that

1 direction. Some are waiting for input from the US to  
2 see for the country of origin for the NSSS technology  
3 what do we plan to do.

4 I would say that we have done some  
5 activities. And Greg did highlight the fact of the  
6 longstanding known issue under GSI 189 with the ice  
7 condensers and the Mark III containments putting the  
8 backup power supply through mitigating strategies for  
9 the igniters -

10 MEMBER POWERS: That all preceded  
11 Fukushima by a lot.

12 MR. FRANOVICH: It did. Actually, the  
13 closure of that GSI did occur just before or around  
14 the time of Fukushima. And we said we would take  
15 another look at it as part of our tiered activities  
16 post-Fukushima, but there are other factors, too, that  
17 we haven't really talked about.

18 For example, in mitigating strategies  
19 prior to the onset of core damage, a lot of the  
20 licensees will go out and open the high points in the  
21 reactor building for the BWRs to provide a natural  
22 draft pathway so you don't have adverse conditions in  
23 the upper part of the building, in particular, when  
24 they look at the spent fuel pool and the spent fuel  
25 instrumentation.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1           Now, that side benefit is you have a vent  
2 path established. It wasn't originally designed for  
3 that. However, you are venting off the reactor  
4 building in the event that your leakage is coming from  
5 somewhere from the drywell or some other pathway that  
6 you may not have anticipated.

7           So, there are other factors that maybe we  
8 haven't highlighted very much. And maybe when we come  
9 back to the Committee later on, we can bring those out  
10 to the -

11           MEMBER POWERS: That would be a very  
12 useful discussion. I mean, it's not that I question  
13 your decision here. In fact, I don't, but it is  
14 simply that I would like to protect my commissioners.  
15 They're going to get the crap beat out of them by the  
16 Europeans over this issue.

17           MEMBER SCHULTZ: And in terms of our  
18 opportunity to interact and your opportunity to  
19 provide additional documentation to the Commission,  
20 that's where I believe you're hearing it from the rest  
21 of the Committee that the focus ought to be in that  
22 direction, not further and more detailed justification  
23 of the decision, but rather more information about how  
24 a reasonable program plan can continue and a stronger  
25 demonstration of how these important topics, the two

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 of them, are going to be integrated into the NRC's  
2 programmatic activities.

3 Because that's the commitment you're  
4 making with these especially that certainly there is  
5 more work to be done and there needs to be a focus to  
6 it.

7 And I don't mean - I don't mean by that a  
8 schedule and dates, but rather a focus as to what  
9 needs to be done and who's going to do it and what  
10 resources are required over time.

11 MR. BOWEN: Understand.

12 MR. BOWMAN: So, if we go to Slide 16,  
13 Milton, so the next few slides get into the Group 3  
14 recommendations.

15 And just as a reminder, these are the  
16 recommendations that require further staff study. So,  
17 these are less developed than some of the earlier  
18 recommendations.

19 The first recommendation of this group  
20 came from the ACRS and it was subsequently included in  
21 the 2012 Appropriations Act.

22 It would involve a reevaluation of natural  
23 external hazards other than seismic and flooding. And  
24 up until recently we really hadn't done very much work  
25 on this recommendation. That's largely because we

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 were focused on the seismic and flooding  
2 reevaluations.

3 I will note that in developing the  
4 mitigating strategies for order EA-12-049, licensees  
5 were required to look at other hazards beyond seismic  
6 and flooding to ensure that the mitigating strategies  
7 could be implemented under those hazards.

8 The guidance that the industry developed  
9 which we endorse includes many, many hazards that the  
10 licensees look at on a site-specific basis. So, each  
11 site has their own specific hazards.

12 We have developed a screening process that  
13 we intend to use to address this recommendation. And  
14 the goal of that screening process is to ensure the  
15 recommendation is addressed efficiently and it would  
16 - basically a screening process that looks at removing  
17 hazards that are of less concern and screening out  
18 sites that have mitigating measures in place.

19 So, the next slide goes through the  
20 process we put in place. And just as a reminder, a  
21 number of years ago when we developed our plan for  
22 this recommendation, we would have gone out - the plan  
23 would have had us go out with a 50.54(f) letter to  
24 essentially require licensees to do this assessment  
25 and submit it to the NRC to determine if regulatory

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

(202) 234-4433

(202) 234-4433

1 action was needed.

2 We think this process is more efficient  
3 and will result in less regulatory burden on our  
4 licensees.

5 So, Step 1 of the process would have us  
6 define the population of natural hazards that should  
7 be considered generically. That step is complete.

8 We would then apply screening criteria to  
9 exclude certain natural hazards from generic  
10 evaluation. For example, a hazard might screen out  
11 because of known conservatism and design, low  
12 frequency of occurrence or the fact that sufficient  
13 warning time exists to take action.

14 Under Step 3 we'd perform a more detailed  
15 analysis of those hazardous sites that don't screen  
16 out in the second step. And that could result in  
17 further screening based on things like site-specific  
18 measures that are in place. Things like technical  
19 specification requirements or mitigating strategies  
20 requirements. And then Step 4.

21 So, the output of Step 3, if needed, could  
22 be a 50.54(f) letter on a site-specific basis rather  
23 than a generic 50.54(f) letter.

24 And then Step 4 would have us assess the  
25 results of Step 3 to determine if there's a need and

1 justification to impose a new requirement under the  
2 backfit rule, or if we should take some other action  
3 like issue a Generic Letter or other generic  
4 communication or something like that.

5 So, this is a Group 3 recommendation, as  
6 I mentioned. Our plan is to complete the evaluation  
7 by the end of 2016. And that would include  
8 interactions with ACRS and with the public before we  
9 do that.

10 MEMBER POWERS: In your list of other  
11 natural hazards, you may not know this right off the  
12 top of your head, but does it include the solar flare  
13 issue?

14 MR. BOWMAN: That's something that we're  
15 considering, yes.

16 MEMBER POWERS: Yes, good.

17 MR. BOWMAN: So, the next slide, Slide 18,  
18 this is a Near-Term Task Force recommendation for the  
19 NRC to require licensees to reconfirm seismic and  
20 flooding hazards every ten years.

21 This recommendation was subsequently  
22 expanded to include other natural external hazards  
23 beyond seismic and flooding.

24 The initial recommendation or initial plan  
25 for this recommendation would have had it addressed



1 through rulemaking. But, again, like with the  
2 previous recommendation, we had done a little work on  
3 this one before our recent initiative. And, again,  
4 that was because of our focus on seismic and flooding  
5 hazard reevaluations.

6 So, as part of our current assessment of  
7 the Tier 2 and 3 recommendations, we've concluded that  
8 this recommendation should be addressed by enhancing  
9 internal processes rather than through the rulemaking  
10 process.

11 And while we agree that the existing  
12 Agency process is ensure plants are operating safely  
13 and that new information is appropriately considered,  
14 we think we can improve upon these processes to make  
15 them more proactive and systematic in the  
16 identification evaluation of new hazard information.

17 This is a Group 3 recommendation. So, we  
18 haven't worked out the specific details of how we'll  
19 do that, but they would generally entail more  
20 continuous engagement with other federal agencies with  
21 the industry and with other stakeholders to assess the  
22 availability of new information and the implications  
23 of that new hazard information.

24 MEMBER POWERS: And, by the way, you guys  
25 deserve a lot of credit for proactively working with

1 other federal agencies. I have been positively  
2 impressed with that.

3 MR. BOWMAN: Thank you.

4 MR. BOWEN: Thank you.

5 MEMBER POWERS: As part of the enhancement  
6 of internal processes, we would also likely need to  
7 enhance the processes that we have in place for  
8 assessing that information, things like the generic  
9 issues program or other processes, to ensure that we  
10 have a consistent mechanism in place to avoid ad hoc  
11 responses and develop predictable regulatory outcomes.

12 There are costs associated with this both  
13 over the next year as we develop the enhancements, and  
14 in the long term as we do our continuous evaluation,  
15 but we think that those enhancements if implemented  
16 correctly, could make us more efficient and save  
17 resources in the longer term.

18 So, again, this is Group 3. So, we would  
19 have more interactions with ACRS and the public over  
20 the next year as we develop those enhancements.

21 The final recommendation is a Group 3  
22 recommendation. This is associated with an evaluation  
23 of whether we should establish a requirement to ensure  
24 realtime radiation monitoring in the EPZs and offsite.

25 We have done very little work on this

1 recommendation as of yet. Our plan is to do an  
2 assessment of it over the next year, which will  
3 include work that's been completed, previous studies,  
4 interaction with ACRS, the public, federal and state  
5 organizations, and then we will provide a  
6 recommendation to the Commission at the end of 2016.

7 So, the next slide, we've discussed this,  
8 you know, throughout the presentation, but this slide  
9 provides a summary of some of the longer term  
10 activities that will be going on after the Tier 2 and  
11 Tier 3 recommendations themselves are complete.

12 We will be doing studies on the  
13 radiological impacts of the Fukushima accident itself  
14 on members of the public. And that will be going on  
15 for many years.

16 We do have plants coming into compliance  
17 with the mitigating strategies and spent fuel  
18 instrumentation orders. And we are actively working  
19 on developing the oversight programs for those orders  
20 and for other - and other initiatives.

21 We'll also work on, as we mentioned, the  
22 oversight program for the SAMGs, which is an important  
23 activity for us.

24 And then I mentioned we have discussed  
25 earlier that we have research activities that will

1 also be going on for many years. And we will also  
2 continue to work with our international partners to  
3 enhance safety.

4 So, these are just some of the examples.  
5 And I know we discussed them all throughout the  
6 presentation. So, I don't want to dwell on them, but  
7 we do believe that new information that comes from  
8 those activities, that we have sufficient processes in  
9 place to handle that information without keeping these  
10 recommendations open in the longer term.

11 So, the next slide summarizes some of the  
12 completed and planned stakeholder interactions we've  
13 had on Tier 2 and Tier 3.

14 We discussed this in a little more detail  
15 at the Subcommittee meeting last month, but we have  
16 had even predating our work to reassess the Tier 2 and  
17 Tier 3 recommendations, we had had interactions with  
18 stakeholders on many of these recommendations in the  
19 past.

20 The PRA feasibility study, for example, we  
21 worked on - with international and domestic partners  
22 on hydrogen control, we discussed on reactor  
23 containment instrumentation.

24 We had the petition for rulemaking on EPZs  
25 that I mentioned earlier. We sent that out for public

1 comment and had extensive input from the public on  
2 that. So, we have had a number of engagements on some  
3 of these even before the recent initiative.

4 In addition to the ACRS Fukushima  
5 Subcommittee meeting last month, we did hold a public  
6 meeting with the Industry Steering Committee meeting  
7 on October 20th. And that - the focus of that meeting  
8 was primarily on Tier 2 and Tier 3.

9 We did have an extended period as part of  
10 that meeting for public comment, but there was very -  
11 we got very little input from the public. I think we  
12 only had one person comment.

13 With respect to future meetings, we  
14 discussed that we have the Commission meeting on the  
15 17th. And we've also discussed our plans for  
16 interactions with both the ACRS and the public on the  
17 Group 2 and 3 recommendations in the near term.

18 MEMBER SCHULTZ: On the Group 2  
19 recommendations, Greg, we mentioned that already  
20 you're planning a public meeting and you'd provide us  
21 feedback related to that.

22 It would be helpful to the Subcommittee  
23 and to the Full Committee if before the Subcommittee  
24 meeting you can give us a summary of that meeting, not  
25 only what the comments were, but also you're at least

1 preliminary evaluation of staff response to the public  
2 comments.

3 MR. BOWMAN: Absolutely.

4 MEMBER SCHULTZ: Thank you.

5 MR. BOWMAN: The next slide. So, I wanted  
6 to spend a minute discussing some of the changes that  
7 we made to the draft assessments that we sent you  
8 about a month ago to support this meeting.

9 Just as a reminder, we did release the  
10 draft of the paper, the draft of the assessments both  
11 for the public and for the Full Committee meeting.

12 In my view, the changes that were most  
13 substantive were those associated with adding clarity  
14 and level of detail to the assessments.

15 For example, we clarified our basis for  
16 proposing that Recommendation 12.1 on the ROP be  
17 closed by more clearly establishing the relationship  
18 between that and Recommendation 1.

19 And in places we got feedback from the  
20 Subcommittee meeting that we needed to be more clear  
21 on previous Commission direction, there were some  
22 places where we tried to paraphrase and we revised the  
23 paper to make it a little more true to what the  
24 Commission actually directed us to.

25 So, I think the biggest thing, in my

1 opinion, that we changed was clarity based on feedback  
2 we got from the ACRS.

3 As you can imagine, this paper has been an  
4 all-consuming activity for us over the last several  
5 months.

6 And so, I think when you get that into  
7 something, you sometimes lose the forest through the  
8 trees. And so, the Subcommittee meeting really helped  
9 us in that.

10 The other significant change, and I  
11 discussed this during my presentation, we did move two  
12 of the ERDS recommendations from Group 3 to Group 1.  
13 And that's based largely on the technical challenge  
14 that we believe will make them unlikely to be cost-  
15 justified and also on the NRC's role during an  
16 emergency.

17 And then -

18 MEMBER SCHULTZ: Greg, just on those you  
19 just determined that because they were originally  
20 Group 3 for a year's worth of consideration and in  
21 reconsideration you determined that we've got enough  
22 information to make a decision.

23 MR. BOWMAN: Right. As the steering  
24 committee - as our steering committee reviewed our  
25 paper, they saw the basis we put together and decided

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 that -

2 MEMBER SCHULTZ: They came through the  
3 steering committee --

4 MR. BOWMAN: That's correct.

5 MEMBER SCHULTZ: -- discussions.

6 MR. BOWMAN: That's correct.

7 MEMBER SCHULTZ: Thank you.

8 MR. BOWMAN: And then finally there was a  
9 good deal of discussion in the paper on resource  
10 implications of this work.

11 We did a lot of work with - I'm trying to  
12 make that section a little more clear what we  
13 ultimately sent to the Commission just so they can  
14 better understand how adopting our proposals would  
15 impact resources in '16 and what our plans are in  
16 subsequent years for handling resources.

17 And as I mentioned - as Steve mentioned  
18 earlier, the paper is currently with the Commission.  
19 Went up to the Commission last Thursday.

20 So, on the last slide with respect to  
21 milestones, we had the Commission meeting on the 17th  
22 and we are looking forward to gain the Commission's  
23 direction on the paper and then moving forward with  
24 resolving the remaining recommendations, including our  
25 engagement with the ACRS.



1                   So, that concludes my presentation.  
2       Before I turn it over to you, though, I did want to  
3       again express my appreciation to the Committee for all  
4       your help with this paper.

5                   I think, as I mentioned, developing our  
6       assessments and turning this paper around was a huge  
7       accomplishment for the staff and your input last month  
8       really did help us make a better product. So, I  
9       wanted to say thanks for that to all of you.

10                  MEMBER SCHULTZ: Other questions from the  
11       Committee?

12                  (No audible response.)

13                  MEMBER SCHULTZ: All right. And I'd like  
14       to thank the staff - excuse me. I asked for other  
15       questions from the Committee. I'm hearing none. So,  
16       I'd like to thank you for your presentation at this  
17       point in time and we'll transition to the presentation  
18       from NEI at this point. Thank you.

19                  (Pause.)

20                  MEMBER SCHULTZ: Thank you, Kathy. At  
21       this time I'd like to introduce Steven Kraft from the  
22       Nuclear Energy Institute. And Steve is here prepared  
23       to present an industry perspective related to these  
24       recommendations.

25                  Steve, thank you for being here. Welcome.

1 MR. KRAFT: Well, thanks, Steve.  
2 Appreciate that. As Steve Schultz said, I'm Steven  
3 Kraft from the Nuclear Energy Institute, Senior  
4 Technical Advisor.

5 One day we'll have to discuss what that  
6 term actually means in several context, but the  
7 purpose today is to follow-up conversations we had  
8 with the Subcommittee on this topic, a number of  
9 questions that were asked and on the Fukushima - what  
10 are now what's left of the Tier 2/Tier 3 issues.

11 It is not by mistake that I put Tier  
12 2/Tier 3 in quotes on my opening slide. Normally, you  
13 just breeze through the - stay on the first slide.

14 There are no more Tier 2/Tier 3 issues.  
15 That term is now antiquated if you follow what the  
16 staff has done.

17 In fact, Dick, you raised at the last  
18 Subcommittee meeting, haven't you changed sort of the  
19 rubric you're looking at for these issues? And the  
20 answer was, of course it's now in, you know, Group 1,  
21 Group 2, Group 3, sometimes they're called bins, you  
22 know, whatever you want to call them.

23 And I think that's appropriate because  
24 last night when I was getting ready for this, I  
25 attempted to pull out - well, I - sorry, I pulled out

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 what I considered to be the seminal document on these  
2 issues, which was not the near-term task force report.  
3 That was seminal enough, but it was SECY-11-0137.

4 And that is probably the best listing of  
5 what these issues were and categories. And then I  
6 traced through some presentations the staff has made  
7 in the last several months to, I believe, this group,  
8 to - at the industry, NRC Joint Steering Committee  
9 meeting where they listed the Tier 2/Tier 3 issues as  
10 they were originally identified in that SECY and they  
11 were nicely color coded.

12 But then there were changes since then,  
13 too, particularly with regard to what happened with  
14 the CPRR rulemaking and the mitigating beyond-design-  
15 basis events rulemaking.

16 And I put the - I actually did a 19th  
17 century event. I had paper in front of me and I put  
18 them next to each other, because my computer screen  
19 wasn't big enough and I tried to draw lines and it got  
20 so confusing.

21 And I was going to actually make a slide  
22 to show you all, but it was so confusing that the  
23 graphic would have hurt the conversation. And I said,  
24 that's just not the way to do it. Let's just talk  
25 about it.

1           And I think the point here that I'm trying  
2       to make is that, as staff has said multiple times  
3       during this - the presentation just prior to mine, is  
4       that the Tier 1 requirement is implemented or closed.  
5       It's a well-known fact. I'm not going to harp on it.

6           We have Tier 2/3 issues that are - that  
7       were in those original lists, have either been  
8       implemented, included in the mitigating beyond-design-  
9       basis events rulemaking, or studied and closed.

10          What was left of those related to specific  
11       safety as the Tier - I should clarify as the Tier 1  
12       requirements were.

13          Because when we went through the Tier 1  
14       requirements particularly with regard to those that  
15       ended up or those that were the beginning of the  
16       mitigating beyond-design-basis events rulemaking, a  
17       lot of them were along the lines of the questions you  
18       were asking about, SAMGS and how the operators behave  
19       and this sort of thing.

20          And as they - that rulemaking began life  
21       as the mitigating strategies something or it was some  
22       name like that, the original technical basis was about  
23       that.

24          But as the staff worked through the issues  
25       and we had many meetings with them on that led by my

1 colleague David Young, who you met with when you  
2 considered that rulemaking information from our side,  
3 and more and more got thrown into that rulemaking.

4 More and more got added, because there was  
5 a recognition on both the part of the NRC staff all  
6 the way up through executive management and the  
7 industry all the way up through our executive  
8 management that there was a value in showing  
9 everything, how that all connected rather than  
10 discrete orders. And I thought that was a very  
11 valuable thing to do.

12 At one point, an unnamed - I will not name  
13 one of our industry executives said to me, well, we  
14 ought to put in - well, we were considering at that  
15 time the filtering strategies rulemaking. Of course  
16 the name changed.

17 And I said that one thing, no, I thought  
18 that was a different animal, because in that  
19 rulemaking we are actually providing the very first  
20 regulatory action and the very first rulemaking NRC  
21 would have on encountering a melted core.

22 And I was concerned that if you put the  
23 two together, there would be bleed-over and that  
24 wasn't the way we wanted to do it. And it turns out  
25 that I am - my friends know, and you are all my

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 friends, I say a lot, but often I'm wrong. But that  
2 one I was right, because ultimately we know what  
3 happened at the CPRR rulemaking.

4 Had that been incorporated with the other  
5 one, it would have been a far trickier action because  
6 this is going to apply to every plant that is  
7 currently in operation, future plants, et cetera,  
8 whereas that rulemaking was limited to if it had gone  
9 forward, to the 29 active Mark Is and -- oh, I'm  
10 sorry, not the 29. We're now down to 27, right?  
11 Because Pilgrim is shutting down and as is Fitz. So,  
12 it's a sad moment, but that takes them out of the  
13 inventory, those plants.

14 So, at this point, first let me say that  
15 I think the staff has done a superb job in pulling  
16 this work together.

17 I agree with Greg. It was a massive work  
18 - bit of work. That they did a very good job, but let  
19 me take it a step further. We think that these issues  
20 could be closed, and now.

21 Now, in the Group 3 issues there are some  
22 where you got to work something out. You got to  
23 figure out what that program is going to be to  
24 monitor, changes in understanding of natural hazards.  
25 I understand you got to figure that out.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1           We have a comparable EPRI program. We  
2           talked about that at the last meeting. And there may  
3           very well be some touch points the staff has to have  
4           in terms of their process, in terms of public  
5           comments. Steve, you mentioned you wanted that  
6           information.

7           I want to say up front the industry, and  
8           Steve Kraft personally, respects and values the NRC  
9           process. Absolutely. And there are those touch  
10          points that you have to have.

11          And I think everyone on the staff here  
12          knows that we are the first to point out when you step  
13          outside a process. And so, you have - we value that  
14          process.

15          But when doing so, there is, I think, an  
16          obligation to think forward a bit as to what that  
17          process will obtain you. And I think you can look at  
18          the difference between the Group 2 and the Group 3  
19          activities where the Group 2 activities, if I  
20          understood what Greg said, those touch points have  
21          been made, yet the recommendation is still, well, we  
22          got to do a little more.

23          Ask yourself the question, what do you  
24          think you're going to learn that you don't already  
25          know?

1           It has been four and a half years. There  
2   is a - I discovered when I did all that paper  
3   comparison, there is as very elegant symmetry that I  
4   don't think was purposeful. But if SECY-11-0137  
5   defined these issues, SECY-15-0137 is closing them.

6           Whether those numbers were correct, I  
7   don't know, or were done on purpose, I don't know.  
8   That happens sometimes. But if you're looking for a  
9   sign, if you believe in karma, there you go.

10          Ed, I'll be here all week if you want to,  
11   you know, tip your waitress, please. Anyway, but that  
12   doesn't mean closed is closed. We have an expression  
13   at NEI there is done, and there's done-done.

14          As I point out to my management often, in  
15   NRC space there is no such thing as done-done. And  
16   that's because there are always openers. And there  
17   should always be openers. So, let's talk about what  
18   we're really asking to be closed.

19          What we're asking to be closed is relative  
20   to Fukushima. Because when you call something  
21   Fukushima, it takes on an aura that says, oh, my God,  
22   we got to move fast. Well, we did that. Been there,  
23   done that, bought the T-shirt, you know, the whole  
24   thing.

25          There is another NAS report coming out on



1 Fukushima. I hear it's this month, next month. Going  
2 to cover spent fuel pool offload. They're going to  
3 update the 2004 report and some security issues. Look  
4 forward to reading it. NRC staff and the industry has  
5 made lots of input into that.

6 And regardless of my personal opinion,  
7 that spent fuel pool offload has been studied to a  
8 fare-the-well and there isn't a lot more to learn.

9 Every time there's a blip in the system  
10 someplace, there's a request from a variety of  
11 individuals to study it again. And NRC often studies  
12 it again.

13 In fact, the spent fuel pool study itself  
14 has a really nice section. I believe it's 1.7, if I  
15 remember correctly. It has a nice summary history of  
16 all of the studies that have been done and it was  
17 actually very interesting reading.

18 And in our comments to the staff on the  
19 report, we complimented them on a very, very well-  
20 written report. Easy to follow, having said that.  
21 So, again, when we say "closed," I think we mean  
22 closed for Fukushima, go into normal process.

23 And the staff, you were having a very  
24 healthy discussion with the staff on what "closed"  
25 meant and there are issues you don't believe should be

1 closed completely. That's between you and the staff,  
2 you know.

3 We can have our input on that, but I  
4 suggest that you need - the staff needs to ask itself  
5 this question: What more do you think - someone is  
6 going to show up with something you have never heard  
7 of before, has never been said before, you haven't  
8 analyzed before, and I don't think that's going to  
9 happen.

10 Surely, of course, we learn as Fukushima  
11 units are decommissioned and pulled apart, Drs. Rempe  
12 and Corradini are leading a DOE expert panel that I  
13 have the privilege to be on. We're having a major  
14 meeting in our offices next week to help TEPCO with  
15 the question of they want - they want to provide  
16 information. What information do we need and what are  
17 we going to do with the information? How is it going  
18 to feed development in MAAP and MELCOR and things like  
19 that? So, that's going to go on.

20 And if something comes out of that where  
21 we say, oh, my, we never thought that would have  
22 happened, that will then reopen an issue at some  
23 point, but that's probably years from now we'll  
24 probably be getting the information.

25 I mean, we've looked at a lot of the

1 pictures TEPCO has with remarkable clarity with some  
2 of their probes. The pictures, it's hard to tell  
3 immaterial condition.

4 Look at a RCIC pump and ask yourself if  
5 it's broken. Well, I'll know when you open it up,  
6 because it's not like things to fall into piece.

7 There is a photo of the MSIB room. It  
8 looks pristine. It looks like the day it was built.  
9 So, you know, I'm not sure what we're going to learn  
10 from all this. We'll make the effort and see what we  
11 can find out, but the purpose of the meeting is to  
12 further help TEPCO understand what we can do. So,  
13 monitoring for new developments is a very standard  
14 thing that we do in this industry.

15 So, I won't go through the overarching  
16 lessons from Fukushima. I talked about it last time.  
17 It's in the record. We've said it again and again and  
18 again. I'm not going to repeat it. And of course  
19 what we have done since, what we call our bias for  
20 action.

21 So, let's just get to this one here, the  
22 remaining issues. I'm not going to read through this.  
23 I was taking notes about - on the conversations that  
24 were being had and I have to tell you that one of the  
25 most endearing qualities of my favorite federal agency

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 and my all-time favorite advisory board is that - I'm  
2 not joking. You guys think I make jokes. I say that  
3 from the heart.

4 I enjoy coming here. I like every one of  
5 you. I've known Harold since I was a kid, anyway.  
6 And we've always had a wonderful relationship.

7 (Laughter.)

8 MR. KRAFT: For the record, he's holding  
9 up a soft-sided briefcase that says "NEI" that he must  
10 have picked up at a conference of ours at some point.

11 But I will say that that endearing quality  
12 is that you don't always understand what happens at  
13 our plants.

14 Some of you have experience that goes back  
15 decades. It's been updated. SAMGs, which we  
16 sometimes call EPG SAGs, emergency procedure guidance,  
17 severe accident guidance, and the plants take all that  
18 and turn them into SAMGs.

19 We have been in this building, I think,  
20 four times in proprietary session because, by the way,  
21 the guidance from the owners groups are proprietary  
22 commercial products. And so, they sell them - all the  
23 domestic utilities are members, but there are other  
24 foreign utilities that buy what they want. So, there  
25 is that concern. There's nothing secretive about them

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 in that regard, but there's a commercial product.

2 In an effort to educate the staff on what  
3 - how SAMGs work particularly with regard to what  
4 turned into the CPRR rulemaking, and Ed Fuller sitting  
5 right here was in all those sessions and I hope he got  
6 a lot out of it.

7 And it's not like we're not open to doing  
8 it again. We certainly will and I like the idea of  
9 making sure the residents are fully familiar with how  
10 they work, but let me just try to provide some  
11 insight. And we've talked about this before.

12 First of all, not to be critical, Mike,  
13 but when you said that in the TI that followed  
14 immediately the Fukushima accident, there was a - you  
15 made a statement about the SAMGs weren't kept up.  
16 That was an overly broad statement.

17 A few instances of it not being kept up,  
18 I think, is the point. And the output of that  
19 inspection was the plants were still fine, they were  
20 still safe, people knew what to do.

21 What was confusing, and I think is being  
22 resolved, is who was the keeper of the SAMGs at the  
23 plant? And it tended to be that individual who began  
24 SAMGs in, I guess, late '80s. I think it was after  
25 the Chernobyl event.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1           And you know the way we do these things.  
2           We pull together industry experts. We have guidance  
3           documents. We interact with NRC. It's a process that  
4           we use, and that individual from a particular plant  
5           may have been in engineering at the time.

6           Well, life goes on, jobs change, maybe he  
7           now ended up in the HP organization. And then life  
8           changes, goes on and maybe ends up in the Ops  
9           organization. It tended that that went with that  
10          person, because that's where the expertise was on  
11          something that was such, you know, potential use, but  
12          in a very rare case. That was unsatisfactory. And  
13          that is being corrected.

14          And we learn that lesson and where does  
15          the information on mitigating strategies, what we call  
16          FLEX, go? What document is it memorialized in? How  
17          does it get picked up in the systematic approach to  
18          training that we have to abide by?

19          So, that - make sure it's somewhere in the  
20          hierarchy of documents. It doesn't belong in an FSAR  
21          as far as I can figure out. There are other documents  
22          that could be used. And I say that because it's not  
23          part of the licensing basis. So, that's our point  
24          there.

25          And        then        the        question        about

1 instrumentation is an interesting one. And I will  
2 tell you we had our SAMG experts up here in the past.  
3 the SAMGs, you know, they're a document that you have  
4 to study to get, you know, one of the things you have  
5 to do to understand as an operator.

6 And, by the way, there are many people at  
7 the plants who are not licensed operators, but take  
8 what's called the management certification course,  
9 which is equivalent. You just don't end up with an  
10 NRC license, but those documents - you can't start, as  
11 pointed out, you cannot start in the middle of an  
12 event looking for pages.

13 So, they have been rendered into  
14 flowcharts and I believe we showed them to you. I  
15 know we showed them to the staff.

16 And I won't describe them in detail, but  
17 the point is you find yourself on what leg, you look  
18 down, you try to move in the right direction.

19 On those SAMGs, there are indications and  
20 directions as to how you double-check whether you're  
21 getting the right answer from your instruments.

22 So, if you get an indication and you say,  
23 well, that's interesting, I wouldn't have given -- my  
24 understanding of the scenario, I wouldn't have  
25 expected that pressure or temperature, whatever it is,

1 there's then usually something that tells you how to  
2 double-check that. Typically it's some other  
3 indication and a little graph that you have to read.

4 And then the question you all asked about  
5 MELCOR, I completely agree. You do not use MELCOR or  
6 MAAP in a predictive sense in the middle of an  
7 accident. Nobody does that. That's not what's going  
8 to happen.

9 But when you stand up your emergency  
10 response organization, you stand up a technical  
11 operation - technical support center, sometimes the  
12 support center is in the room right next to the  
13 control room, sometimes it's elsewhere on site, but it  
14 is right nearby.

15 The emergency response center interacts  
16 with the agencies and the governments in the area.  
17 That's offsite. Okay. So, that's the one that's  
18 remote.

19 There are teams that show up at the  
20 technical support center when the ERO gets stood up,  
21 that are looking for indications. They're looking at  
22 what they've got, what the control room is telling  
23 them, you're seeing the indications, and then they  
24 might refer to the MAAP modeling get done, they might  
25 refer to their PRA, whatever they have available to

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701



1       them to then say, okay, what's going to happen next if  
2       we don't correct, we don't arrest this sequence. What  
3       happens next that then drives recommendations to the  
4       control room?

5               Now, when you all were at Palo Verde, I  
6       remember asking the question of one of the shift  
7       managers there, who makes the final decision?

8               Well, there's a regulation that says the  
9       only person that is allowed to put his or her hands on  
10      the control and turn it one way or another, must hold  
11      an NRC license whether it's a reactor operator  
12      license, or a senior reactor operator license.

13              And in many plants, it's the ROs that do  
14      it, not the SROs, but, you know, in a pinch I'm sure  
15      anyone with a license will do it and only under the  
16      circumstances where you have such damage to the plant  
17      and you're invoking your emergency damage mitigation  
18      guidelines or strategies, which is not the SAMG.

19              This is the terrorist attack, the large  
20      explosion. And you enter that part of the EDMGs where  
21      you have lost command and control.

22              That's a euphemism for saying people are  
23      so injured or they are dead that who's left? How do  
24      you do that?

25              People will show up with knowledge. They

1 may not have the license, but, trust me, they'll do  
2 what they have to do.

3 Other than that situation, you - this is  
4 how you do it. So, the ultimate is the licensed  
5 person in the control room, typically the shift  
6 manager at the time, but it is a collaborative  
7 discussion before something goes forward. And that's  
8 why we are looking at things in advance before we take  
9 an action.

10 And of course when the event occurs, the  
11 ERO, the TSC, the emergency director is in the control  
12 room, because there's no other choice. That's who's  
13 there.

14 And in a control room, shift managers or  
15 shift supervisors, whatever level that's present must  
16 be a certified emergency director, but it does  
17 transfer out to the TSC at a certain point.

18 So, that's how that goes. And how is NRC  
19 going to look at it? Well, there will be a piece of  
20 the ROP that will do that that's being developed.

21 That's the SRM from the Commission on  
22 mitigating design basis rulemaking included a sentence  
23 at the bottom that said, work out a way to have it in  
24 the ROP.

25 So, there will be insight into how this is

1 going to go forward, which is going to be greater  
2 visibility. Even though it's not a regulated  
3 activity, it will be - there will be visibility to it.  
4 I think that's very, very important to recognize.

5 So, I believe that's pretty much what I  
6 wanted to say, except to just here I think we can  
7 close Group - Group 1 should be closed. That's the  
8 recommendation from the staff.

9 Group 2, I think, should be closed as  
10 well. And on November 17th, we'll be making that  
11 recommendation to the Commission.

12 And then there was an interesting  
13 discussion and I'm glad the staff raised it, is that  
14 there's the need for NRC to act. You have to have a  
15 proven need for a requirement.

16 And then there are rules and procedures  
17 NRC has for determining that and that's often where we  
18 get into debates with NRC about, you know, in-process,  
19 out-process.

20 But what gets missed a lot is what happens  
21 outside those regulations and what the industry does  
22 and what they're subject to in other requirements.

23 The reason for that is we do not take  
24 credit for what is done at the sites to improve  
25 reliability, what is done at the sites in answer to

1 INPO requirements which are taking NRC safety  
2 compliance as a baseline and goes higher for the - for  
3 what they call excellence.

4 So, the question as an example about SFPI,  
5 has anyone gone beyond just the base, you know,  
6 pressure - I'm sorry - level requirement, which I know  
7 during that discussion four years ago, you know, we  
8 had a conversation.

9 Two of the three manufacturers -- all  
10 three technologies are radar-based technologies one  
11 way or another. Two of them because they actually  
12 have probes in the water, offered an option for  
13 temperature. The one didn't, because it's just a bell  
14 above the water level to get the radar signal.

15 How many people, how many plants picked up  
16 the temperature, I don't really know. But that's not  
17 a material question, because literally a month or so  
18 after the accident INPO issued IER 11-4 that had to do  
19 with spent fuel pool and you had to do a number of  
20 things.

21 One, you had to know in the control room  
22 on a daily basis, how far your spent fuel pool was  
23 from 200 degrees, not 212. 200. There's a curve.

24 When the - and that turnover, that's one  
25 of the things that's briefed from one crew to the

1 next.

2 Mineral, Virginia earthquake on - when was  
3 that? March 23rd, 2011? When was it?

4 MEMBER BALLINGER: August.

5 MR. KRAFT: Oh, thank you. I'm sorry,  
6 August. Don't tell my wife I forgot. That was her  
7 mother's funeral. So, thank you for that.

8 Within a day or so I didn't, you know,  
9 wasn't all that important to call right then and  
10 there, but in a day or so I called the head of the  
11 spent fuel area for Dominion and inquired how that  
12 process worked in the control room.

13 And he said, it was beautiful. We had a  
14 chart. They looked it up. The log said we're 68 days  
15 from 200. So, we didn't have to worry about the pool  
16 right away, which is the essence of what you want to  
17 know.

18 It is the reason, by the way, of the level  
19 instrumentation, which was not installed at that plant  
20 at North Anna at the time, because it was too soon  
21 after the accident, because when you read the order,  
22 the SFPI, it very properly says the purpose of this  
23 instrumentation is so the decision-makers know whether  
24 they have to pay attention to the pool right away or  
25 not.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1           The problem with Fukushima in addition to  
2       how do you get water to the pool, which they  
3       eventually solved, was not really do we know the pool  
4       is draining. The question was really before that. Do  
5       we have to worry if the pool is draining?

6           We had no information. So, SFPI became a  
7       very important point. So, that along with now the  
8       pre-knowing the temperature - and then part of that  
9       IER was not just knowing if you were within so many  
10      hours of - I forget what it is. So many days of 200  
11      degrees, you have to then protect your cooling  
12      equipment, barriers around them so no one drives a  
13      forklift into them, things like that. So, very  
14      comprehensive and INPO is assuring that everyone is  
15      doing that.

16          So, I just want to make the point that  
17      there are things that the industry does that of course  
18      we don't take credit in the regulations, but NRC ought  
19      not box their vision to where they don't see that  
20      stuff.

21          And that stuff could be used to provide,  
22      you know, confidence, if I could use that word, that  
23      there's the right decision being made.

24          With that, let me close and offer to  
25      answer questions.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 MEMBER SCHULTZ: Thank you, Steve.

2 Any questions for Steve from the  
3 Committee?

4 (No audible response.)

5 MEMBER SCHULTZ: Thank you very much for  
6 your presentation - was there a question?

7 (No audible response.)

8 MEMBER SCHULTZ: All right. Thank you.

9 MR. KRAFT: Thank you.

10 MEMBER SCHULTZ: Appreciate it very much.  
11 At this point in time, I'd like to ask for comments  
12 from members of the public.

13 If anyone in the audience, members of the  
14 public in the audience would like to make a comment  
15 for the benefit of the Committee, please come to the  
16 microphone in the meeting room.

17 And at the same time, we'll be opening up  
18 the phone line. I Just heard it. I understand the  
19 phone line is open.

20 If there is a member of the public on the  
21 phone line who would like to make a comment, please  
22 introduce yourself and make a comment.

23 If there's a member of the public on the  
24 phone line who would not like to make a comment, but  
25 would like to alert us that the phone line is open,

1 please just say "hello."

2 (No audible response.)

3 MEMBER SCHULTZ: Hearing no request or  
4 comment we'll close the phone line. To finish the  
5 public comment period, I'm looking around the room one  
6 more time.

7 And seeing no one there, I'd just like to  
8 have my opportunity to thank the staff once again for  
9 the presentations today. And also for the effort that  
10 they've put into this project since our Subcommittee  
11 meeting and of course before.

12 And, Steve, thank you for the comments on  
13 behalf of industry from the Nuclear Energy Institute.  
14 And with that, I'll turn the meeting back to you,  
15 John.

16 CHAIR STETKAR: Thanks, Steve. And I'd  
17 also like to echo Steve's thanks to both the staff and  
18 the industry. Staff put a lot of effort into this and  
19 we appreciate that.

20 With that, we are recessed until one  
21 o'clock.

22 (Whereupon, the proceedings went off the  
23 record at 10:45 a.m. for a recess and went back on the  
24 record at 1:02 p.m.)

25 CHAIR STETKAR: The meeting will now come



1 back to order. Before we begin on the topic for this  
2 afternoon, if there's anyone on the bridge line, I  
3 will alert you to the fact that we are now webcasting  
4 our meetings and that you have the ability to see the  
5 presentations and listen in on what I've been told  
6 might be a better audio feed than you get over the  
7 telephone. And if you want the link to that, you can  
8 find it at <http://video.nrc.gov>. And you can click on  
9 the link and pull up the video cast.

10 And with that, we will have the afternoon  
11 presentation on revised fuel cycle oversight process  
12 cornerstones. And Dr. Dana Powers will lead us  
13 through it.

14 Dana?

15 MEMBER POWERS: Thank you.

16 CHAIR STETKAR: You're welcome.

17 MEMBER POWERS: Much as I hate to admit  
18 it, he's a very, very crafty chairman because he has  
19 scheduled a delight for after lunch to keep us alive  
20 and awake and not grow sleepy after having enjoyed our  
21 mid-day repast.

22 As you are aware, the NRC uses the reactor  
23 oversight process as a mechanism to marshal its  
24 resources for monitoring the nuclear power plants,  
25 their operation and maintenance. Well now, we're

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 looking at the prospect of expanding this reactor  
2 oversight process to the nuclear fuel cycle  
3 facilities. And of course, that involves a different  
4 set of challenges.

5 We have two young ladies that ordinarily  
6 are responsible for that, but the weight and the  
7 burden describing the challenges involved in an  
8 oversight process for the fuel cycle facilities now  
9 weighs on Margie's shoulders. But knowing Margie very  
10 well, I am confident she will bear that burden  
11 enormously.

12 And it is fair to say this is the start of  
13 developing an oversight process for the fuel cycle  
14 facilities and very logically they have started by  
15 established the cornerstones.

16 And so Margie, you're going to describe  
17 those cornerstones. And it's also fair, I think, to  
18 telegraph that you're looking for the committee's  
19 comments and help on the defining of the cornerstones,  
20 but also helping you with the cross-cutting issues.

21 So with that, I'll turn it over to Ms.  
22 Kotzalas.

23 MS. KOTZALAS: Thank you. Good morning --  
24 or good afternoon. I am Margie Kotzalas. I am the  
25 Chief of the Programmatic Oversight and Regional

1 Support Branch in the Office of Nuclear Material  
2 Safety and Safeguards.

3 As Dr. Powers just mentioned, we are here  
4 to present to you the work that we have done on the  
5 cornerstones for the revised fuel cycle oversight  
6 process. And I'm going to refer to that as FCOP from  
7 now on.

8 The last time we briefed you on  
9 cornerstones was in 2011. At that time, we were  
10 developing the overall framework for the FCOP. And  
11 you provided us a letter recommending that we continue  
12 to work on developing the FCOP and stated that it was  
13 a substantial improvement over the traditional  
14 oversight process. After that, we sent a Commission  
15 paper describing our recommendation for the FCOP  
16 framework in the cornerstones. And this paper is  
17 SECY-11-0140.

18 In the staff requirements memorandum, the  
19 Commission acknowledged that the current oversight  
20 process was effective, but stated that it could be  
21 enhanced. They approved our recommendation and  
22 directed us to continue interaction with the  
23 stakeholders on the development of each of the  
24 elements of the oversight process and to come back to  
25 them for approval after completion of certain elements

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

(202) 234-4433

(202) 234-4433

1 such as the significance determination process, the  
2 action matrix, and results of the pilot program.

3 The Commission also directed us to work  
4 with our stakeholders to develop the optimal basis for  
5 the cornerstones and to provide a notation vote paper  
6 by January of 2016. And this paper will be on the  
7 cornerstones and this is what we are presenting to you  
8 today.

9 So in that SRM, the Commission also told  
10 us to consider how the cornerstones would be  
11 understood in the context of fuel cycle facilities and  
12 less as to whether they resemble the ROP. So after  
13 receiving this direction, we started our engagement  
14 with the industry stakeholders through a number a  
15 public meetings and workshops. We considered the  
16 uniqueness of the different facilities, the different  
17 processes in these facilities, and how that creates a  
18 multitude of accident scenarios, how the potential  
19 chemical exposure events vary significantly among the  
20 different licensees, and how there is no  
21 standardization of initiating events, mitigating  
22 systems, or barrier integrity like in the ROP.

23 All of these factors led us to a set of  
24 cornerstones that we're going to present today. So as  
25 we go through our presentation and get into the

1 details, we ask that you consider areas that cut  
2 across the cornerstones. And as Dr. Powers indicated  
3 earlier, one of the topics that we request your  
4 assistance in is developing the cross-cutting areas.

5 This slide shows the framework that the  
6 Commission has approved. The entry condition to the  
7 FCOP is an effective CAP or Corrective Action Program.  
8 By effective CAP, we define that as it meets the  
9 guidance in Reg. Guide 3.75, Corrective Action Program  
10 for Fuel Cycle Facilities.

11 It is essential that licensees are able to  
12 effectively identify and correct problems independent  
13 of the NRC. Certain elements of the framework, such  
14 as the significance determination process and the  
15 treatment of performance deficiencies which are not  
16 more minor, depend on licensees to have an effective  
17 CAP.

18 Today, we're going to present the  
19 cornerstones. These are the area circled in red.  
20 These cornerstones inform the important elements that  
21 need to be measured in order to determine that we are  
22 fulfilling the NRC mission.

23 The core inspection program, which I hope  
24 you can see, is this box right here. That core  
25 inspection program is developed from the cornerstones

1 to ensure that the NRC verifies compliance with the  
2 most risk significant regulatory requirements. The  
3 inspection results which are in these diamonds which  
4 are evaluated in these diamond boxes here, determine  
5 whether there is a performance deficiency and whether  
6 or not it is more than minor. If so, the significance  
7 of the inspection finding will be evaluated through a  
8 significance determination process which is this  
9 block. And we will also evaluate the licensee's  
10 performance at the end of a period of time, maybe a  
11 year or two years, through our action matrix, which is  
12 these areas down here.

13 This will help us determine whether  
14 additional inspections or other regulatory actions are  
15 needed. And developing all of these elements are  
16 multi-year projects. So at this point, we have the  
17 cornerstones sufficiently to engage you to seek your  
18 recommendations for moving forward.

19 So to refresh your memory, these  
20 cornerstones in the fuel cycle oversight process apply  
21 to seven operating facilities and there are four other  
22 facilities who have operating licenses, but have not  
23 yet begun construction or are not yet operational.  
24 These facilities are conversion enrichment fuel  
25 fabrication facilities such as Honeywell, LES, AREVA

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 Richland, Global, BWXT, Westinghouse, NFS. These  
2 facilities are all regulated by the NRC regardless of  
3 whether they are located in an agreement state.

4 The predominant hazards of these  
5 facilities are UF6, HF, releases, fires, criticality,  
6 and chemical exposure.

7 Now I would like to discuss the approach  
8 that we used to determine the optimal cornerstones for  
9 the oversight of fuel cycle facilities. This approach  
10 is straight forward and can be thought of in layers or  
11 tiers. The top layer is the mission to protect public  
12 health and safety and the environment and to promote  
13 common defense and security. So that is the very top.

14 Peeling back that layer, we have the  
15 Agency's fuel cycle strategic performance areas which  
16 are derived from the Agency's strategic performance  
17 plan which are the fuel cycle safety and safeguards.

18 Continuing with this framework, we now  
19 consider those areas of licensee performance which  
20 warrant oversight in order to ultimately support the  
21 Agency's mission. And these areas are the  
22 cornerstones. And they further break into the  
23 consideration for radiological chemical hazards and  
24 the current operational environment.

25 Then we peel back another layer. Each

1 cornerstone has an objective which is supported by a  
2 key attribute and inspectable areas. And therefore,  
3 by inspecting these, we have reasonable assurance of  
4 meeting the NRC's mission.

5 Applicable across more than one of these  
6 cornerstones is the concept of a cross-cutting area.  
7 We seek your input to identify the appropriate areas.  
8 And at the subcommittee meeting in September, we  
9 proposed and provided you some preliminary thoughts.  
10 We will discuss these cross-cutting areas further in  
11 a moment, but first I wanted to show you what our  
12 recommended cornerstones are first.

13 This is a diagram that provides again the  
14 mission, the strategic performance areas and then the  
15 cornerstones. And the dotted line at the bottom are  
16 the cross-cutting areas that cut across each one of  
17 those cornerstones.

18 So the cornerstones' performance areas are  
19 criticality safety, chemical and operational safety,  
20 occupation, occupational, and radiation, public  
21 radiation safety, emergency preparedness, security,  
22 and material control and accounting. And again, as I  
23 stated, depicted at the bottom are the cross-cutting  
24 areas. For the ROP, those areas are human  
25 performance, problem identification and resolution,



1 and safety conscious work environment. For fuel  
2 cycle, we envision they would be relatively similar.

3 The subcommittee suggested the following  
4 cross-cutting areas: human performance, problem  
5 identification and resolution, safety conscious work  
6 environment, and procedure compliance. These top  
7 three bullets are in the ROP.

8 Procedural compliance is also cross  
9 cutting. However, its foundation is human  
10 performance.

11 Inspection Manual Chapter 0310 which is  
12 the manual chapter for cross-cutting areas enumerates  
13 procedural adherence as a sub-area of the cross-  
14 cutting aspect of human performance. For fuel cycle  
15 facilities, we agree with this concept and we believe  
16 it is applicable here. So we ask your input to help  
17 us identify what the appropriate cross-cutting areas  
18 are for fuel cycle oversight process.

19 MEMBER POWERS: You're arguing the  
20 procedure compliance is a subset of human performance?

21 MS. KOTZALAS: Correct.

22 MEMBER POWERS: So it doesn't need to be  
23 called out separately?

24 MS. KOTZALAS: Correct. It is not  
25 critical that we finalize these areas now. For the

1 time being, we plan on fully developing cross-cutting  
2 areas when we develop the performance assessment  
3 process. By then, we will have revised all the  
4 inspection procedures, developed the SDP and so we  
5 will be able to affirm whether the cross-cutting areas  
6 that we propose and recommend are truly the right  
7 ones.

8 MEMBER POWERS: Is it also true, that as  
9 you go through the rest of the process -- defining the  
10 rest of the process, that you may iterate back and  
11 even change the cornerstones?

12 MS. KOTZALAS: Yes.

13 MEMBER POWERS: This is just a first cut  
14 at the cornerstones.

15 MS. KOTZALAS: This is our best  
16 determination of what they will be. As we further  
17 develop the process, we may find that something else  
18 is better. We expect to continue to engage the ACRS  
19 as we go through the process and the different steps.  
20 So we will be seeking your feedback all along the way.

21 MEMBER POWERS: How do your stakeholders  
22 feel about these cornerstones?

23 MS. KOTZALAS: It's difficult for me to  
24 speak for the stakeholders, but the feedback that we  
25 have received during public meetings is that they

1 believe that these cornerstones represent what is  
2 appropriate for fuel cycle facilities. They use the  
3 same type of nomenclature that fuel cycle facilities  
4 and the operators are used to. So they think that  
5 this fits very well.

6 MEMBER POWERS: I think that's very  
7 important what you said about the nomenclature, that  
8 we're not introducing some strange new language into  
9 the field.

10 MS. KOTZALAS: Yes. We believe that that  
11 was important also because we didn't want to create  
12 any type of confusion that may affect the safety of  
13 the plants.

14 MEMBER POWERS: Good. Very good.

15 CHAIR STETKAR: Margie?

16 MS. KOTZALAS: Yes.

17 CHAIR STETKAR: I unfortunately wasn't at  
18 the subcommittee meeting, so I don't have the benefit  
19 of the discussions that went on there. In some of the  
20 discussion we've had in the past, there seems to be a  
21 notion that the -- if I look at your cornerstones and  
22 I'm not arguing with the cornerstones, but people tend  
23 to look at problems on the -- they are nuclear  
24 problems or they are chemical problems and they  
25 sometimes don't necessarily see the nexus between the

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 two. How does your -- and I'm not arguing with the  
2 cornerstones. I'm thinking about how does your  
3 treatment of cross-cutting issues address that type of  
4 issue? Or is it intended to?

5 MS. KOTZALAS: I would say -- April, do  
6 you have anything? Okay.

7 MS. SMITH: This is April Smith. The  
8 cross-cutting areas, especially if you look at those  
9 top three, human performance, P&NR, and safety  
10 conscious work environment, those are going to cut  
11 across whether we're looking at something as you  
12 described as two views, nuclear or chemical. That  
13 cuts across either way. And as we again go through  
14 the process of the pilot program, we may end up making  
15 some distinctions, but right now those overall ones  
16 would cover both areas pretty holistically.

17 CHAIR STETKAR: Okay, good. Thank you.

18 MS. KOTZALAS: Okay, the rest of the  
19 presentation we are going to provide an overview of  
20 the objections for each cornerstone. At the  
21 subcommittee level, at the meeting, we delved into the  
22 key attributes and the inspectable areas and we had  
23 quite a bit of discussion within each of the  
24 cornerstones.

25 In the interest of time, however, we are

1 going to describe the objectives and expect if there  
2 are any questions, we will address them within each of  
3 these slides.

4 MEMBER SCHULTZ: Margie, before you go  
5 there, could we go back one slide to talk about the  
6 cross-cutting areas a little further?

7 You mentioned procedure compliance and the  
8 thought is that that does not belong as a cross-  
9 cutting area or issue?

10 MS. KOTZALAS: We believe that it is a  
11 subset of human performance, at least in the ROP in  
12 the Manual Chapter 0310 which describes the cross-  
13 cutting areas. It states that procedural adherence is  
14 a subset of human performance.

15 MEMBER SCHULTZ: Right. And it's also a  
16 subset of safety conscious work environment as well.

17 MS. KOTZALAS: Okay. April?

18 MS. SMITH: I could understand where  
19 you're headed with that. However, you can have human  
20 performance and good human performance happening at a  
21 facility and not necessarily an open recognition of  
22 safety conscious work environment. So it's a way  
23 again of calling out that specific performance area  
24 and separating. So yes, we want to make sure that  
25 people are doing what we want them to do. But at the

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 same time, we want to make sure we have from top down  
2 in terms of management this concept of safety  
3 conscious work environment. Does that answer your  
4 question?

5 MEMBER SCHULTZ: I was not suggesting you  
6 would replace safety conscious work environment with  
7 procedure compliance for sure.

8 MS. SMITH: Sure. Yes. I understand.

9 MEMBER SCHULTZ: I'm just trying to  
10 understand your current thinking on it.

11 MEMBER POWERS: The point you're raising  
12 is that procedure compliance is an aspect of safety  
13 conscious work environment.

14 MEMBER SCHULTZ: Yes. It's an outcome of  
15 the quality of human performance and safety conscious  
16 work environment. And maybe it relates to the problem  
17 identification and resolution program as well. So  
18 again, I don't see it as a cross-cutting issue in  
19 itself. It's an outcome.

20 MEMBER POWERS: It may well be, but what  
21 you don't -- I mean I think what you're cautioning on  
22 is if they're going to take procedural compliance and  
23 make it not a cross-cutting issue, but a subset, it  
24 better be a subset of all three.

25 I think that's why the subcommittee

1 thought maybe procedure compliance gets pulled out by  
2 itself because it cuts across the cross-cutting issues  
3 as well as the cornerstones.

4 MEMBER SCHULTZ: Yes. That's where I was  
5 going. I'm not sure what to call it.

6 MEMBER POWERS: I mean I don't have  
7 troubles with them making it a subset and what not.  
8 It's just this broad recognition needs to come in and  
9 I'm sure it would, but it's -- it was just a thought  
10 on the part of the subcommittee that maybe it --  
11 because it's pandemic in all these things that it be  
12 recognized as such.

13 MEMBER SKILLMAN: I think what was  
14 important during that subcommittee meeting relative to  
15 procedure compliance is the recognition of how  
16 dangerous hexafluoride can be. And we thought the  
17 procedures that guide how the cylinders and how that  
18 element is handled probably deserve unique  
19 recognition. So it was the hex that drove the  
20 subcommittee to say this one is probably different in  
21 the context of the fuel cycle oversight process than  
22 in the ROP.

23 I am not suggesting that procedure  
24 compliance isn't very, very important in the ROP. It  
25 certainly is. But there is a lethal argument that is

1 associated with the hex that brought us to suggest  
2 that this should be a stand-alone.

3 MS. KOTZALAS: Okay. Thank you for that.

4 MEMBER POWERS: I think it's also fair  
5 that -- I mean we can accept it either way. It's just  
6 that we want to make sure that procedure compliance is  
7 understood here.

8 MS. KOTZALAS: Understand. Thank you.  
9 Okay, to our first cornerstone, criticality safety.  
10 So the objective for this is to protect against the  
11 consequences of a criticality accident preferably by  
12 preventing the accident itself. You know, there are  
13 -- we had inspectable areas such as -- oh, I know  
14 where it is, in one of the back-up slides.

15 I think what I'll do is forward to the --  
16 okay. I don't know if you can see some of these.  
17 This describes some of the aspects of criticality  
18 safety. There's the analysis, implementation, the  
19 program oversight, problem identification and  
20 resolution, and then some of the inspectable areas.  
21 And again, some of these details in the bottom parts  
22 of the slides, these are our -- what we have worked  
23 out as the best estimate. Again, these can change.  
24 What we really want and we're focusing for Commission  
25 approval of is the cornerstone itself which is the



1 criticality safety.

2 These other pieces below show our thought  
3 process as we developed it.

4 MEMBER POWERS: When you think about these  
5 processes, you immediately confront the issue of  
6 credible and incredible. How do you think about  
7 credible and incredible?

8 MS. KOTZALAS: You're asking me some  
9 difficult questions.

10 MEMBER POWERS: That's what we get paid  
11 for.

12 MS. KOTZALAS: April or Chris, do you want  
13 to help me with that?

14 MS. SMITH: Or even Dennis, the inventor  
15 -- well, I'd be glad to take -- let me just understand  
16 the context of what you're asking. Are you wondering  
17 about credible and incredible in terms of --

18 MEMBER POWERS: It's been my experience  
19 that that which some people deem incredible, my  
20 colleague that chairs the ACRS totally will find it  
21 quite credible oftentimes and vice versa.

22 MEMBER RICCARDELLA: And once in a while  
23 the real world does too.

24 MEMBER POWERS: Well, the real world is a  
25 complex organization and inarticulate at best. But

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 that decision between what's credible and incredible  
2 has a bearing in that it subverts the concept of risk.  
3 Because what you end up saying is if something has a  
4 frequency below some threshold, regardless of the  
5 consequences, I'm going to neglect that. And that's  
6 problematic, I think, in today's risk-informed and  
7 performance-based world.

8 So what I'm asking is how do you think  
9 about defining that threshold between the credible and  
10 incredible?

11 MS. SMITH: Okay, go ahead, Dennis.

12 MR. DAMON: This is Dennis Damon. I was  
13 on the rulemaking team that wrote the Part 70 rules  
14 and that term credible appears two different places in  
15 that rule in the performance requirements. One place  
16 is relevant to this slide which is criticality safety  
17 and it's taken from ANSE/ANS-8.1, the fundamental  
18 standard for criticality safety. So it appears in a  
19 statement about criticality, that before processes  
20 involving special nuclear material is operated, it  
21 shall be determined that it is subcritical for normal  
22 and credible abnormal conditions.

23 And the other place it appears is in the  
24 two statements about likelihood of accidents and it  
25 says credible high consequence events shall be highly

1 unlikely, for example.

2 So then it also says in the description of  
3 what has to be supplied by the licensee in their  
4 submission for an ISA summary, they are to submit  
5 their definition of credible.

6 So what I did was I recognized, I think,  
7 one of the problems of that use of that word is that  
8 it can be used by someone to not consider something in  
9 their ISA. So in the Standard Review Plan, on the  
10 acceptance criteria for review of licensee submission  
11 of a definition of credible, I wrote a little  
12 paragraph saying don't do this, don't screen things  
13 out unless you've got an argument that they physically  
14 are not possible and so on.

15 There's three criteria in there. One of  
16 them is quoted from Commission policy essentially that  
17 was developed in the context of addressing the  
18 appearance of that word credible in regulations for  
19 reactors and for independent spent fuel storage  
20 installations where they said they were using  
21 frequency screening criteria. And so the one  
22 criterion in the Standard Review Plan that relates to  
23 that is a ten to the minus six frequency of for an  
24 external event. And it has some qualifying language  
25 where you're very confident that the frequency of the

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 vent is less than ten to the minus ten.

2 In the context we're talking about here of  
3 the fuel cycle facilities for the current group of  
4 facilities, I think that criterion, that frequency  
5 criterion is adequate for screening because there  
6 isn't -- there are not at the current facilities  
7 inventories of materials that could cause massive  
8 amounts of off-site damage or very large numbers of  
9 offsite serious health effects. There's enough to  
10 cause probably off-site fatality in extreme  
11 circumstances. So given that qualification, I think  
12 the screening criterion is adequate.

13 But I would agree that if you were to  
14 license a facility that had much bigger inventories of  
15 material or large inventories of radioactive material  
16 which these facilities do not have, but large  
17 inventories of radioactive material which could  
18 produce large amounts of off-site impact, then a  
19 screening criterion like the reactor screening  
20 criterion of ten to the minus seven or even lower  
21 would be more appropriate.

22 MEMBER POWERS: The argument is that the  
23 inventory is low. So the ten to the minus eight event  
24 that extinguishes all life on the planet is not a  
25 possibility.

1           On the other hand, they don't want them to  
2           spend an enormous amount of time protecting from the  
3           meteor strike in the middle of the repository.

4           CHAIR STETKAR: The only concern is that  
5           listening to this discussion I heard numbers like ten  
6           to the minus six and ten to the minus seven that  
7           seemed to be used interchangeably. Those are vastly  
8           different in the scales of frequency although people  
9           seem to think that they're only like one digit apart.

10          MEMBER POWERS: In your world, they are  
11          only one digit apart.

12          CHAIR STETKAR: But I understand how big  
13          that digit is. And you start -- well, is ten to the  
14          minus seven incredible? Is ten to the minus six? Is  
15          ten to the minus five incredible? Is a beyond design  
16          basis seismic event at ten to the minus four  
17          incredible? That's the whole issue because although  
18          you cite some reactor regulations that indeed do have  
19          numbers and others don't, but the implicit numbers are  
20          orders of magnitude higher than those numbers that you  
21          cite.

22          Seismic events. Design basis seismic  
23          events have an expected frequency of somewhere in the  
24          one in ten thousand to one in one hundred thousand per  
25          year. That's a large two orders to three orders of

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 magnitude higher than the numbers you were citing. So  
2 the question is what then is incredible?

3 MR. RAMSEY: Hi. My name is Kevin Ramsey.  
4 I guess my response to this discussion is to a large  
5 extent I consider incredible to be a moot point  
6 because when we're doing the risk assessment under our  
7 regulations, the intermediate consequence events have  
8 to be made unlikely. High consequence events have to  
9 be made highly unlikely. So you do your risk  
10 assessment. Dream up whatever incredible things you  
11 want to. There is a point at which they're so  
12 unlikely, you don't have to add any additional  
13 controls. I mean they're already highly unlikely.  
14 We're not going to require any additional controls.

15 Now licensees are free to apply defense-  
16 in-depth and they often do, but in terms of what we're  
17 going to require, if the event in and of itself is  
18 highly unlikely already, we're done. We've met the  
19 performance criteria. So you can keep ratcheting it  
20 up to the point at which we're not going to require  
21 any additional controls.

22 VICE CHAIR BLEY: I think there's a  
23 difference between the story that was just told and  
24 some of the concerns we've heard. And the difference  
25 is if you really look at them and understand them, and

1 understand how rare they are or not rare, and make a  
2 judgment that they're as rare as you would make things  
3 with controls, then you've considered them. The worry  
4 is when they're screened out and dismissed without  
5 sufficient thought because they are somehow not  
6 credible when you haven't really considered what that  
7 is. I think that's a major difference. And if you do  
8 what we just heard, that's pretty good.

9 MEMBER POWERS: I very much like what  
10 Dennis was saying. I'm not sure I'm so enthused about  
11 the oh, it's very unlikely and therefore I can't do  
12 anything because that just hasn't answered the  
13 question at all because you haven't told me what very  
14 unlikely is. Very unlikely is the same as saying it's  
15 incredible and I'm asking for the threshold. When  
16 that threshold is movable depending upon the magnitude  
17 of potential consequences, then I'm much more  
18 comfortable with that.

19 MR. TRIPP: Chris Tripp here. I'll just  
20 say that I think what we're getting into is we're  
21 getting into the ISA framework and that's already been  
22 decided in licensing and in regulation. ISAs are  
23 done. They've been accepted by the NRC and so forth.  
24 This is inspection. We're talking about how are we  
25 going to inspect what's in place.

1           And I'll just point out that under our  
2       first key attribute it has identify incredibly  
3       abnormal conditions and demonstrating subcriticality  
4       for normal, incredible, abnormal conditions. So we  
5       recognize there's a lot of times where this is maybe  
6       a weakness of the framework that licensees have not  
7       adequately documented the basis for why something was  
8       incredible. But now we're looking at how are we going  
9       to inspect what's in place rather than questioning  
10      what's already been approved years ago.

11           So that's definitely something we're going  
12      to look at. Based on past events that we've seen, we  
13      have had a lot of findings in this area. So it's on  
14      the list. That's one of the things that we're going  
15      to concentrate on as being one of the key contributors  
16      to a lot of the events that we have. So we are very  
17      mindful of that, but we have to deal with the existing  
18      framework.

19           CHAIR STETKAR:       In practice, the  
20      regulation requires that the applicant provide those  
21      definitions. From my facility, I will define what is  
22      unlikely, what is highly unlikely and incredible,  
23      right?

24           Do they do that quantitatively? Do they  
25      do it qualitatively? Do they do it by comparison



1 between likelihood and consequences? How do they do  
2 that in practice? Because that is something that  
3 needs to be inspectable, right, the rationale behind  
4 the definitions that they establish. So how do they  
5 do that?

6 MR. TRIPP: I'd say it's mostly  
7 qualitative.

8 CHAIR STETKAR: Qualitative.

9 MR. TRIPP: There's a mix.

10 CHAIR STETKAR: Okay. So how does an  
11 inspector determine that qualitative judgment that I  
12 think something that's on -- my dad had heart surgery  
13 and he said well, you know, it couldn't be safer than  
14 three percent chance of dying. To me, you know,  
15 that's a pretty big chance of dying.

16 MR. LOPEZ: This is Omar Lopez. I was a  
17 fuel facility inspector and the way that we evaluate  
18 when the licensee makes an argument of incredibility  
19 is that we make sure that they are not relying on any  
20 controls. For example, we have had two significant  
21 enforcement actions when the licensees screen out a  
22 bunch of accidents because they were saying they were  
23 incredible. But when we started inspecting each  
24 particular accident sequence, we noticed that they  
25 were relying on controls, like operator actions or

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 passive engineer controls. So the licensee realized  
2 that and then they reevaluated the accident sequence  
3 and added controls. And they were not calling any  
4 more incredible.

5 So as part of the inspection program, we  
6 will inspect that. That's part of the -- the  
7 inspection program requires us to review any accident  
8 sequence that are called incredible. We need to  
9 verify that we agree with that and that is made in the  
10 regulation. And we have multiple examples where we  
11 say yes, that doesn't meet the regulation. You are  
12 relying on specific controls, so that's not  
13 incredible.

14 CHAIR STETKAR: Okay. Thank you.

15 MS. KOTZALAS: Okay, I will move on to the  
16 next cornerstone. This one is chemical and  
17 operational safety.

18 During the subcommittee, we had a lot of  
19 discussion about where chemical fit into the  
20 cornerstones. We believed that it fit the best into  
21 the operational safety cornerstone because this is a  
22 cornerstone that deals with accident sequences and  
23 they're not routine exposures. So the most  
24 significant hazards from the chemicals are from  
25 accidents. So our objective for this cornerstone is

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 to verify the availability and reliability of IROFS  
2 which are safety systems and other safety controls  
3 such as chem and fire to protect the workers and the  
4 public health and safety.

5 So if you wanted to look very quickly,  
6 here are some of the other things. We look at the  
7 design, the human performance, equipment performance,  
8 configuration control, problem identification and  
9 resolution.

10 MEMBER POWERS: So when I look at chemical  
11 operational safety, I should say -- I should say to my  
12 mind this includes fire safety?

13 MS. KOTZALAS: Yes, it does.

14 MEMBER POWERS: Which makes me very happy  
15 because fire is a chemical process.

16 MS. KOTZALAS: Yes, it's included in the  
17 objective. Chemical and fire safety controls.

18 Okay, the next cornerstone is occupational  
19 radiation safety and this one is to verify adequate  
20 worker -- protection of the worker health and safety  
21 from exposure to radiation during routine fuel  
22 processing.

23 MEMBER SCHULTZ: How does this cornerstone  
24 definition compare to what you would see in a nuclear  
25 plant?

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 MS. KOTZALAS: In a power plant?

2 MEMBER SCHULTZ: Yes. Or any other  
3 facility that has radiation.

4 MS. KOTZALAS: I believe it is very, very  
5 similar.

6 MEMBER SCHULTZ: Similar, yes. I think  
7 it's worthwhile checking just to make sure that the  
8 similarity -- the comparison shows that you have a  
9 clean definition on both counts.

10 MS. KOTZALAS: Yes. When we were  
11 developing these cornerstones, we looked heavily to  
12 the ROP and we took what made sense. And this one and  
13 the one that we're going to discuss next about public  
14 radiation safety, they match very closely.

15 MEMBER SCHULTZ: They should.

16 MS. KOTZALAS: Yes, right.

17 MEMBER SCHULTZ: They should.

18 MS. KOTZALAS: And our SVP as we are  
19 working --

20 MEMBER SCHULTZ: I wouldn't try to create  
21 a difference where one doesn't need to be.

22 MS. KOTZALAS: Correct. The next one is  
23 the public radiation safety and this is to verify  
24 adequate protection of public health and safety from  
25 radiation used in fuel processing. These could be

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1       inadvertent exposures in routine operations such as  
2       effluent discharges or storage of solid contaminated  
3       material and as well as the transportation aspects of  
4       it.

5               MEMBER POWERS:   One of the issues that  
6       came up in the subcommittee meeting is with respect to  
7       that transport issue.  Where is the boundary between  
8       facility and transportation safety?

9               MS. KOTZALAS:  Could you refresh my memory  
10       a little bit more?

11              MEMBER POWERS:  I think we asked you does  
12       it start at the gate or does transportation include  
13       something beyond the gate?

14              MS. KOTZALAS:     For the fuel cycle  
15       oversight process?

16              MEMBER POWERS:  Yes.

17              MS. KOTZALAS:  Omar, you can correct me if  
18       I'm wrong.  I believe that the fuel cycle oversight  
19       process and the current process regulates  
20       transportation only -- for us, only in adding the  
21       material to the containers.  And that once it is on  
22       the transport vehicle, there is another oversight  
23       process that carries it.

24              MEMBER POWERS:  That's what you told us at  
25       the subcommittee.

1 MS. KOTZALAS: Oh, well, then good. I'm  
2 consistent.

3 MEMBER POWERS: I just wanted the rest of  
4 the committee to hear that.

5 MS. KOTZALAS: Thank you.

6 MEMBER POWERS: It does come up.

7 MS. KOTZALAS: Yes.

8 MEMBER POWERS: I mean if you had to go  
9 off on the highways, then that's a whole different  
10 world.

11 MS. KOTZALAS: That's correct. Okay, the  
12 next one is emergency response. And this is also  
13 analogous to what is in the ROP. This is to verify  
14 that licensees adequately implement, maintain, and  
15 perform actions required for an approved emergency  
16 plan to protect public health and safety during an  
17 emergency. And this one also involves chemical  
18 emergency as well as radiological emergency.

19 MEMBER POWERS: Margie, be kind enough to  
20 tell the rest of the committee the definition of that  
21 parenthetical comment, "those chemicals under US NRC  
22 jurisdiction."

23 MS. KOTZALAS: Okay, so we have a  
24 Memorandum of Understanding with OSHA. We have -- the  
25 NRC has regulatory responsibility for chemicals that

1 are produced or touch radioactive materials. So there  
2 are chemicals in the facility that we don't regulate  
3 and those are things like -- that aren't involved in  
4 the processing of fuels. So for those chemicals that  
5 we have jurisdiction, those are the ones that we  
6 inspect, and those are the ones that we require an  
7 emergency plan for.

8 CHAIR STETKAR: So since I don't know much  
9 about these, but barely enough to be dangerous,  
10 sulfuric acid, nitric acid used in the processing  
11 streams would come under NRC jurisdiction?

12 MS. KOTZALAS: Yes, because they're --

13 CHAIR STETKAR: But other chemicals used  
14 in a wash process may not.

15 MS. KOTZALAS: If it comes in contact with  
16 radioactive material or is formed from radioactive  
17 material, then we regulate.

18 MR. RAMSEY: Not example.

19 MS. KOTZALAS: Okay.

20 MR. RAMSEY: Chemicals, before process  
21 addition or after process removal, we don't address.  
22 So the bulk storage tanks, if there's a release from  
23 the bulk storage tank, we're not getting into that.

24 CHAIR STETKAR: OSHA owns that.

25 MR. RAMSEY: Now once it's been put into

1 the process and commingled with license material, if  
2 something happens to it there, then our regulations  
3 apply. But again, if you get to the end and the  
4 chemicals are separated, let's say you're deconverting  
5 UF6 and you're pulling the HF out, once it's out and  
6 separated from the uranium, then we're saying okay,  
7 that big tank of HF over there, not us. And that's  
8 just the jurisdictional position that the Commission  
9 has taken.

10 CHAIR STETKAR: And the dotted lines are  
11 pretty clearly understood?

12 MR. RAMSEY: Yes. I mean when we go  
13 through the ISA, they have to define exactly what  
14 processes they're addressing in terms of the risk  
15 assessment. So you won't see -- I mean if we're  
16 talking like bulk storage tanks, that's not covered.

17 CHAIR STETKAR: I was thinking more about  
18 the back end of the process after you do some  
19 separation of the material.

20 MR. RAMSEY: Yes, and we've had HF  
21 recovery, ammonia recovery. Once that stuff is  
22 separated and recovered, how they store it and how  
23 they reuse it or sell it, we don't assess that.

24 MEMBER REMPE: Do you look at co-located  
25 hazards if there's a problem with what they're doing

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701



1 on their side of the fence and I mean if you were  
2 talking about things being credible or incredible, do  
3 you just totally ignore those things?

4 MR. RAMSEY: No, but we don't require it  
5 to be addressed unless that collated hazard increases  
6 what we refer to as radiological risks for our  
7 licensed material. It has to have an impact on what  
8 we authorized.

9 MEMBER REMPE: And how do you assess that  
10 it's going to have an impact or not?

11 MR. RAMSEY: Well, they have to define a  
12 scenario. If there's a chemical release next door,  
13 and that gets drawn into your ventilation system and  
14 it's going to prevent you from controlling the  
15 material that we license, then they have to address  
16 it.

17 MEMBER REMPE: So are there limits on how  
18 much material they can have on their side of the fence  
19 before it becomes an effect on our side of the fence?

20 MR. RAMSEY: No, we don't restrict what  
21 neighbors do. We just say our licensees have to  
22 assess if there are accidents near their facility that  
23 could impact the risk of -- you know, how well they  
24 control our license material.

25 CHAIR STETKAR: How do you deal with Dr.

1 Powers' chemical reaction that happens to involve  
2 combustion in the facility that's got both your  
3 hazards and OSHA's hazards in it, when the fire  
4 doesn't know which -- the fire doesn't quite know that  
5 legal jurisdiction?

6 MR. RAMSEY: Well, I think --

7 CHAIR STETKAR: Honestly. Who determines  
8 whether the --

9 MR. RAMSEY: If it increases radiological  
10 risk at all, it needs to be included in the risk  
11 assessment.

12 CHAIR STETKAR: At all.

13 MR. RAMSEY: You really have to get into  
14 whether it impacts how well they control the material  
15 that we license. We're not going to try to get into  
16 what every other agency in this country authorizes.  
17 We're going to focus on the material that we  
18 authorize.

19 MEMBER POWERS: If there is an explosion  
20 in the storage tank that affects the control room at  
21 the site, then that's a scenario that would appear in  
22 the integrated safety assessment.

23 CHAIR STETKAR: In that sense --

24 MEMBER POWERS: The hand itself, the NRC  
25 isn't going to go inspect the tank and make sure

1       there's no corrosion around it.

2                   CHAIR STETKAR: I was thinking more of the  
3       traditional fires that burn up a bunch of cables, for  
4       example, in process systems that are affecting both  
5       sides of the fence.

6                   MEMBER POWERS: And if that produced an  
7       impact on your site, that would be a scenario that --  
8       I mean it's no different than if there was a chemical  
9       plant next to a nuclear reactor and you had the cat  
10      cracker blew up and affected your site and you better  
11      look at that scenario.

12                  MS. KOTZALAS: The next cornerstone is  
13      security. And the security cornerstone verifies that  
14      the safeguards systems both for the on the site itself  
15      and transportation promote common defense and security  
16      by preventing sabotage, lost, theft, diversion and  
17      unauthorized disclosure of classified and sensitive  
18      information, and also to verify that the licensee's  
19      physical protection systems minimize the possibility  
20      for removal of SNM and to facilitate the recovery of  
21      SNM.

22                  MEMBER POWERS: So if a bunch of black-  
23      clad guys show up at the gate and they say we're here  
24      to steal the OSHA-protected materials, we don't want  
25      any of your SNMs, so please let us in and let us swipe

1       that.  You're going to let them right in, right?

2                   MS. KOTZALAS:  Absolutely.

3                   (Laughter.)

4                   Okay, the next cornerstone is material  
5       control and accounting.  The objective is to verify  
6       that the MC&A programs promote common defense and  
7       security by detecting and protecting against loss,  
8       theft, diversion and misuse of SNM again, facilitating  
9       the recovery of missing SNM and to verify that the  
10      licensee adequately detects unauthorized production  
11      and unauthorized levels of enrichment at enrichment  
12      facilities.

13                  During the subcommittee, there were some  
14      questions about how -- what this cornerstone -- what  
15      we will inspect matches what the IAEA inspects.  So we  
16      found an answer to that question and essentially,  
17      we're looking at very different things.  The IAEA, the  
18      international safeguards, they verify that the nuclear  
19      material declarations of a state or a country are  
20      accurate.  And they don't verify the individual  
21      components of our MC&A system.  They verify that the  
22      facility is being used as it is declared and that  
23      significant quantities of nuclear material are not  
24      being diverted for undeclared uses.  So we're looking  
25      at very different things.  One is to see whether a

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 government is using their material as they said. And  
2 the other one for us to determine that there are  
3 systems in place to prevent diversion and facilitate  
4 location as stated there. Okay?

5 In summary, you know, in order to develop  
6 our cornerstones, we used a layered approach. We  
7 started with the NRC mission. We considered the  
8 specific hazards at the fuel cycle facilities and the  
9 operational environment and we arrived at our  
10 recommended cornerstones.

11 Our recommended cornerstones, they  
12 represent all the major operations at all the  
13 different facilities. They are risk informed through  
14 the integrated safety analysis and they align with the  
15 SRM.

16 Do we have any more questions?

17 MEMBER POWERS: Any more questions on the  
18 subject and particularly any additional thoughts on  
19 the issue of cross-cutting issues?

20 MEMBER SCHULTZ: Margie, can we go back to  
21 slide 9?

22 MS. KOTZALAS: Nine?

23 MEMBER SCHULTZ: Nine, the cross-cutting  
24 issues slide. I think it's nine.

25 MS. KOTZALAS: Eight.

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1                   MEMBER SCHULTZ: Eight. There it is. My  
2                   own view is that I'm still concerned with procedural  
3                   compliance being a cross-cutting issue. If I look at  
4                   the other three cross-cutting issues, they're not just  
5                   one element or one piece in terms of overall  
6                   performance. So a suggestion for consideration would  
7                   be that procedural compliance might be a broader term,  
8                   might be more appropriately represented by a broader  
9                   term. And I would suggest process safety as being a  
10                  cross-cutting issue. When I look at the cornerstones,  
11                  there's at least three and maybe more that are  
12                  associated with process safety.

13                 And I would include under process safety  
14                 not just procedural compliance, but procedure  
15                 development, the quality of the procedures,  
16                 operational safety margin associated with process  
17                 safety and that would include how is margin defined,  
18                 how is margin maintained, so that the cross-cutting  
19                 issue is a broader concept like human performance,  
20                 problem identification, resolution, safety conscious  
21                 work environment.

22                 I'm concerned that procedural compliance  
23                 or this procedural problem, if someone makes a  
24                 procedural error and suddenly it's a cross-cutting  
25                 issue, I can see that as an indicator, but I think the

1 cross-cutting area ought to be defined more broadly  
2 and yet be applicable to a good number of the  
3 cornerstones.

4 MEMBER CORRADINI: So you think it's just  
5 a subset of the other one?

6 MEMBER SCHULTZ: No, I just don't think  
7 the procedural compliance is defined as broadly as it  
8 ought to be. Procedural compliance I did not comply  
9 with my procedure. There's always a reason for that.  
10 Some of it is human performance and safety conscious  
11 work environment.

12 MEMBER CORRADINI: You're saying if I do  
13 a root cause analysis I would find something else as  
14 the real reason?

15 MEMBER SCHULTZ: Yes, usually --

16 MEMBER CORRADINI: That's what you're  
17 saying.

18 MEMBER SCHULTZ: Usually when there's a  
19 procedural compliance problem the first thing you look  
20 at is how good is the procedure that was not complied  
21 with?

22 VICE CHAIR BLEY: Under the specific  
23 situation that occurred.

24 MEMBER SCHULTZ: So I think that process  
25 safety would allow you to say if I don't have -- if my

1 procedures are lousy, but I comply with them, that's  
2 a problem. That, in fact, ought to be a cross-cutting  
3 issue.

4 MEMBER REMPE: I agree with that because  
5 the questioning attitude will sometimes make you not  
6 want to comply with the procedure. And what you  
7 should do is stop work and maybe change the procedure.

8 MEMBER SCHULTZ: Or you've modified your  
9 procedure so that they're easy.

10 MEMBER REMPE: Right, blind compliance  
11 isn't a great idea sometimes.

12 MEMBER SCHULTZ: So again, I would just  
13 suggest it would be defined more broadly and process  
14 safety is a term I came up with in the last 20  
15 minutes. So there might be a better one. But I would  
16 try to broaden it to what I mentioned, procedural  
17 development, the quality of them, include compliance  
18 or adherence, and also what safety margin is provided  
19 within the overall area of process safety. So that  
20 goes to criticality safety, chemical safety,  
21 occupational and radiation safety and public safety as  
22 well.

23 MS. KOTZALAS: Okay, thank you.

24 MEMBER POWERS: All right, any other  
25 comments that people want to make? Seeing none, we



1 have a procedure for eliciting comments from the  
2 audience. Are there any people in the audience that  
3 would care to make comments? I see none.

4 Now we have a procedure for people online  
5 making comments that I don't even begin to understand.  
6 However, I have a delegee who is extremely familiar  
7 with that and he -- I will ask, Mr. Stetkar to go  
8 through that litany of activities to elicit comments  
9 from over the wire.

10 MEMBER STETKAR: You only do that because  
11 you know in your heart that I really love this.

12 MEMBER POWERS: That's right.

13 MEMBER STETKAR: Do we have the bridge  
14 line open he asked questioningly? It sounds like it  
15 is. Is anybody nodding over there? It is.

16 If there is anyone on the bridge line, do  
17 us the favor of just letting us know that it's open by  
18 saying hello, please?

19 MR. LEWIS: Marvin Lewis, member of the  
20 public.

21 MEMBER STETKAR: Thanks, Marvin. Now if  
22 any members of the public would like to make a  
23 comment, identify yourself and do so. Hearing none --

24 MR. LEWIS: Marvin Lewis, member of the  
25 public.

1                   MEMBER STETKAR: Would you like to make a  
2 comment?

3                   MR. LEWIS: Sure would.

4                   MEMBER STETKAR: Okay, continue.

5                   MR. LEWIS: Okay, well, look. A very  
6 interesting conversation. I think you are interested  
7 in results and keeping things on a level keel and that  
8 sort of thing. But I'd like to point out something a  
9 little different, namely, at Fukushima the ground, the  
10 faults were supposed to be incapable of a 9 plus  
11 earthquake and they were able. And of course, you see  
12 the results.

13                   Secondly, at Fukushima, the seawall was  
14 designed to mitigate, reduce the tsunami. It turns  
15 out it was poorly designed and actually increased the  
16 tsunami significantly. How much I don't know, three  
17 or ten times. I see those numbers all over the place.

18                   I'm just trying to think, okay, we come up  
19 with a number like ten to the minus eight, ten to the  
20 minus seven, ten to the minus six. How likely is that  
21 number for that real? And how likely is that number  
22 just a Fukushima error? Thank you.

23                   MEMBER STETKAR: Thank you, Marvin. Do we  
24 have any other members of the public who would like to  
25 make a comment?

1 MR. HOFFMAN: This is Ace Hoffman. I  
2 would simply like to concur with what Marvin Lewis  
3 said.

4 MEMBER STETKAR: Thank you, Mr. Hoffman.  
5 Any other members of the public who would like to make  
6 a comment?

7 MR. SIEGEL: I'm Edward Siegel. I'm an  
8 infamous whistleblower from Westinghouse before most  
9 of you were born. This all sounds very nice, nice and  
10 procedural and some of it pretty poor connection. It  
11 went over my head.

12 It sounds like generic policy and when I  
13 worked at Westinghouse and then GE and then PSE&G and  
14 then AVV Combustion and then the IAEA, I heard a lot  
15 of this stuff. And I'm sure to some extent it works,  
16 but the bad word is "some extent" and people never got  
17 down to the nitty gritty like which alloys they used.

18 I'm the guy who exposed transition welds  
19 in the Westinghouse reactor that necessitated 64  
20 reactors being inspected by the NRC and TEPCO and  
21 KEPCO having 17 and 12 shutdowns for three years from  
22 2002 to 2005, because people would listen to me  
23 because they hired me to work on it. They didn't like  
24 what they heard.

25 So what I'm hearing from you folks, no

1 offense intended to you specifically since we don't  
2 know each other, is hear no evil, see no evil, speak  
3 no evil, think no evil. And that's evil. What always  
4 needs naysayers, devil's advocates, and  
5 whistleblowers. That's what keeps our society  
6 supposedly free. We have the news media, even though  
7 it's aggravating these days. And people at the NRC,  
8 Angela Coggins knows me well, if she's still there,  
9 and Greg Jaczko, I used to speak to at home, your  
10 former chairman, but in general, people in the nuclear  
11 industry don't want to hear bad news. They want to  
12 believe.

13 Look, not to get political, we've had an  
14 example of that which is coming back to haunt us.  
15 Iraq. That's groupthink. Everyone agreed with Cheney  
16 and Bush and all and look what we're in. We'll be in  
17 Iraq for another century with ISIS.

18 So one has to be very careful about  
19 everyone agreeing because of the party line and they  
20 sort of go along and well, the operative word I use is  
21 some. Some is bad. It has got to be definite one way  
22 or the other and the game that the NRC played is  
23 probabilistic risk assessment.

24 I knew Shirley, your former chairwoman, a  
25 long time. At MIT, I was actually thrown out. I told

1 her what she was doing was absolute BS. It sounds  
2 nice, but she was giving a very nice probabilistic  
3 risk assessment when it first came out. It was like  
4 1992, '93, '94, '95, when she was chairwoman. And I  
5 said to her that's very nice and you have all these  
6 flow charts. I do mathematics and physics also,  
7 metallurgy was a sideline. Just where are the  
8 Inconel-182 transition welds? She says, "What's  
9 that?" I said, "Madam Chairwoman, you don't know a  
10 goddamn thing about nuclear reactors."

11 So what I'm hearing is the word "some" a  
12 lot. I use the word some, and pretty good and this  
13 and that. It's got to be much more definite than  
14 that. And if folks having this hearing or meeting or  
15 whatever it is can't agree on definiteness, then they  
16 really have a lot more -- it's easy to come up with  
17 that, but they have a lot more work to do before the  
18 public can trust that they're making the right  
19 decisions. I'll close with that. Thank you.

20 MEMBER STETKAR: Thank you very much, sir.  
21 Are there any other members of the public who would  
22 like to make a statement?

23 By the way, sir, turn off your -- whatever  
24 you have operating in the background. It's bothering  
25 other people on the line.

1 MR. SIEGEL: I was watching Mars Attacks.  
2 It was very interesting. Okay, it's over.

3 MEMBER STETKAR: Put it on mute. Thanks.

4 MR. SIEGEL: Watch the movie sometimes.  
5 It's great.

6 MEMBER STETKAR: Any other members of the  
7 public who want to make a comment?

8 If not, hearing none, we will reclose the  
9 bridge lines so that we don't get the pops and  
10 crackles in here. And having done my duty, I'll turn  
11 it back to the good Dr. Powers.

12 MEMBER POWERS: Thank you, sir. You do  
13 that so well. I really appreciate it.

14 Margie, thank you a lot. I realize you  
15 were abandoned in your hour of need by April. You  
16 will take your vengeance at your leisure, but we  
17 really appreciated you coming here and good luck on  
18 developing the rest of the process.

19 Our intention is to write a letter about  
20 this and pass on our thoughts and with that I will  
21 turn the meeting over to the chairman.

22 CHAIR STETKAR: Thank you. And thanks to  
23 the staff. It was educating, certainly, for me. With  
24 that, we will recess and go off the record for rest of  
25 today. Let's return at 2:30 and Steve, are you ready

**NEAL R. GROSS**

COURT REPORTERS AND TRANSCRIBERS  
1323 RHODE ISLAND AVE., N.W.  
WASHINGTON, D.C. 20005-3701

1 for first briefing?

2 MEMBER SCHULTZ: I am.

3 CHAIR STETKAR: Okay, we'll pick up  
4 Steve's letter, first read through at 2:30.

5 (Whereupon, the above-entitled matter went  
6 off the record at 2:07 p.m.)

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

# Post-Fukushima “Tier 2/3” Issues

Advisory Committee on Reactor  
Safeguards

November 5, 2015



NUCLEAR ENERGY INSTITUTE

nuclear. clean air energy.



# Safety Improvements

- Tier 1 requirements – Implemented or closed
- Tier 2/3 issues that related to safety moved up
  - Implemented or included in MBDBE
  - Or studied and closed
- Remaining Tier 2/3 issues should be closed
- Residual matters to NRC regular processes
- Monitoring for new developments is standard

# Overarching Lessons

- Provide cooling water and power under extreme conditions when station and off-site power are unavailable
- Retain or regain access to the ultimate heat sink
- Be prepared to handle multiple units affected by the same natural hazard
- As demonstrated at Fukushima Daiichi, portable equipment, high-quality site leadership, and dedicated personnel are the keys to success

# Bias for Action

- Positioned for indefinite coping during an extended loss of AC power
- Compliance with NRC orders
  - Mitigating Strategies; substantial completion by end 2016
  - Spent Fuel Pool Instrumentation; full completion by end 2016
  - BWR hardened vent order; full completion by June 30, 2019
- Two national support centers in operation
  - Additional portable equipment within 24 hours
- Initial flooding and seismic walk-downs and assessments leading to final assessments
- Able to handle natural hazards affecting multiple reactors at same site

# Remaining Issues

- Staff aiming in right direction
  - Enough information now or likely will be
- Group 1 should be closed
- Group 2 should be closed
- No proven need for NRC requirement
  - Vents for non-Mark 1/2 containments
  - H<sub>2</sub> Control and Mitigation
- Group 3 closed with addition information
  - Natural hazard reconfirmation program
  - Other natural hazards likely bounded by work to-date
  - EP issues left need some additional input

# Going Forward

- Our lessons learned from Fukushima are substantial and on-going
- We will achieve significant safety benefit by those actions completed by the end of 2016



# Plans for Resolving Open Tier 2&3 Recommendations

ACRS Full Committee Meeting  
November 5, 2015

# Background

- Tier 2\*:
  - Need for further technical assessment and alignment.
  - Depend on Tier 1 issues.
  - Depend on availability of critical skill sets.
  - Do not require long-term study.
- Tier 3\*:
  - Require further study to support a regulatory action.
  - Have an associated shorter-term action that needed to be completed to inform the longer-term action.
  - Depend on availability of critical skill sets.
  - Dependent on the resolution of Recommendation 1.

\*Some Tier 2&3 recommendations have been subsumed into Tier 1



# Resolving Tier 2 and 3 Recommendations

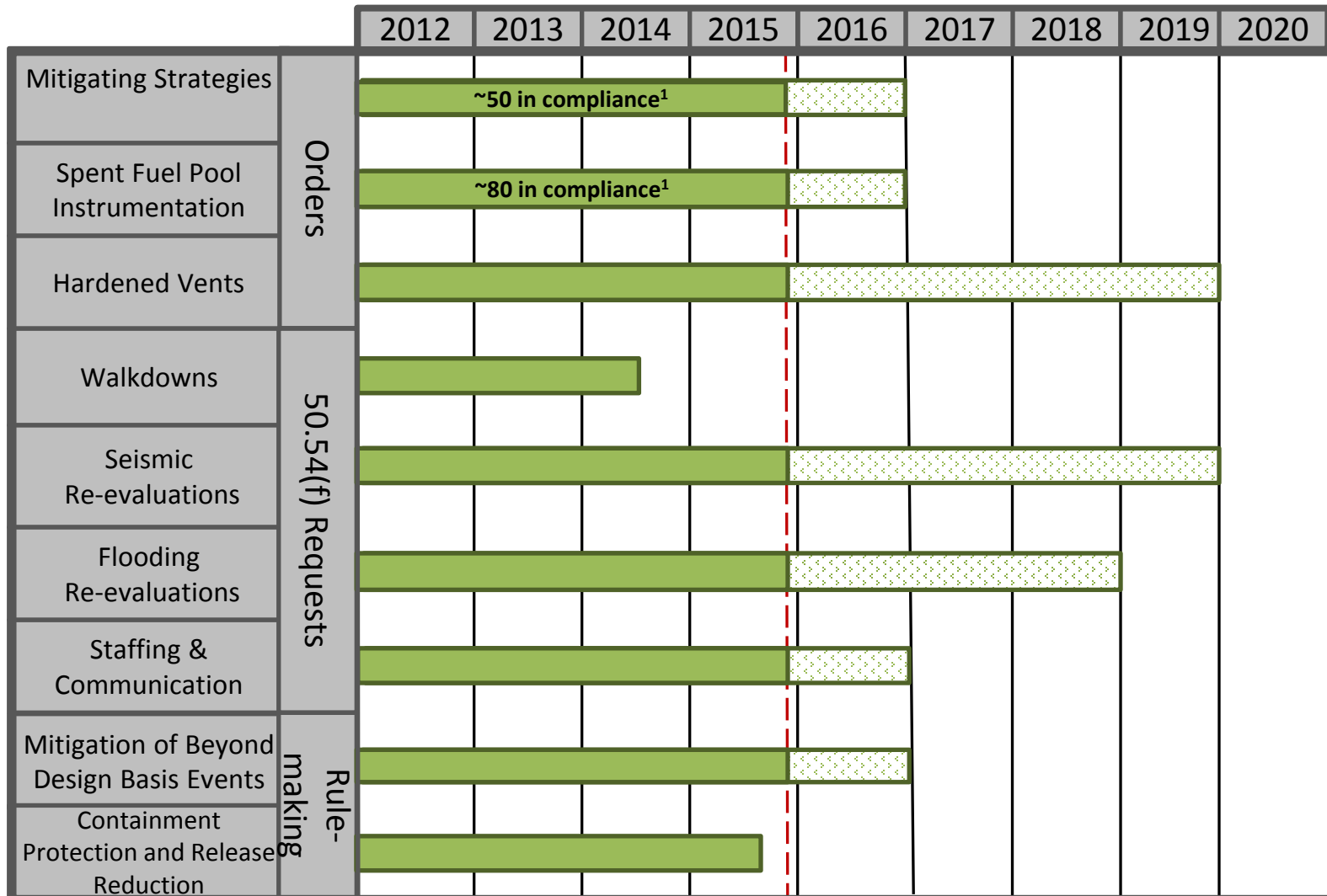
- Assessments with a focus on identifying and evaluating regulatory gaps
- Evaluations consider:
  - Existing requirements
  - Tier 1 safety enhancements
  - Insights from completed Tier 2&3 work
  - Insights from previously completed analyses
  - Related Commission direction
- Engagement with stakeholders
- Importance of maintaining an appropriate level of technical rigor





# Tier 1 Implementation\*

*The NRC is on or ahead of schedule.*



Today

*\*For illustrative purposes only*  
<sup>1</sup> expected after Fall 2015 outages <sup>4</sup>

# Resolution Groups

Group 1 – Can be closed now based on completed evaluations, progress made, and existing processes available to address future work.

Group 2 – Sufficient information available and staff's initial technical assessment complete; closure approach would benefit from interactions with ACRS/external stakeholders; work to be completed by March 2016.

Group 3 – More detailed assessment and/or justification for resolution being prepared; ACRS/external stakeholder interactions would inform resolution of the recommendation; work to be completed in 2016.



# Proposed Resolution Groups for Tier 2 and 3 Recommendations

-	Expedited transfer of spent fuel to dry cask storage
3	Enhanced capability to prevent/mitigate seismically-induced fires & floods
-	Revisit emergency planning zone size & pre-stage potassium iodide beyond 10 miles
9.3	ERDS capability throughout accident (partial)
10	Additional EP topics for prolonged SBO and multiunit events (partial)
11	EP topics for decision-making, radiation monitoring, and public education (partial)
12.1	Reactor Oversight Process modifications to reflect DID framework
12.2	Staff training on severe accidents and resident inspector training on SAMGs
7.2 – 7.5	Spent fuel pool makeup capability
9.1/9.2	EP enhancements for prolonged SBO and multiunit events
9.3	Emergency preparedness (partial)
9.4	Improve ERDS capability
10	Additional EP topics for prolonged SBO and multiunit events (partial)
11	EP topics for decision-making, radiation monitoring, and public education (partial)
5.2	Reliable hardened vents for other containment designs
6	Hydrogen control and mitigation inside containment or in other buildings
-	Reactor and containment instrumentation
-	Reevaluation of “other” external hazards
2.2	Periodic confirmation of seismic and flooding hazards
11	EP topics for decision-making, radiation monitoring, and public education (partial)

Completed

Subsumed in Tier 1

Ready to Close

Further Interaction

Further Assessment

# Group 1 – Seismically-Induced Fires and Floods

3: Evaluate potential enhancements to prevent or mitigate seismically-induced fires and floods

Tier 1 → Initiate development of a PRA methodology

Tier 3 → Determine if regulatory action is needed

## Evaluation

- Existing robust NRC requirements.
- Safety enhancements associated with Tier 1 activities mitigate risk.
- Draft feasibility study for the PRA methodology is currently under review.

## Recommendation

Close

. . . Additional safety enhancements not necessary

# Group 1 – Basis of EPZ Size and Pre-Staging KI Beyond 10 Miles

Additional Recommendation: Reevaluate the basis of EPZ size and pre-staging KI beyond 10 miles

Tier 3 → Dependent on long-term studies

## Evaluation

- 2014 denial of rulemaking petition to expand EPZ size.
- Insights from international studies at Fukushima.
- New data from the site supports existing regulations and policies.

## Recommendation

Close

. . . Information continues to support existing regulations and policies

# Group 1 – Various Emergency Preparedness Activities

Rec. 9.3 (Partial): Maintain ERDS throughout accident

Rec. 10.3: ERDS enhancements

Rec. 11.2: Evaluate recovery and reentry insights from Fukushima

Rec. 11.4: Training in the local community on radiation, radiation safety, and the use of KI

## Evaluation

- NRC's oversight role in emergencies
- ERDS design considerations
- Some licensees voluntarily transmit ERDS continuously
- FEMA is leading the ongoing efforts for 11.2 and 11.4

## Recommendation

Close

. . . Cost/benefit considerations; progress to date

# Group 1 – ROP Modifications to Reflect Defense-in-Depth Framework

12.1: Expand ROP self-assessment and biennial ROP realignment to include defense-in-depth considerations

Tier 3 → Dependent on Recommendation 1

## Evaluation

- Rec. 1 now closed to RMRF initiative.
- ROP self-assessment and realignment processes being enhanced.
- General ROP enhancements underway.
- Existing agency processes in place.

## Recommendation

Close

. . . Follow normal agency processes for future ROP enhancements

# Group 1 – Staff Training on Severe Accidents and SAMGs

12.2: Enhance training to include lessons learned and training on SAMGs for resident inspectors

Tier 3 → Dependent on Recommendation 8 (now subsumed in MBDBE rulemaking)

## Evaluation

- Severe accident training enhanced to include the accident and lessons learned.
- SAMG training is being developed.
- Qualification programs being updated.

## Recommendation

Close

. . . Enhancements to training and qualification programs are underway



# **Group 1 – Emergency Preparedness Activities Addressed by the Mitigation of Beyond-Design-Basis Events Rulemaking**

Rec. 9.1: Initiate rulemaking to require EP enhancements for multiunit events

Rec. 9.2: Initiate rulemaking to require EP enhancements for prolonged station blackout

Rec. 9.3 (Partial): Order licensees to perform various EP enhancements until rulemaking is complete

Rec. 10.1: Analysis of protective equipment Requirements

Rec. 10.2: Command and control structures

Rec. 11.1: Enhanced resources to get equipment onsite

## Group 2 – Reactor and Containment Instrumentation Enhancements

ACRS: Assess need to enhance reactor and containment instrumentation to survive beyond design basis events

Tier 3 → Further staff study; dependent on higher priority recommendations

### Evaluation

- Tier 1 enhancements and existing requirements.
- Insights from MBDDBE rulemaking analyses.
- Ongoing work to develop consensus standard.

### Recommendation

No need for regulatory action identified, but staff plans additional interaction before finalizing assessment

## Group 2 – Vents for Other Containment Designs

5.2: Reevaluate the need for hardened vents for other containment designs. . . [take] appropriate regulatory action . . .

Tier 3 → Dependent on insights from Tier 1 activities (Order EA-13-109 and related rulemaking)

### Evaluation

- Significant information from previous studies.
- EA-13-109 in progress.
- Mitigating strategies enhance safety.
- Commission disapproved CPRR rulemaking.

### Recommendation

No need for regulatory action identified, but staff plans additional interaction before finalizing assessment

## Group 2 – Hydrogen Control and Mitigation

6: Identify insights about hydrogen control and mitigation inside containment or in other buildings as additional information is revealed through further study. . .

Tier 3 → Dependent on insights from Tier 1 activities and further evaluation

### Evaluation

- 10 CFR 50.44.
- Significant information from previous studies.
- EA-13-109 in progress.
- Mitigating strategies enhance safety.
- NRC participated in international studies.

### Recommendation

No need for regulatory action identified, but staff plans additional interaction before finalizing assessment

## Group 3 – Evaluation of Other Natural Hazards

ACRS and Consolidated Appropriations Act for 2012:  
The [NRC] shall require reactor licensees to reevaluate the seismic, tsunami, flooding, and other external hazards at their sites . . .

Tier 2 → Lack of critical skill set for both NRC and industry

### Evaluation

- External natural hazards addressed by mitigation strategies.
- Enhanced efficiency through screening process.
- Process focuses on hazards of primary concern.

### Recommendation

Further assessment/  
interaction needed

. . . Including previous assessments, protection under current regulations, and stakeholder input

# Proposed Process for Other External Hazard Assessment

1. Define the population of natural hazards other than seismic and flooding to determine those hazards that should be reviewed generically (complete).
2. Determine and apply screening criteria to exclude certain natural hazards from further generic evaluations or exclude some licensees from considering certain hazards.
3. Perform a technical evaluation to assess the need for additional actions if the hazard or licensee was not screened out generically in Task 2.
4. Determine if additional actions are needed on a site- or hazard-specific basis.



# Group 3 – Periodic Reconfirmation of Natural Hazards

2.2: . . . rulemaking to require licensees to reevaluate the seismic hazards and flooding hazards every 10 years and address any new and significant information. If necessary, update the design basis. . .

Tier 3 → To be based on insights from Tier 1 reevaluations (also Tier 2 other external hazards)

## Evaluation

- Existing processes ensure safety maintained.
- Rulemaking not necessary.
- Internal processes could be enhanced to make them more proactive and systematic.

## Recommendation

Further assessment/  
interaction needed

. . . To obtain input from stakeholders and complete process enhancements

# Group 3 – Radiation Monitoring During an Accident

Rec. 11.3: Efficacy of real-time radiation monitoring in EPZ and onsite

Tier 3 → Required further staff study

## Evaluation

- Consider history with real-time radiation monitoring.
- Benefit from interaction with Federal, State, local stakeholders.

## Recommendation

Further assessment/  
interaction needed

. . . To gather stakeholder input,  
evaluate, and document  
assessment results



# Summary of Longer-Term Activities

- SECY paper discusses that work will continue in a number of areas. Examples include:
  - Long-term Fukushima health studies
  - Implementation of Tier 1 recommendations
  - ROP enhancements and oversight of Tier 1 recommendations
  - Research activities
  - Staff training enhancements
  - Collaboration with international stakeholders
- New insights from these activities will be addressed using existing processes



# Stakeholder Interactions

- Engagement on specific recommendations
- Focused public meetings on resolution plans
  - October 6: ACRS subcommittee meeting
  - October 20: Public meeting with industry's Fukushima steering committee
- Future meetings on resolution plans
  - November 17: Commission meeting
  - Group 2 and 3 public meetings
  - Group 2 and 3 ACRS meetings



# Changes Since ACRS Subcommittee Meeting

- Input from ACRS subcommittee meeting, JLD Steering Committee, and public meeting
- Substantive revisions include:
  - Various changes to improve clarity based on ACRS and JLD Steering Committee feedback
  - Additional detail provided for some recommendations
  - Two recommendations associated with ERDS moved from Group 3 to Group 1
  - Clarified resource implications and plans for budgeting future work
- Paper is currently under Commission review



# Proposed Resolution Groups for Tier 2 and 3 Recommendations

-	Expedited transfer of spent fuel to dry cask storage
3	Enhanced capability to prevent/mitigate seismically-induced fires & floods
-	Revisit emergency planning zone size & pre-stage potassium iodide beyond 10 miles
9.3	ERDS capability throughout accident (partial)
10	Additional EP topics for prolonged SBO and multiunit events (partial)
11	EP topics for decision-making, radiation monitoring, and public education (partial)
12.1	Reactor Oversight Process modifications to reflect DID framework
12.2	Staff training on severe accidents and resident inspector training on SAMGs
7.2 – 7.5	Spent fuel pool makeup capability
9.1/9.2	EP enhancements for prolonged SBO and multiunit events
9.3	Emergency preparedness (partial)
9.4	Improve ERDS capability
10	Additional EP topics for prolonged SBO and multiunit events (partial)
11	EP topics for decision-making, radiation monitoring, and public education (partial)
5.2	Reliable hardened vents for other containment designs
6	Hydrogen control and mitigation inside containment or in other buildings
-	Reactor and containment instrumentation
-	Reevaluation of “other” external hazards
2.2	Periodic confirmation of seismic and flooding hazards
11	EP topics for decision-making, radiation monitoring, and public education (partial)

Completed

Subsumed in Tier 1

Ready to Close

Further Interaction

Further Assessment

# Questions and Discussion



# Backup Slides



# Seismically-Induced Fires and Floods (Group 1)

## Background:

- NTTF Recommendation 3.
- Evaluate potential enhancements to prevent or mitigate seismically-induced fires and floods.
- Activity has a Tier 1 and a Tier 3 component.
  - Tier 1: Initiate development of a PRA methodology
  - Tier 3: Determine if regulatory action is needed

## Current Status:

- Staff has been involved with PRA standards development organizations.
- The draft feasibility study for the PRA methodology is currently under review.



# Seismically-Induced Fires and Floods (Group 1)

## PRA Methodology Activities

- Initial project plan, July 2012 (ML12208A210 and ML121450222)
- Detailed SIFF Project Plan (in collaboration with BNL), August 2013
- Public Workshop on SIFF, December 2013 (ML14022A249)
- Draft SIFF PRA Feasibility Report, July 2015 (ML15195A428)
- Final SIFF PRA Feasibility Report – December 2015





# Seismically-Induced Fires and Floods (Group 1)

- The feasibility study concluded that a phased- or graded- approach for estimating SIFF risk was preferable
  - Goal of PRA approach is to systematically identify SIFF accident sequences under which equipment would be required to function rather than quantifying SIFF risk
  - Use screening methods to eliminate low SIFF risk contributors
    - Perform plant walkdowns
    - Screen based on plant equipment characteristics and configuration
    - For ignition sources there was limited agreement among experts that some generic screening based on SSCs was possible. For internal flooding sources SSC based screening was not considered practical – rather use quantity of source fluid and availability of motive power
  - Perform more detailed analyses for more risk significant contributors.
    - May be able to build straightforwardly on existing seismic, fire, or flood PRAs to analyze selected scenarios



# Seismically-Induced Fires and Floods (Group 1)

- The current “state-of-the-art” for SIFF is incomplete in several areas:
  - Probabilistically modeling and quantifying the risk to for multiple concurrent hazards
  - Lack of fragility data for seismically induced fires and floods
  - Adequate HRA accounting for concurrent events, different performance shaping factors, lack of access, etc.
  - Understanding the mechanisms of failure: e.g., when does a component catch fire, what is flow rate from a damaged tank
- Since the start of this effort, other organizations have been developing approaches to estimate SIFF risk (e.g., EPRI):
  - Based on currently available information these approaches are aligned with the findings of the feasibility study



# Seismically-Induced Fires and Floods (Group 1)

- SIFF project activities lead to the conclusion that currently the technical challenges involved prevent PRA modeling and quantifying of SIFF scenarios with a level of confidence that is comparable to the “state-of-the-art” of current PRAs.
- Most of the PRA community seems to support a phased- or graded-approach for estimating the risk from SIFF and applying it to a pilot application.



# Seismically-Induced Fires and Floods (Group 1)

- To finalize a graded PRA methodology, the following need to be addressed:
  - Plant-specific seismic, fire, and flooding models
  - Development of component seismic fragility data for fire and flooding
  - Pilot application to test and refine the method.
- Based on the feasibility study and related activities, it is concluded that finalization of the PRA methodology will require considerable time and resources.
  - Existing and post-Fukushima mitigation capabilities can adequately address SIFFs
  - Limited risk evaluations did not yet identify significant safety issues.



# Seismically-Induced Fires and Floods (Group 1)

Final Assessment (Oct 2015) will discuss:

- Existing requirements for fire and flood protection.
- Post-Fukushima seismic walkdowns identified and corrected vulnerabilities.
- Safety enhancements associated with Tier 1 activities (e.g., EA-12-049) mitigate risks.
- Domestic and international operating experience.
- Integration of fire and flood response procedures would not represent a substantial safety enhancement.

Conclusion: Additional safety enhancements not necessary. Recommendation should be closed now. PRA feasibility study to be completed later this year.



# Evaluation of Other Natural Hazards (Group 3)

## Background:

- ACRS recommendation and included in Consolidated Appropriations Act for 2012.
- Initial plan followed same general process used for the Tier 1 hazard reevaluations (i.e., 50.54(f) letter).
- Prioritized as a Tier 2 activity because of the lack of critical skill sets for both NRC and nuclear industry.

## Current Status:

- Staff is assessing how other external hazards will be addressed by mitigation strategies.
- This review is limited to only natural external hazards (consistent with Act and Steering Committee direction).



# Proposed Steps for Other External Hazard Assessment (Group 3)

1. Define the population of natural hazards other than seismic and flooding to determine those hazards that should be reviewed generically (complete).
2. Determine and apply screening criteria to exclude certain natural hazards from further generic evaluations or exclude some licensees from considering certain hazards.
3. Perform a technical evaluation to assess the need for additional actions if the hazard or licensee was not screened out generically in Task 2.
4. Determine if additional actions are needed on a site- or hazard-specific basis.



# Evaluation of Other Natural Hazards (Group 3)

## Initial Assessment (Oct 2015) will include:

- Assessment of additional safety benefits from mitigation strategies relevant to other hazards.
- Discussion of available technical/environmental data (risk/frequency).
- Discussion of the expected hazards of primary concern.
- Discussion of plans to develop screening and assessment process for other hazards.

## Final Assessment (Late 2016) will add:

- Previous supporting assessments (e.g., Generic Issues Program reviews, RIS on tornado missiles).
- Summary of protection under current requirements.
- Discussion of additional regulatory actions (if needed).
- Input from ACRS/external stakeholders.





# Periodic Reconfirmation of Natural Hazards (Group 3)

## Background:

- NTTF Recommendation 2.2.
- Initially proposed rulemaking to require licensees to confirm seismic and flooding hazards every 10 years.
- Prioritized as Tier 3 to be developed using insights gained from Tier 1 hazards reevaluations.
- Should also consider other natural hazards.

## Current Status:

- Deferred pending completion of Tier 1 hazard reevaluations and Tier 2 evaluation of other hazards.



# Periodic Reconfirmation of Natural Hazards (Group 3)

Initial assessment (Oct 2015) will include:

- Insights from Tier 1 and 2 hazard reevaluations to assess current processes.
- Discussion on existing processes and how new information is currently considered.
- Paper discusses that rulemaking is not viable.
- Staff plans to enhance internal programs to more proactively and systematically assess new hazard information.
- Program would leverage existing process.

Final Assessment (Late 2016) will add:

- Input from ACRS/external stakeholders.
- Complete actions to develop program.



# Vents for Other Containment Designs (Group 2)

## Background:

- NTTF Recommendation 5.2.
- Prioritized as Tier 3 because issue needed further evaluation and insights from Tier 1 activities (Recommendations 4 and 5.1) to support a decision on possible regulatory action.
- Largely deferred pending work on EA-13-109 (Severe Accident Capable Vents for Mark I and Mark II Containments) and Containment Protection and Release Reduction (CPRR) rulemaking.



# Vents for Other Containment Designs (Group 2)

## Current Status:

- EA-13-109 implementation in progress.
  - Guidance issued
  - Phase 2 OIPs due by end of 2015
- Commission disapproved proceeding with CPRR rulemaking for Mark I and Mark II containments.
- Many related activities completed or ongoing.
  - Insights available from implementation of mitigating strategies
  - Insights available from Commission decisions on related matters (e.g., MBD BE and CPRR rulemakings)



# Vents for Other Containment Designs (Group 2)

## Initial Assessment (Oct 2015) includes:

- Significant information available from previous activities and analyses (e.g. CPIP, NUREG-1150, SOARCA).
- Available technical information, including analyses for EA-13-109 and CPRR draft regulatory basis.
- Discussion of related previous Commission decisions.
- Evaluations for each containment type.
- Initial conclusion: Further study is unlikely to demonstrate the need for regulatory action

## Final Assessment (March 2016) will add:

- More detailed documentation of technical justification.
- Insights from ACRS/external stakeholders.



# Hydrogen Control and Mitigation (Group 2)

## Background:

- NTTF Recommendation 6.
- Prioritized as Tier 3 because of need for further evaluation and insights from Tier 1 activities to support a decision on possible regulatory action.
- Largely deferred pending work on EA-13-109, CPRR rulemaking, and international activities (including information on Fukushima accident sequences).



# Hydrogen Control and Mitigation (Group 2)

## Current Status:

- EA-13-109 planning/implementation in progress.
- Staff has participated in international activities related to hydrogen control practices.
- Many related activities completed or ongoing.
  - Insights available from Commission decisions on related matters (e.g., MBDBE and CPRR rulemakings)



# Hydrogen Control and Mitigation (Group 2)

## Initial Assessment (Oct 2015) will include:

- Significant information available from previous activities and analyses.
- Impact of existing regulations & mitigating strategies.
- Insights from CPRR analyses, SOARCA, international initiatives, and previous Commission decisions.
- Evaluations for each containment type.
- Assessment of potential migration of hydrogen to reactor buildings or other structures.
- Initial conclusion: Further study is unlikely to demonstrate the need for regulatory action.

## Final Assessment (March 2016) will add:

- More detailed documentation of technical justification.
- Insights from ACRS/external stakeholders.





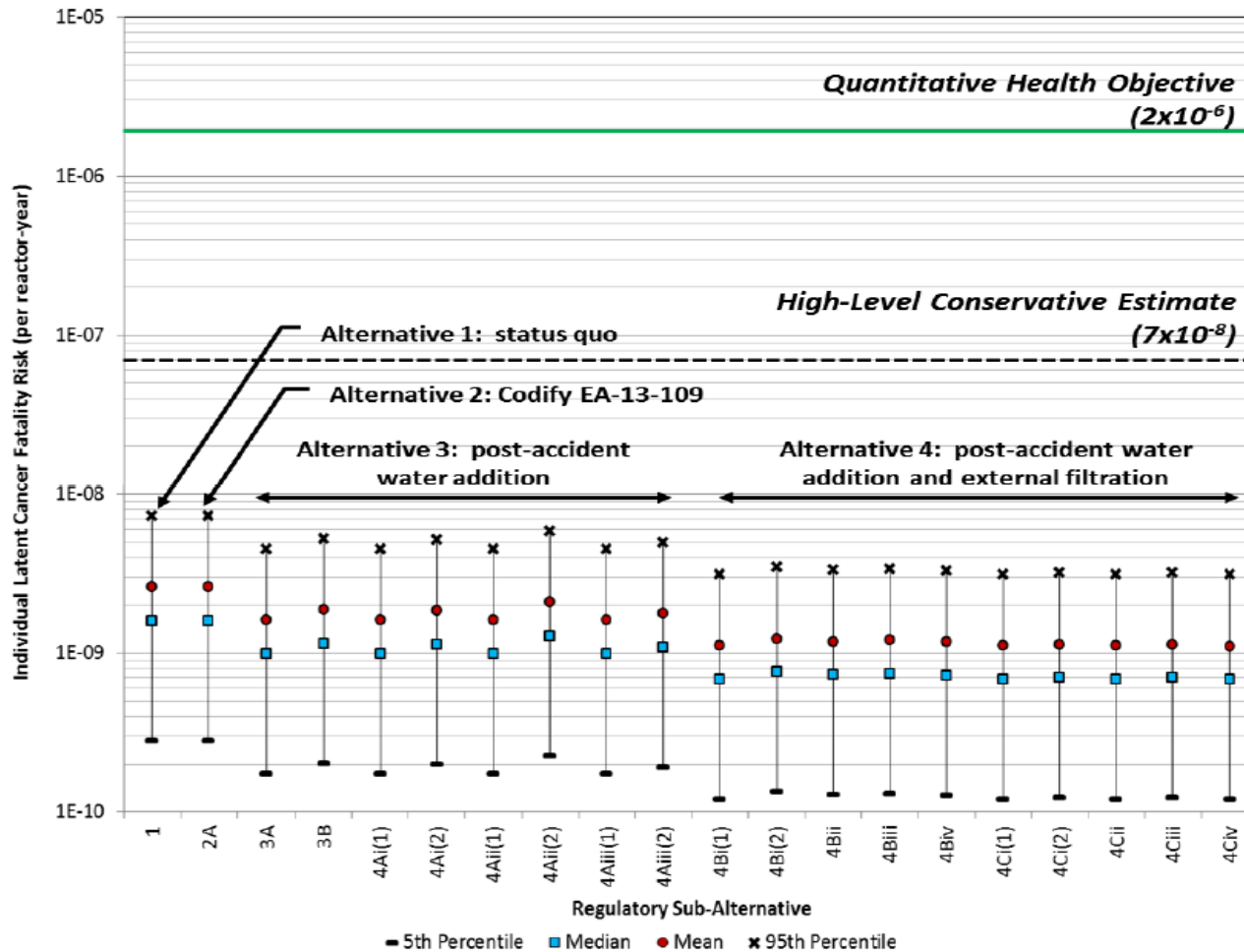
# Evaluation of Other Containments and Hydrogen Control

Table 1 Recommendation 5.2 and 6 – Other Containment Designs and Hydrogen Control; Requirements and Practices							
	Core Cooling Functions	Venting and/or Heat Removal for Containment Pressure Control		Other Containment Failure Modes and/or Core Debris Cooling	Release Reduction (Filtering)	Hydrogen Control	
		Pre-Core Damage	Severe Accident			Containment	Other
Mark I	EA-12-049 EA-13-109	EA-13-109 EA-12-049 EOPs FSGs	EA-13-109 SAMGs	EA-13-109 (CPRR)	N/A (CPRR)	EA-13-109 SAMGs	EA-13-109 SAMGs
Mark II	EA-12-049 EA-13-109	EA-13-109 EA-12-049 EOPs FSGs	EA-13-109 SAMGs	EA-13-109 (CPRR)	N/A (CPRR)	EA-13-109 SAMGs	EA-13-109 SAMGs
Mark III	EA-12-049	EA-12-049 EOPs FSGs	SAMGs	SAMGs	N/A (current assessment)	GSI-189 EA-12-049 SAMGs FSGs	GSI-189 EA-12-049 SAMGs FSGs
Ice Condenser	n/a	EOPs	SAMGs	SAMGs	N/A (current assessment)	GSI-189 EA-12-049 SAMGs FSGs	GSI-189 EA-12-049 SAMGs FSGs
Large Dry	n/a	EOPs	SAMGs	SAMGs	N/A (current assessment)	SAMGs	N/A (current assessment)
EA-12-049: Mitigation Strategies Order EOPs: Emergency Operating Procedures SAMGs: Severe accident management guidelines EA-13-109: BWR Mark I/II Severe accident capable vent order FSGs: FLEX (Mitigating Strategies) Support Guidelines GSI-189: Generic Safety Issue re: Hydrogen Issues							



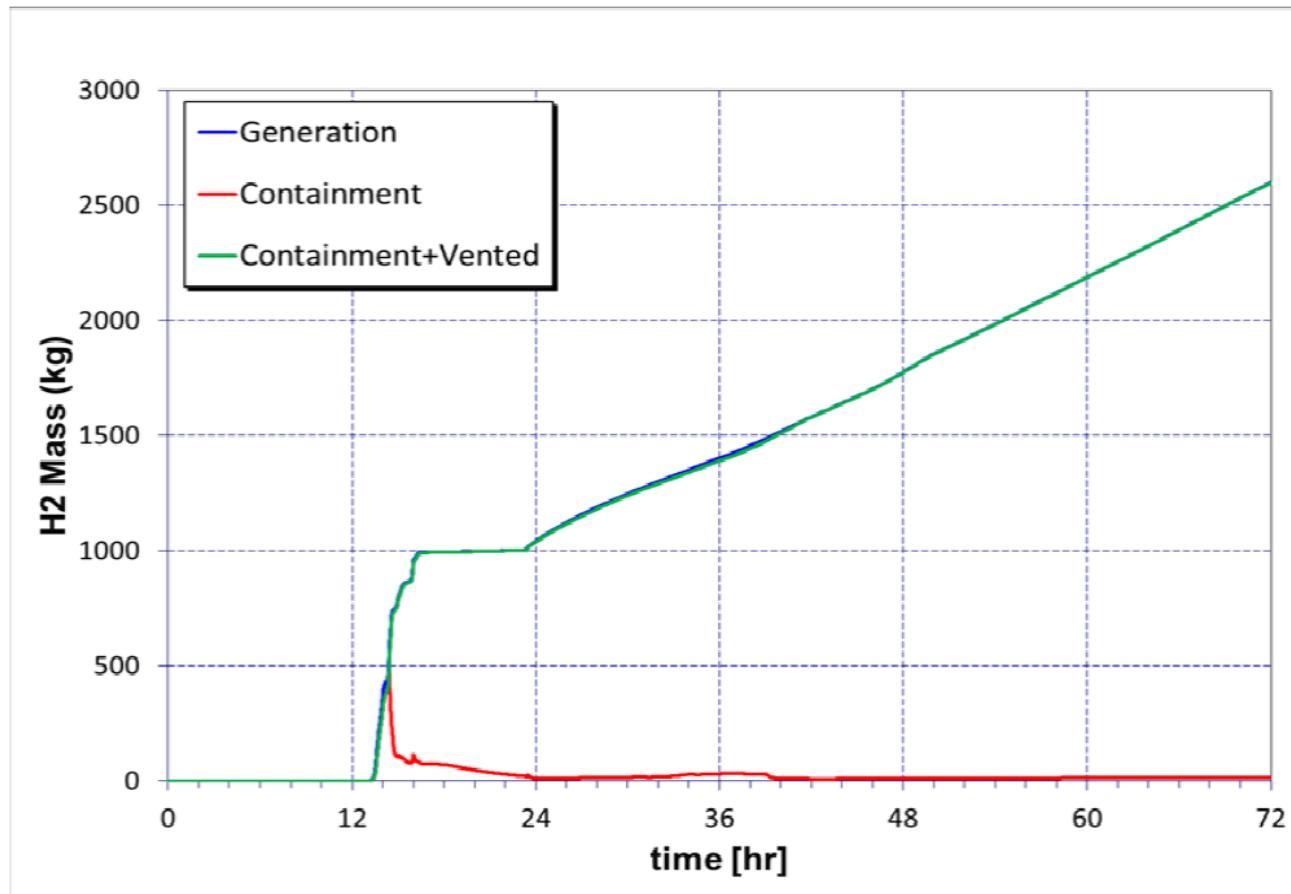
# Mark I/II Containments (Order EA-13-109 & CPRR Rulemaking)

Figure 3-3: Uncertainty Bounds for Individual Latent Cancer Fatality Risk



# Hydrogen Control for Mark I/II Containments

Figure 4-19: Mark I Hydrogen Generation and Transport for Case 9 (SAWA)



# Containment Designs

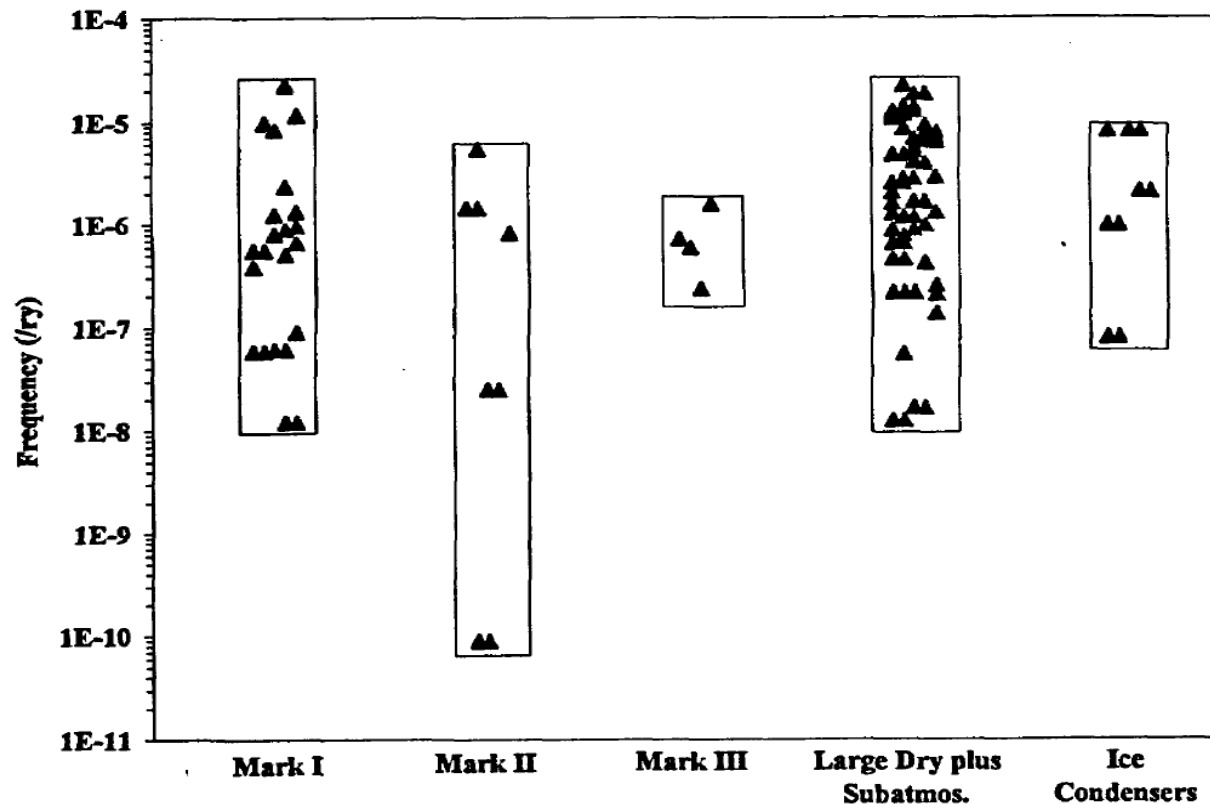
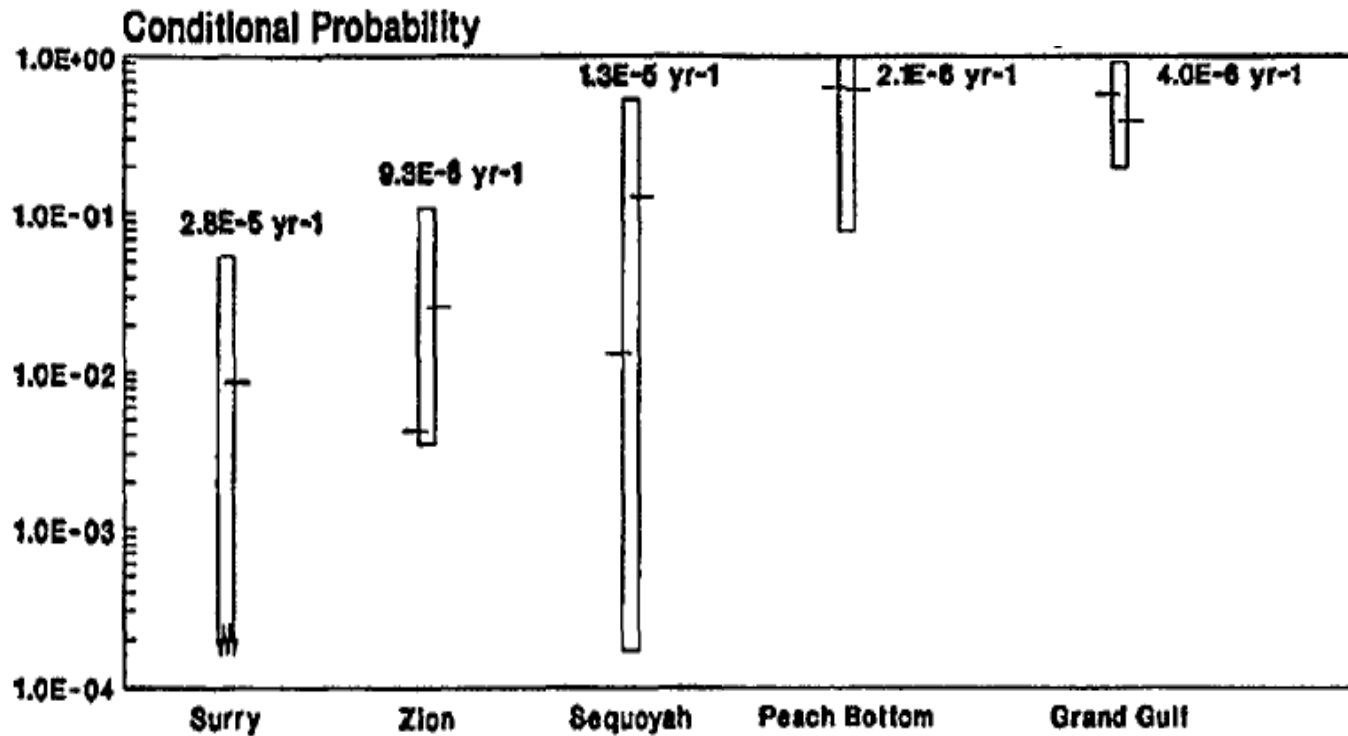


Figure E.3 Frequencies of significant early release (by containment type) as reported in the IPEs.

NUREG-1560, "Individual Plant Examination Program: Perspectives on Reactor Safety and Plant Performance"



# Containment Designs



a. Station blackout

NUREG-1150 Conditional Containment Failure Probability  
for Station Blackout



# Mark III – Vents/Performance

- Core Cooling Functions
  - RCIC Dependence on Suppression Pool Addressed Within Mitigating Strategies
  - Restoration of Suppression Pool Cooling vs. Venting
- Containment Pressure Control
  - Pre-Core Damage: Mitigating Strategies
  - Post-Core Damage: SAMGs
- Other Containment Failure Modes/Debris Cooling
  - NUREG/CR-5529, An Assessment of BWR Mark III
  - NUREG-0933, NUREG-1150
- Release Reduction (e.g., engineered filters)



# PWR Ice Condenser – Vents/Performance

- Core Cooling Functions
  - No Direct Dependence (for ELAP)
- Containment Pressure Control
  - Pre-Core Damage: Mitigating Strategies
  - Post-Core Damage: SAMGs
- Other Containment Failure Modes/Debris Cooling
  - NUREG/CR-6427, An Assessment of DCH Issues
  - CPIP, NUREG-1150
- Release Reduction (e.g., engineered filters)



# Mark III / Ice Condenser Hydrogen

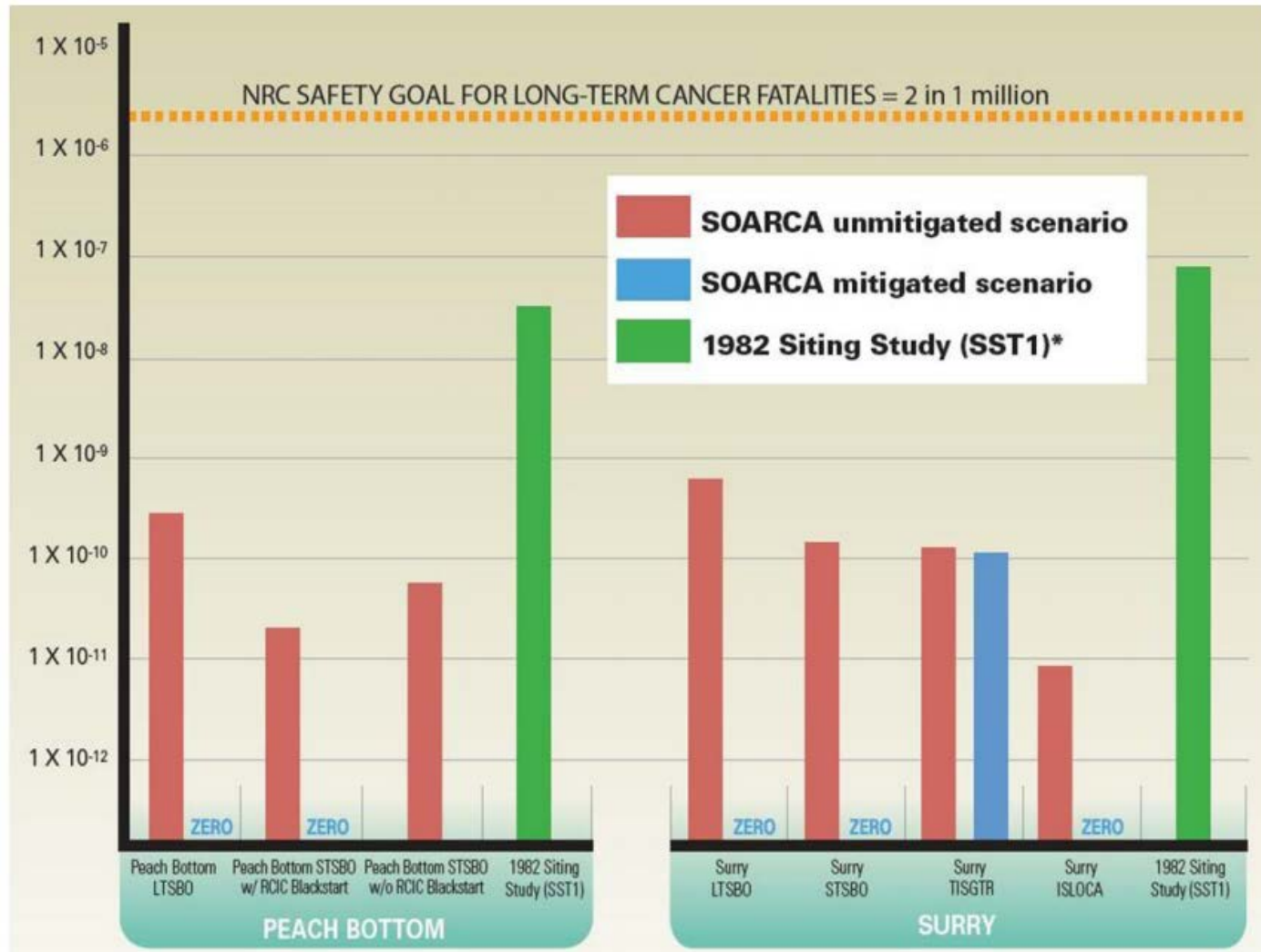
- NUREG-1150
- NUREG/CR-6427, “An Assessment of DCH Issues for Plants with Ice Condenser Containments”
- GSI-189, Ice Condenser/Mark III Hydrogen
- Regulatory Commitments for Backup Power
- Order EA-12-049
  - NEI 12-06 Guidance





# PWR Large Dry

Scenario-Specific Risk of LCF for an Individual within  
10 miles assuming LNT (per reactor-year)



# Project Plans

- Staff does not expect that regulatory actions beyond those taken are needed to close Recommendations 5.2 and 6
- Plans are to:
  - Interact with ACRS and external stakeholders
  - Develop final assessment
  - Provide paper to Commission by March 2016
- Absent new information from stakeholders, the staff expects these additional activities will support and provide further justification for the initial conclusion.



# ROP Modifications to Reflect Defense-in-Depth Framework (Group 1)

## Background:

- NTTF Recommendation 12.1.
- Expand ROP self-assessment and biennial ROP realignment to include defense-in-depth considerations.
- Tier 3 because it was dependent upon Recommendation 1.

## Current Status:

- NTTF Recommendation 1 has been closed.
- Baseline Inspection Procedure Enhancement project has been identifying enhancements from Fukushima inspections.
- TI 2515/191 pilot has been completed; other inspections will occur in 2016 and 2017.



# ROP Modifications to Reflect Defense-in-Depth Framework (Group 1)

Final assessment (Oct 2015) will discuss:

- Progress made to date on ROP enhancements (e.g. IP 71111.01, feedback from walkdowns).
- ROP self-assessment and realignment being enhanced following normal agency processes.
- Staff plans to use ROP Feedback Process to collect insights from Fukushima inspections.
- NRR/JLD, NRR/DIRS, and regions will work together to assess insights and enhance the ROP.
- Follow normal agency processes for future ROP enhancements (e.g., SAMG oversight).

Conclusion: Recommendation should be closed.



# Reactor and Containment Instrumentation for Beyond-Design-Basis Conditions (Group 2)

## Background:

- Based on an ACRS recommendation to assess need to enhance reactor and containment instrumentation to survive beyond design basis events.
- Prioritized as Tier 3 because it required further staff study and depended on other Fukushima activities.
- ACRS Fukushima Subcommittee previously briefed on the topic on 9/16/14.

## Current Status:

- Staff has interacted with domestic and international organizations on this subject.
- Staff analyzed related Tier 1 activities.
- Ongoing work to develop consensus standard for severe accident instrumentation.



# Reactor and Containment Instrumentation for Beyond-Design-Basis Conditions (Group 2)

## Process Used for Review:

- Key project activities from SECY-12-0095 broken into three tasks:
  1. Ensure licensees and NRC staff are appropriately considering instrumentation needs when implementing Tier 1 activities.
  2. Obtain and review information from previous and ongoing research efforts and coordinate with international and national stakeholders including industry standards organizations.
  3. Based on results of Task 1 and 2 determine if additional actions are needed.



# Reactor and Containment Instrumentation for Beyond-Design-Basis Conditions (Group 2)

## Process Used for Review:

- Task 1 results
  - Staff engaged in Tier 1 activities including:
    - Guidance development for Mitigating Strategies, Spent Fuel Pool Instrumentation, and Containment Vent Orders.
    - Supported MBDBE rulemaking.
- Task 2 results
  - Staff engaged with several national and international organizations including:
    - International Atomic Energy Agency
    - Institute of Electrical and Electronics Engineers
    - U.S. Department of Energy
    - Electric Power Research Institute



# Reactor and Containment Instrumentation for Beyond-Design-Basis Conditions (Group 2)

## Task 3 results – Operating Reactors:

- MBDBE staff requirements memorandum for SECY-15-0065 proposed rule:
  - Commission disapproved SAMGs as a requirement.
  - Not necessary for adequate protections of public health and safety.
  - Quantitative benefits not sufficient to show substantial safety benefit.
- MBDBE Order
  - Provisions to ensure key instrumentation is powered to demonstrate success of the strategies and to indicate imminent or actual core damage.





# Reactor and Containment Instrumentation for Beyond-Design-Basis Conditions (Group 2)

## Task 3 results – Operating Reactors (continued):

- Spent Fuel Pool and Containment Vent Orders
  - Includes expectations that instrumentation will work in the temperature, radiation, and humidity levels expected during the time such instrumentation is needed



# Reactor and Containment Instrumentation for Beyond-Design-Basis Conditions (Group 2)

## Task 3 results – Operating Reactors (continued):

- Review of national and international organizations work
  - IAEA Report NP-T-3.16 “Accident Monitoring Systems for Nuclear Power Plants”
    - Contains annex providing guidance for list of instrumentations and expectations that such instrumentation will work in severe accident environment
  - IEEE Standard 497, “IEEE Standard Criteria for Accident Monitoring Instrumentation for Nuclear Power Generating Stations”



# Reactor and Containment Instrumentation for Beyond-Design-Basis Conditions (Group 2)

## Task 3 results – Operating Reactors (continued):

- Staff plans to update RG 1.97, “Criteria for Accident Monitoring Instrumentation for Nuclear Power Plants
- Update based on IEEE Std. 497 update
  - Operating plants may use RG 1.97 update on a voluntary basis



# Reactor and Containment Instrumentation for Beyond-Design-Basis Conditions (Group 2)

## Task 3 results – New Reactors:

- Reviews of severe accident instrumentation including equipment survivability to continue based on Commission Policy
  - Based on Commission Policy Decisions in 1990s.
  - Mitigation features must be designed to provide reasonable assurance that they will operate in severe accident environments for the time span needed.
- Mitigating Strategies requirements to ensure key instrumentation remains powered during an extended loss of alternating current power



# Reactor and Containment Instrumentation for Beyond-Design-Basis Conditions (Group 2)

## Initial Assessment (Oct 2015) will include:

- Existing requirements for protection of instrumentation.
- Insights gained from MBDBE rulemaking.
- Insights from Spent Fuel Pool and Containment Vent Orders
- A discussion on continued work on endorsement of industry standards (to be used voluntarily).
- Interactions with national and international organizations.
- A discussion on continued reviews on new reactor equipment survivability in accordance with policy.
- Initial conclusion: Limited additional safety benefit; no further regulatory action needed.

## • Final Assessment (Mar 2016) will add:

- Input from ACRS/external stakeholders.



# Staff Training on Severe Accidents and SAMGs (Group 1)

## Background:

- NTTF Recommendation 12.2.
- Enhance internal training to include lessons learned.
- Provide training on SAMGs for resident inspectors.
- Prioritized as Tier 3 because it was dependent on the resolution of Recommendation 8 (subsumed into the MBDBE rulemaking).

## Current Status:

- Severe accident training enhanced to include the lessons learned and accident information.
- SAMG training is being developed.
- Qualification program updates being evaluated.



# Staff Training on Severe Accidents and SAMGs (Group 1)

Final Assessment (Oct 2015) will discuss:

- Establishment of periodic training seminars on severe accidents.
- Progress on developing SAMG training following normal agency processes.
- Work to update qualification programs.
- Upcoming internal communication to describe new training tools.

Conclusion: Recommendation should be closed.



# Basis of EPZ Size and Pre-Staging KI Beyond 10 Miles (Group 1)

## Background:

- Additional staff recommendation in SECY-11-0137.
- Staff planned to use the Level 3 PRA and the UNSCEAR assessment to reevaluate the EPZ basis.
- For KI, the staff planned to review information from Japan to consider policy changes.
- Prioritized as Tier 3 due to long-term studies.

## Current Status:

- Some international reports are available and staff continues to follow Fukushima health studies.
- Information available to date supports existing regulations and policies on EPZ and KI.





# Basis of EPZ Size and Pre-Staging KI Beyond 10 Miles (Group 1)

Final assessment (Oct 2015) will include:

- 2014 denial of rulemaking petition to amend EPZ size (PRM-50-104).
- Available information in support of current policies and practices.
- Assessment that EPZ size and practices related to KI are adequate.
- Evaluation of new information using existing processes.

Conclusion: No changes necessary to current EPZ size or KI distribution practices. Recommendation should be closed now.



# Various Emergency Preparedness Activities

## Background:

- NTTF Recommendations 9, 10, and 11.
- Aspects include ERDS enhancements, public outreach/training, offsite radiation monitoring.
- Initial approach to collectively address these items using an advance notice of proposed rulemaking.
- Prioritized as Tier 3 due to unavailability of critical skills or required longer-term staff evaluation.

## Current status:

- The staff has completed an evaluation of each recommendation and developed a resolution plan.
- Activities distributed between Groups 1 and 3.



# Various Emergency Preparedness Activities (Group 1)

Final assessment (Oct 2015) will propose closure of items subsumed in the MBDBE rulemaking:

- Rec. 9.1, Initiate Rulemaking to Require EP Enhancements for Multiunit Events
- Rec. 9.2, Initiate Rulemaking to Require EP Enhancements for Prolonged Station Blackout
- Rec. 9.3 (Partial), Order licensees to perform various EP enhancements until rulemaking is complete
- Rec. 10.1, Analysis of Protective Equipment Requirements
- Rec. 10.2, Command and Control Structures
- Rec. 11.1, Enhanced Resources to Get Equipment Onsite



# Various Emergency Preparedness Activities (Group 1)

Final assessment (Oct 2015) will recommend closure of the following additional EP recommendations:

- Rec. 9.3 (Partial), ERDS Enhancements
- Rec. 10.3c, Continuous ERDS Transmission
- Rec. 11.2, Evaluate Recovery and Reentry Insights from Fukushima
- Rec. 11.4, Training in the Local Community on Radiation, Radiation Safety, and the Use of KI

Conclusion: Recommendations should be closed now based previous assessments and progress made to date, including work with other Federal agencies.



# Various Emergency Preparedness Activities (Group 3)

Initial assessment (Oct 2015) will discuss status of:

- Rec. 10.3a, Alternative Method for Transmitting ERDS
- Rec. 10.3b, ERDS Data Set
- Rec. 11.3, Efficacy of Real-Time Radiation Monitoring in EPZ and Onsite

Final Assessment (Late 2016) will provide:

- Details on additional efforts to determine basis for closure or recommended actions.
- A synopsis of work done in these areas.
- Understanding of ongoing efforts and existing processes.
- Input from ACRS/external stakeholders.



# Next Steps

- Public Meeting with Industry's Steering Committee – Oct 20, 2015
- Commission Paper – Oct 30, 2015
- ACRS Full Committee – Nov 5, 2015
- Commission Meeting – Nov 17, 2015
- Focused Public/ACRS Meetings – As needed
- Progress/closeout to be provided in periodic update SECY papers



# Summary

- October SECY paper will discuss specific deliverables, resource needs, and deadlines.
- Revised resolution approach will result in the Tier 2 and 3 assessments being completed earlier than originally planned.
- Additional engagement with stakeholders planned on Group 2 and 3 recommendations.
- Related activities will continue as part of existing agency processes.





**U.S. NRC**

UNITED STATES NUCLEAR REGULATORY COMMISSION

*Protecting People and the Environment*

# **Post-Fukushima Severe Accident Research**

**Presented to the  
ACRS Fukushima Subcommittee**

Richard Lee  
Office of Nuclear Regulatory Research

*October 6, 2015*



## **Severe Accident Research Objectives**

- Support agency risk-informed regulatory initiatives
- Address operating reactor emerging issues
- Provide new reactor licensing support
- Maintain severe accident phenomenological knowledge base and expertise
- Maintain validated analytical tools
- Maintain core knowledge of advanced reactor safety issues
- International collaborations (CSARP/MCAP, CSNI activities, IAEA and EU activities)

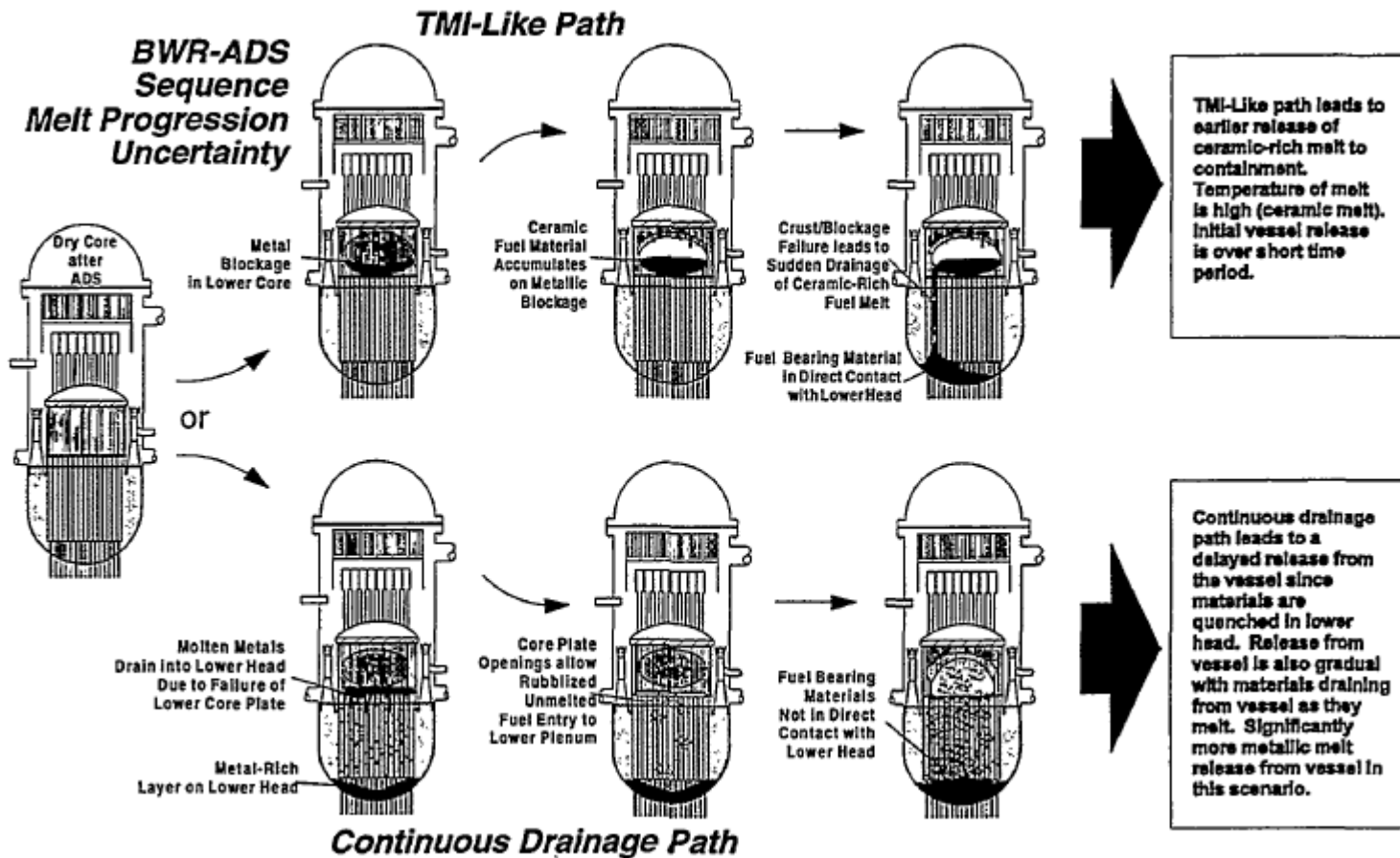
# Post-Fukushima Research Needs

- **Phenomenological Research**
  - No fundamentally new severe accident phenomena identified for LWR technology
  - Some previously identified phenomena require additional attention
    - Melt progression, particularly late phase
    - Hydrogen risk
    - Ex-vessel melt behavior (coolability and FCI)
    - Fission products behavior in containment

## **Melt Progression**

- **Relocation of molten core believed significantly different between BWR and PWR**
  - Molten pool formation in PWR
  - Melt collapse on support plate in BWR
  - Past experimental database more representative of PWR
- **Debris cooling in lower plenum**
  - Melt fragmentation and debris bed formation
  - Effect of salt (or raw) water on coolability

# Is BWR Melt Progression Similar to PWR Melt Progression ?



Final Results of the  
XR2-1 BWR Metallic Melt  
Relocation Experiment

NUREG/CR-6527  
SAND97-1039

## **Hydrogen Behavior**

- **Hydrogen generation sources and migration pattern**
  - Potential for stratification
  - Flammability consideration
- **Hydrogen combustion risk in vent path**
- **Hydrogen behavior in reactor building and spent fuel pool**
- **Assessment of hydrogen control measures**

## **Ex-Vessel Melt Behavior**

- **Melt fragmentation and debris bed formation**
  - Effects of composition, temperature, and pour rate
- **Ex-vessel melt coolability**
  - Oxidic melt vs. mixed melt
  - Long-term core-concrete interaction
- **Energetic melt-water interaction**
  - Potential for stratified explosion

## **Fission Products Behavior**

- **Fission products chemical forms**
  - Effect of salt (or raw) water
  - Aqueous source term
- **Fission products transport and retention**
  - Effect of salt (or raw) water
  - Leaching from submerged fuel
  - Pool scrubbing effectiveness

# Improvement of Analysis Tools

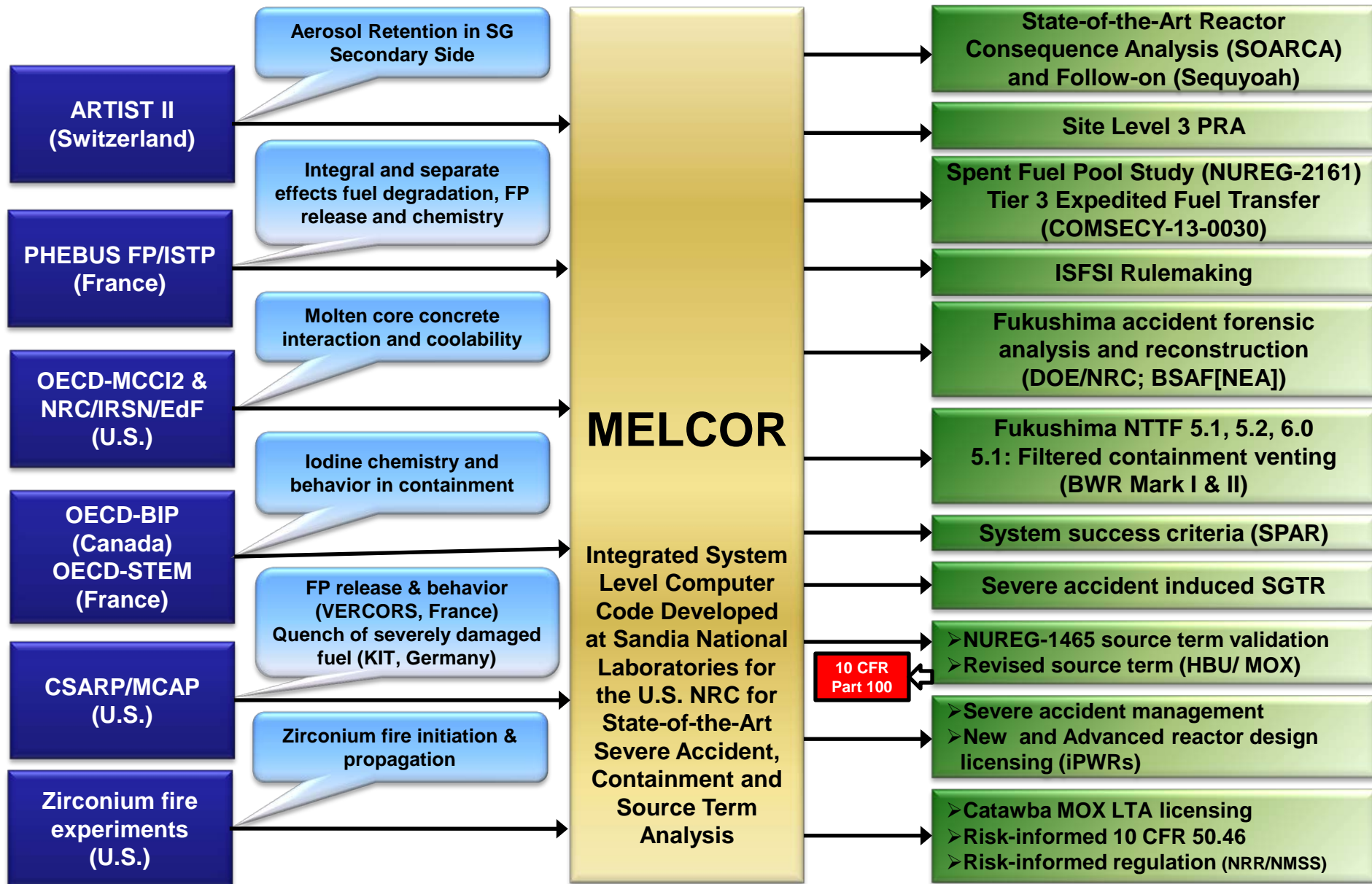
- **Phenomenological modeling**
  - Late phase melt progression, melt quenching and fragmentation, melt spreading and debris coolability
  - Combustible gas transport and stratification
  - Fission product chemistry (aqueous iodine, ruthenium) and transport
  - Pool scrubbing under saturated condition
- **Mitigation system modeling**
  - Engineered safety features
  - Operator actions (EOP, FSG, SAMG)



# Improvement of Code Numerics

- Retain same physics and basic equation set
- Revise code to improve stability and efficiency of explicit coupling and time integration
  - Introduce “temporal” filter on all flux rate terms
  - Improved and consistent treatment of “small value threshold” situations
- Revise code to cast all implicit equations (e.g. CVH-FL) in residual form
  - Enables use of Modern Solver libraries
  - Better separation of Computer Science from the Physics/Models

# Regulatory Applications



## **Treatment of Uncertainties**

- **Knowledge (physics) uncertainties**
  - Role of phenomenological research
- **Modeling/parameter uncertainties**
  - Monte Carlo and LHS analyses
- **Data uncertainties**
  - Instrumentation reliability
- **Operator actions (EOP, SAMG)**
  - “Smart SAMGs,” simulators
  - HRA

# Knowledge Management

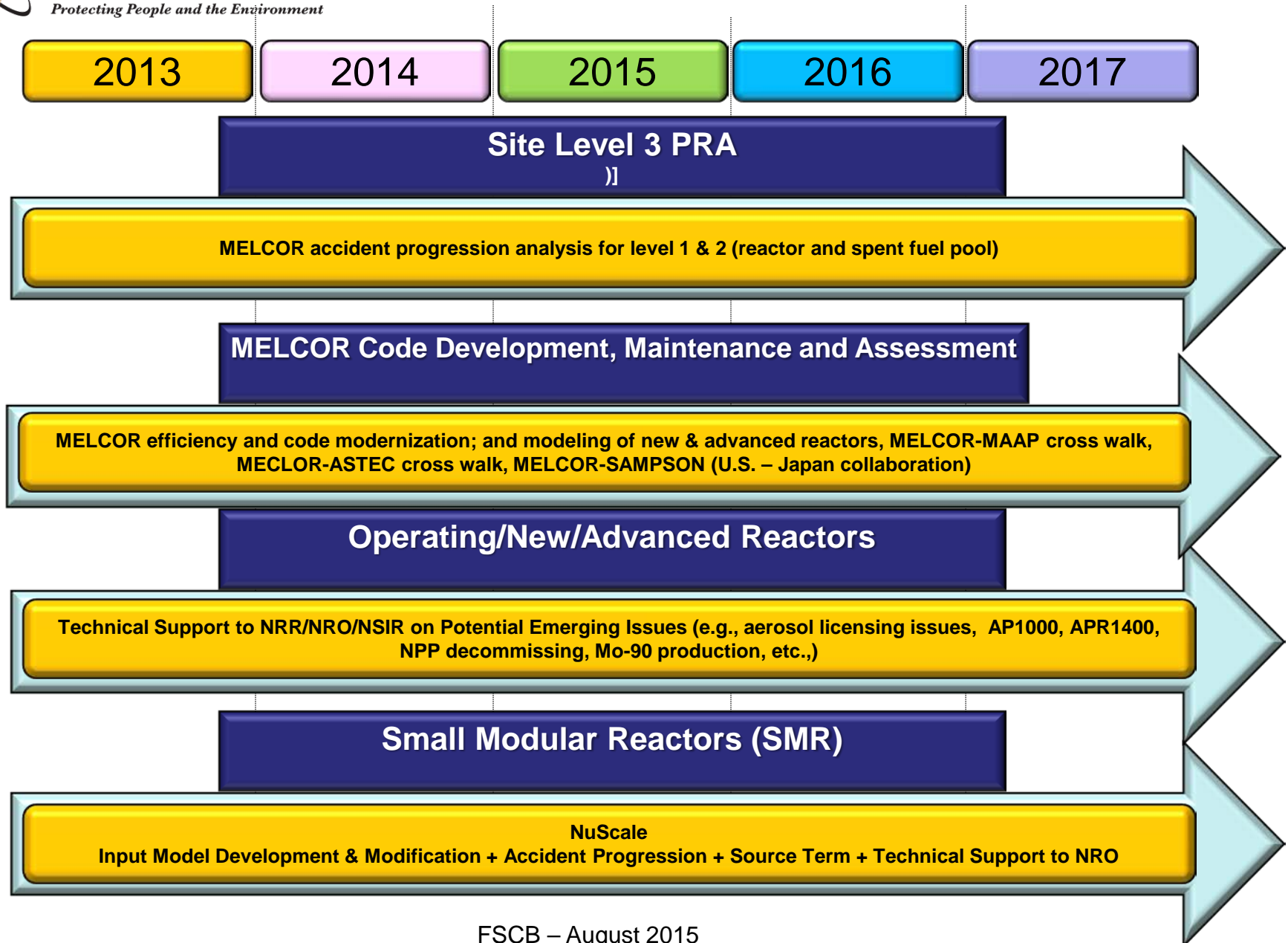
- **Need**

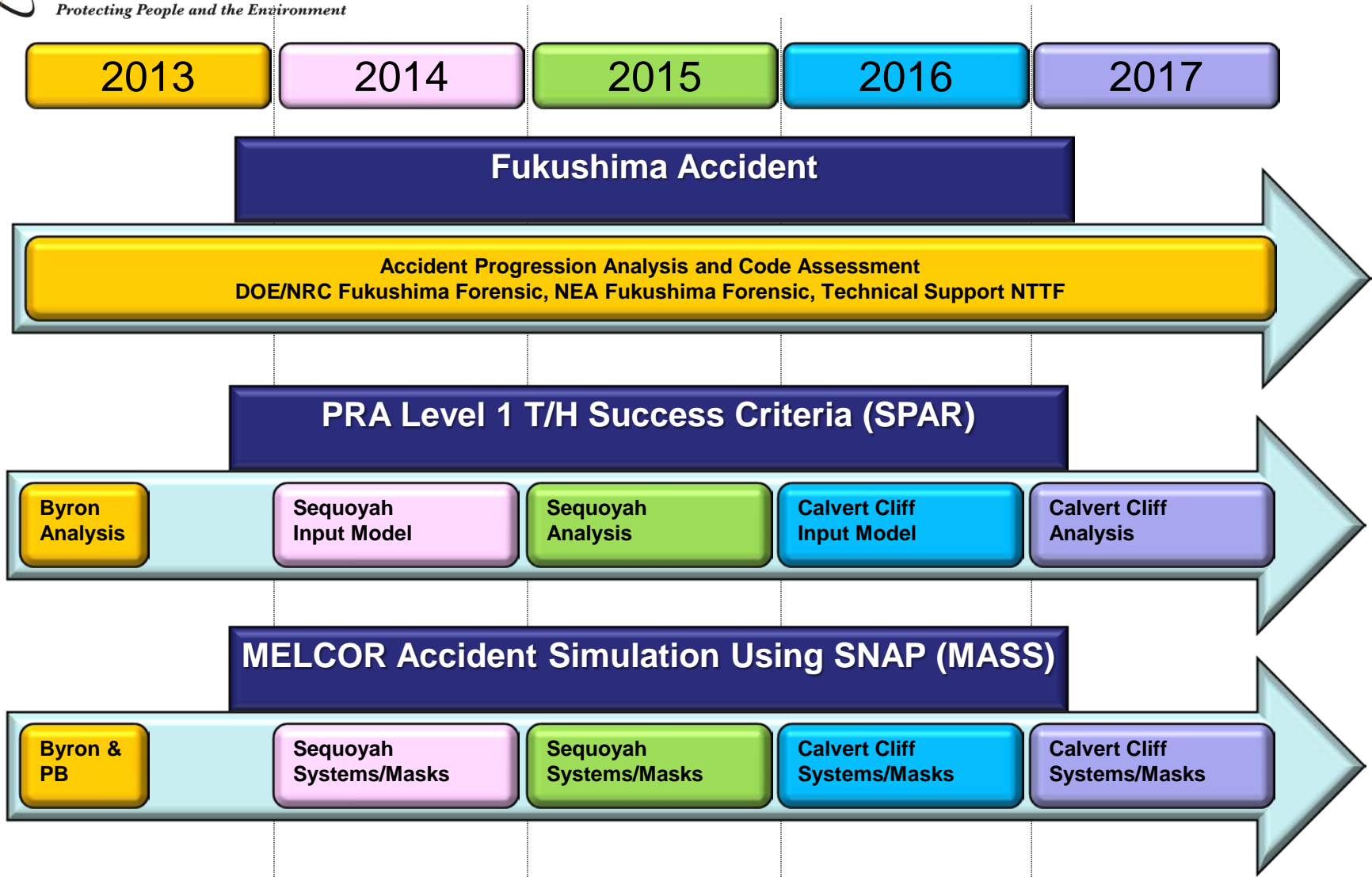
- Post-TMI thrust on accident prevention and SA issue resolution
- Post-Fukushima thinking: balance between prevention and mitigation; R&D needs on mitigation
- Much knowledge gained on severe accidents but workforce is ageing
- Budget reality an incentive to R&D optimization and knowledge preservation

- **An approach**

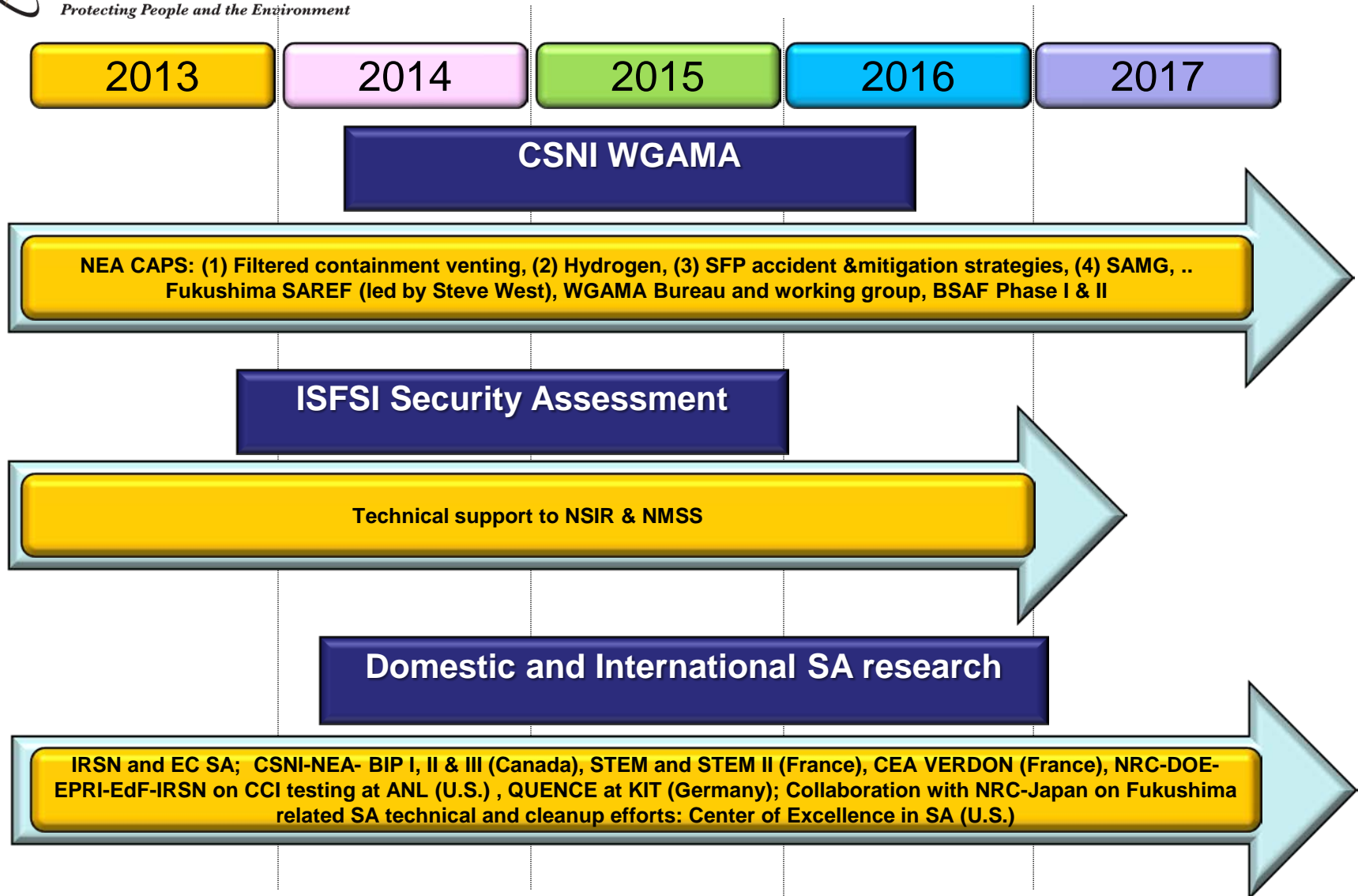
- Establishment of an academia-based center of excellence in severe accident research
- Increased collaboration with international research

# Severe Accident Activities





# Severe Accident Activities (3)



# Conclusion and Challenges

Maintain the infrastructure to support agency severe accident analytical capability and Commission Strategic Plan

## Challenges

- Resources
- Changing priorities
- Succession planning
- International research – objectives, cost and time-frame
- Implementation of agreements





# Revised Fuel Cycle Oversight Process Cornerstones

November 5, 2015

# Background

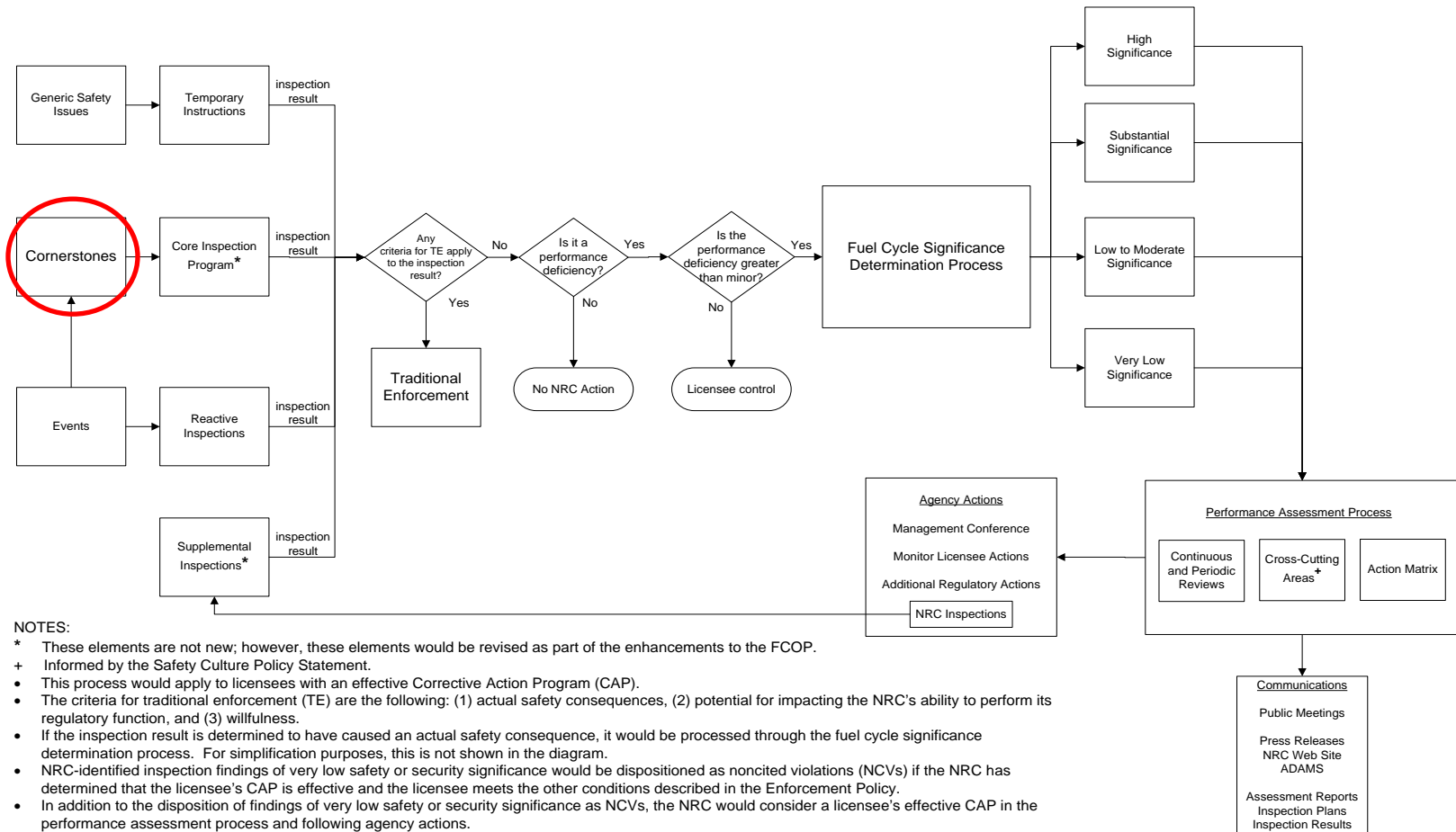
---

- SECY-11-0140, “Enhancements to the Fuel Cycle Oversight Process” (ADAMS No. ML111180705)
  - Staff recommended the hazards analysis-based cornerstone approach.
  - The ACRS agreed with this recommendation (ADAMS Accession No. ML11284A143).
  - Staff requirements memorandum (SRM) for SECY-11-0140 (ADAMS Accession No. ML120050322) approved the NRC staff’s recommendation for enhancing the FCOP.

# Commission Direction

- The existing fuel cycle oversight process is effective and ensures safety and security.
- Commission directed the staff to continue interaction with stakeholders to develop optimal basis for cornerstones.
- SRM directs staff to
  - Develop and implement incentives for licensees to maintain effective corrective action programs (CAP) (completed)
  - Develop the key components as presented in SECY-11-0140:
    - Cornerstones (due to Commission 1/11/16)
    - Definitions for more-than-minor (completed)
    - Definition of performance deficiency (due to Commission 6/23/2016)
    - Significance determination process (due date 6/29/2018)
    - Performance assessment process
  - Conduct a pilot program (results due to Commission 8/23/2019)

# Conceptual Diagram



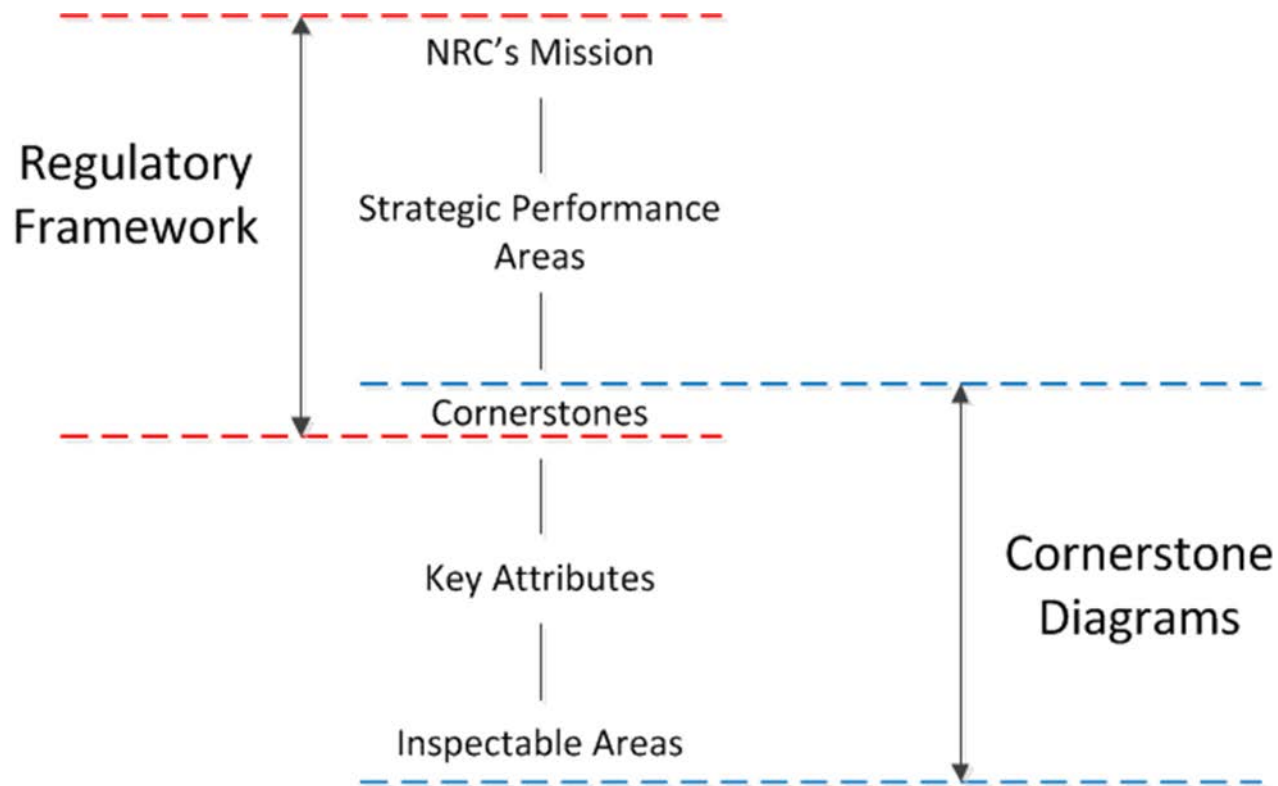
# Development Approach

---

- NRC Strategic Plan (NUREG-1614, Vol. 6)
  - [Mission](#)
  - Strategic performance areas of fuel facility safety and safeguards
- Cornerstone
  - Objective
  - Key attributes
  - Inspectable areas
- Considered in context of radiological and chemical hazards and current operations environment
- Cross-cutting areas remain to be identified

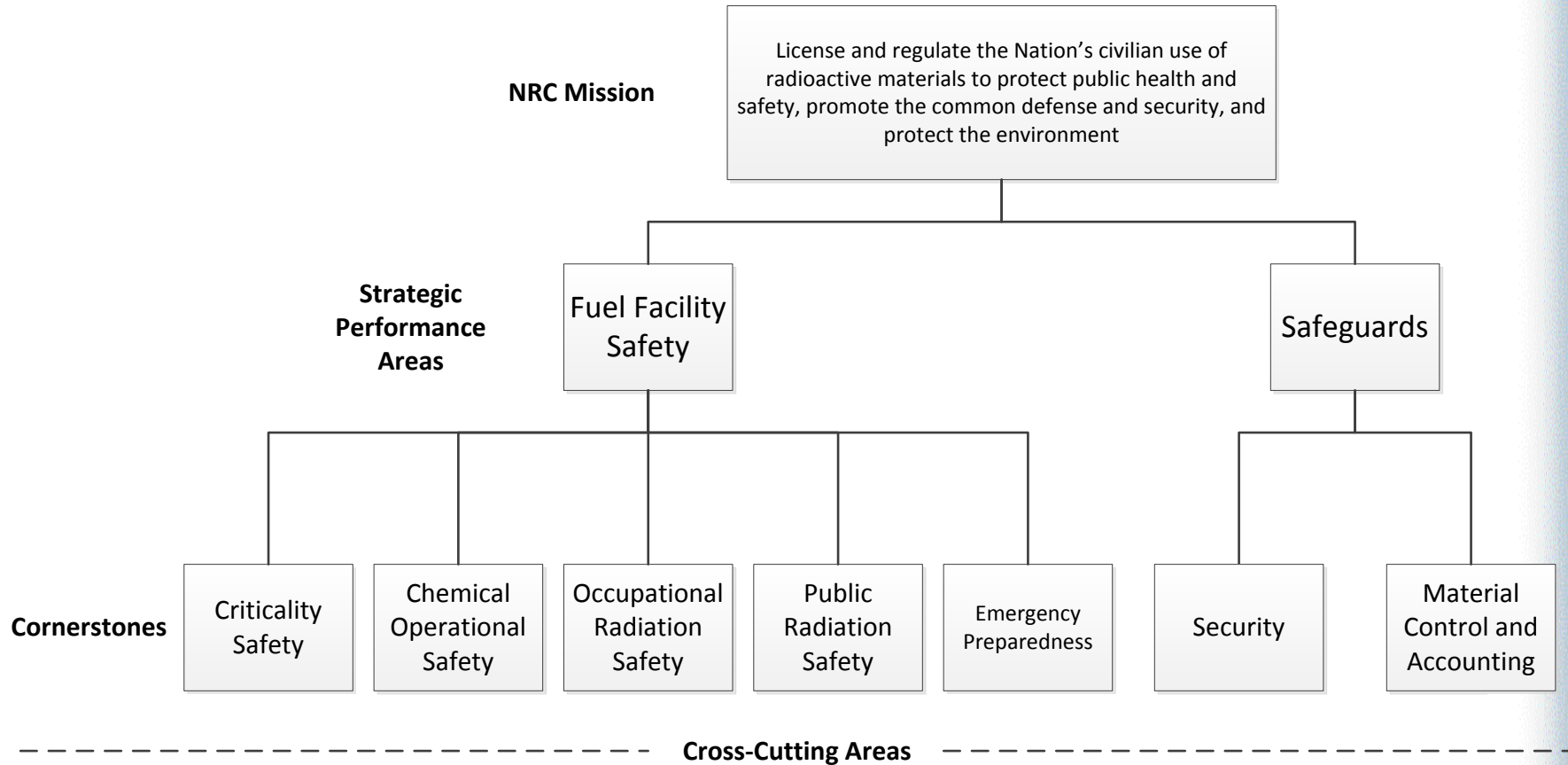
# Development Approach

## Regulatory Framework and Cornerstone Structure





# Recommended Cornerstones



# Consideration for Cross-cutting Areas

---

- Human performance
- Problem identification and resolution
- Safety-conscious work environment
- Procedure compliance
- Staff requests ACRS input to identify appropriate cross-cutting areas



# Criticality Safety

---

**Objective:** Protect against the consequences of a nuclear criticality accident, preferably by prevention of the accident.

# Chemical Operational Safety

---

**Objective:** Verify the availability and reliability of IROFS and other safety controls, such as chemical safety and fire safety controls to protect worker and public health and safety.

# Occupational Radiation Safety

---

**Objective:** Verify adequate protection of worker health and safety from exposure to radiation from radioactive materials used in routine nuclear fuel processing.

# Public Radiation Safety

---

**Objective:** Verify adequate protection of public health and safety from exposure to radiation from radioactive material used in nuclear fuel processing. Activities that could involve inadvertent exposure to the public include routine operations such as gaseous and liquid radioactive effluent discharges, treatment and storage of solid contaminated materials, and transport of radioactive materials and wastes.

# Emergency Preparedness

---

**Objective:** Verify that licensees adequately implement, maintain, and perform actions required by an approved emergency plan developed to protect the public health and safety during a radiological or chemical emergency (for those chemicals under USNRC jurisdiction).

# Security

---

## Objectives:

1. To verify that the licensee's safeguards systems and programs for both fixed site and transportation shipments promote the common defense and security by protecting against: (a) acts of radiological sabotage; (b) loss, theft, and diversion of special nuclear material (SNM); and (c) unauthorized disclosure of classified and sensitive unclassified information; and
2. To verify that the licensee's physical protection systems minimize the possibility for unauthorized removal of SNM and facilitate the location recovery of missing SNM.



# Material Control and Accounting

---

## Objectives:

1. To verify that the licensee's MC&A program promotes the common defense and security by detecting and protecting against loss, theft, diversion, or misuse of SNM, and facilitating the location and recovery of missing SNM.
2. To verify that the licensee adequately detects unauthorized production and unauthorized levels of enrichment of SNM at enrichment facilities.

# Summary

---

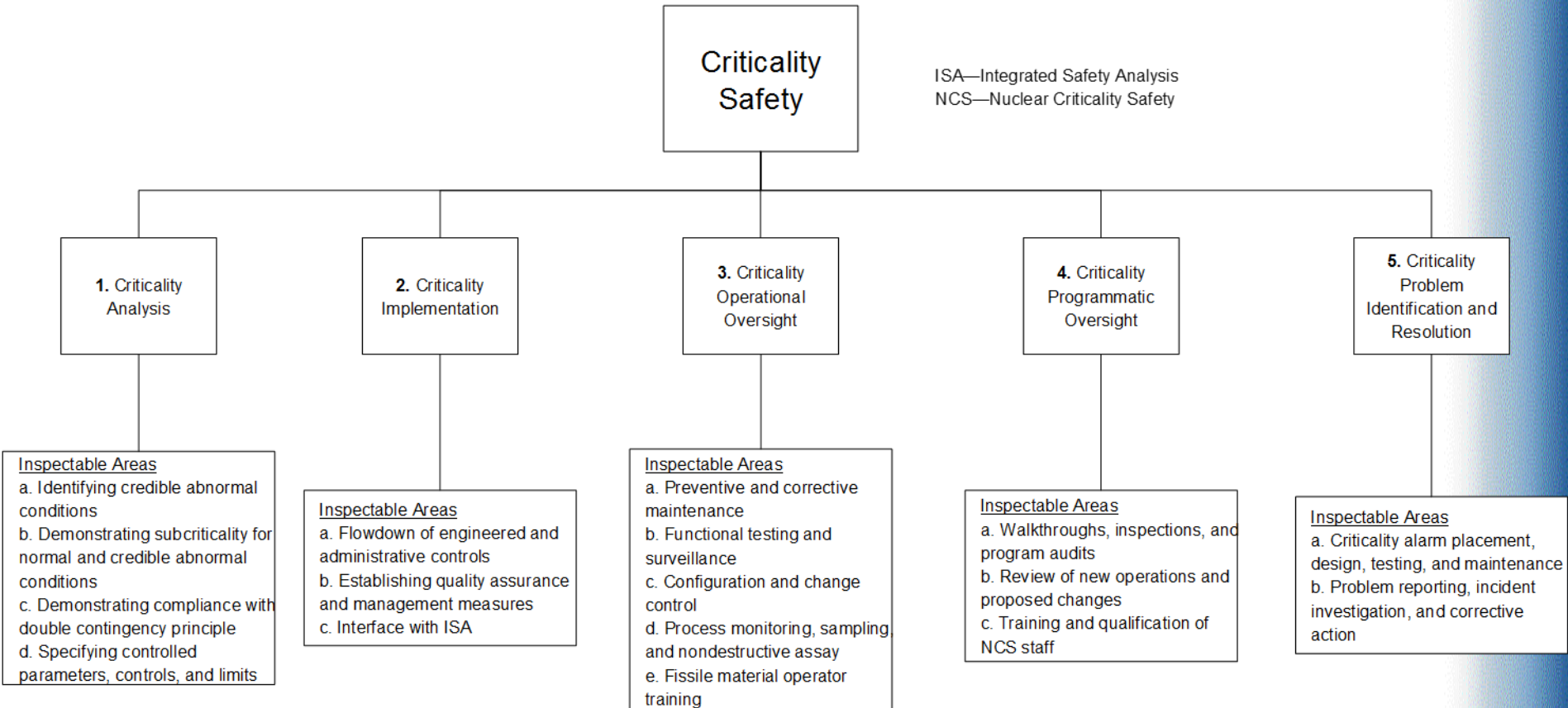
- Staff considered NRC mission, applicable hazards, and operations environment to develop cornerstones
- Recommended cornerstones
  - represent major operations at all facilities
  - are risk-informed via integrated safety analysis (ISA), where applicable
  - align with SRM



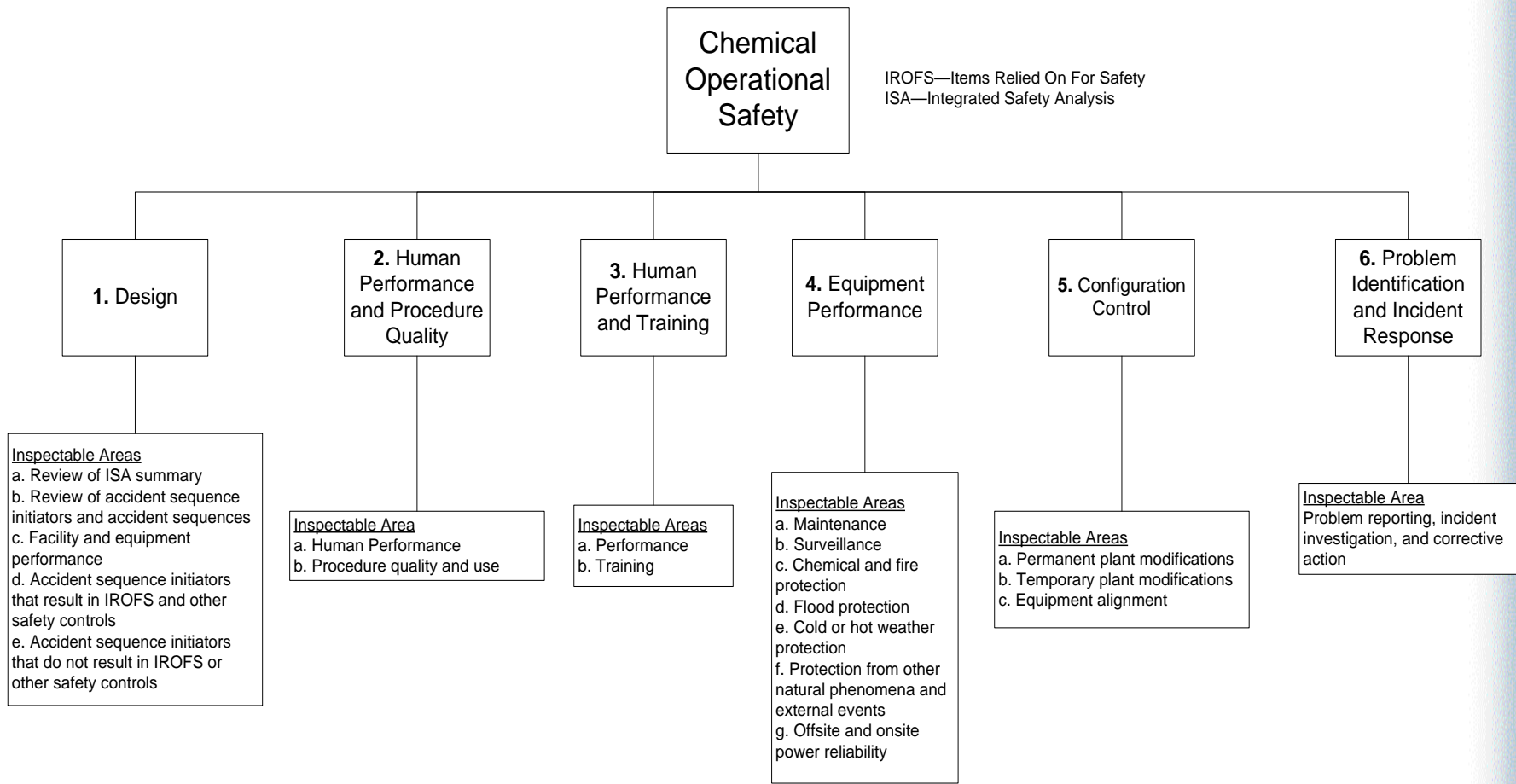


## Background Slides

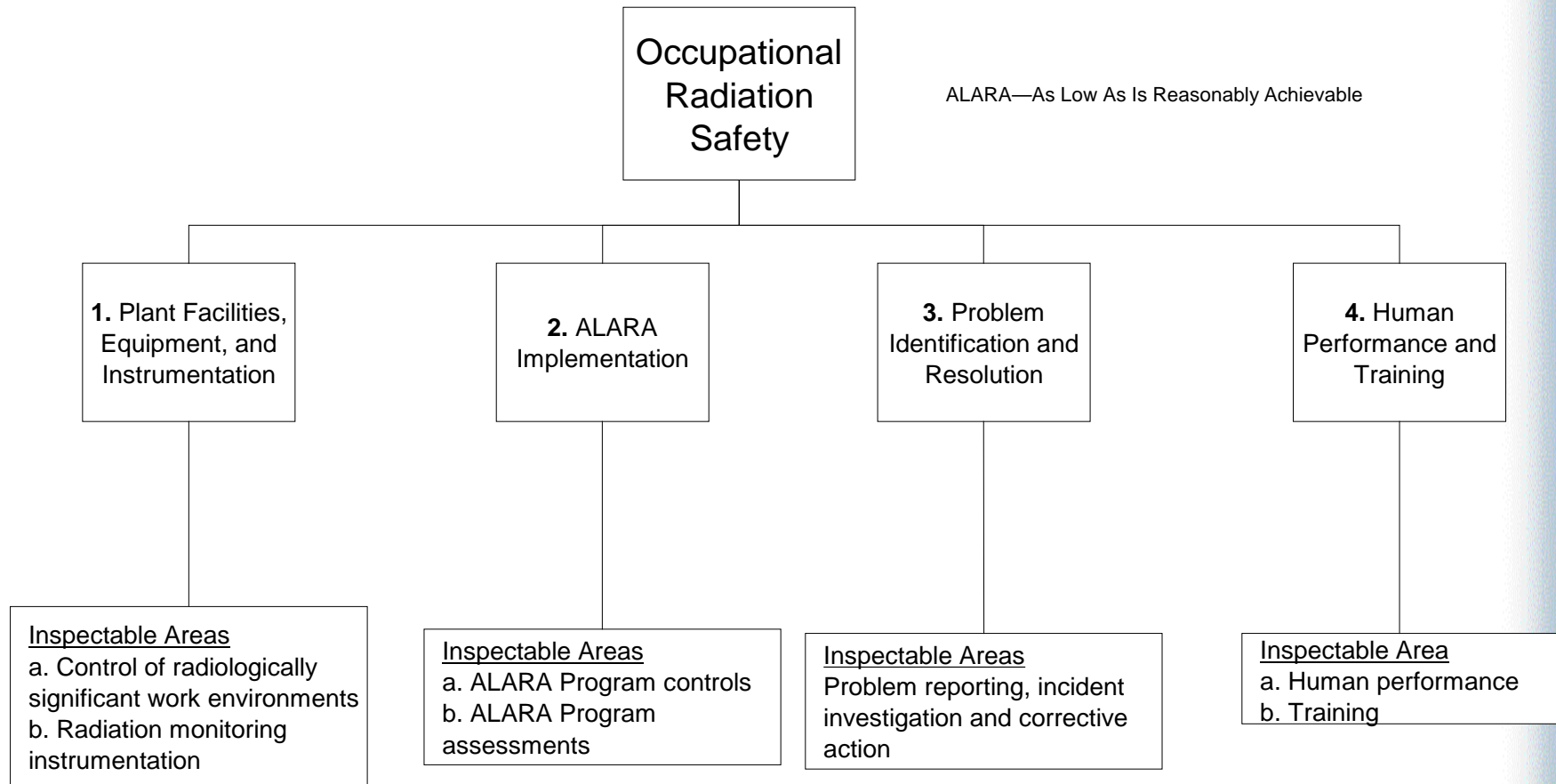
# Criticality Safety



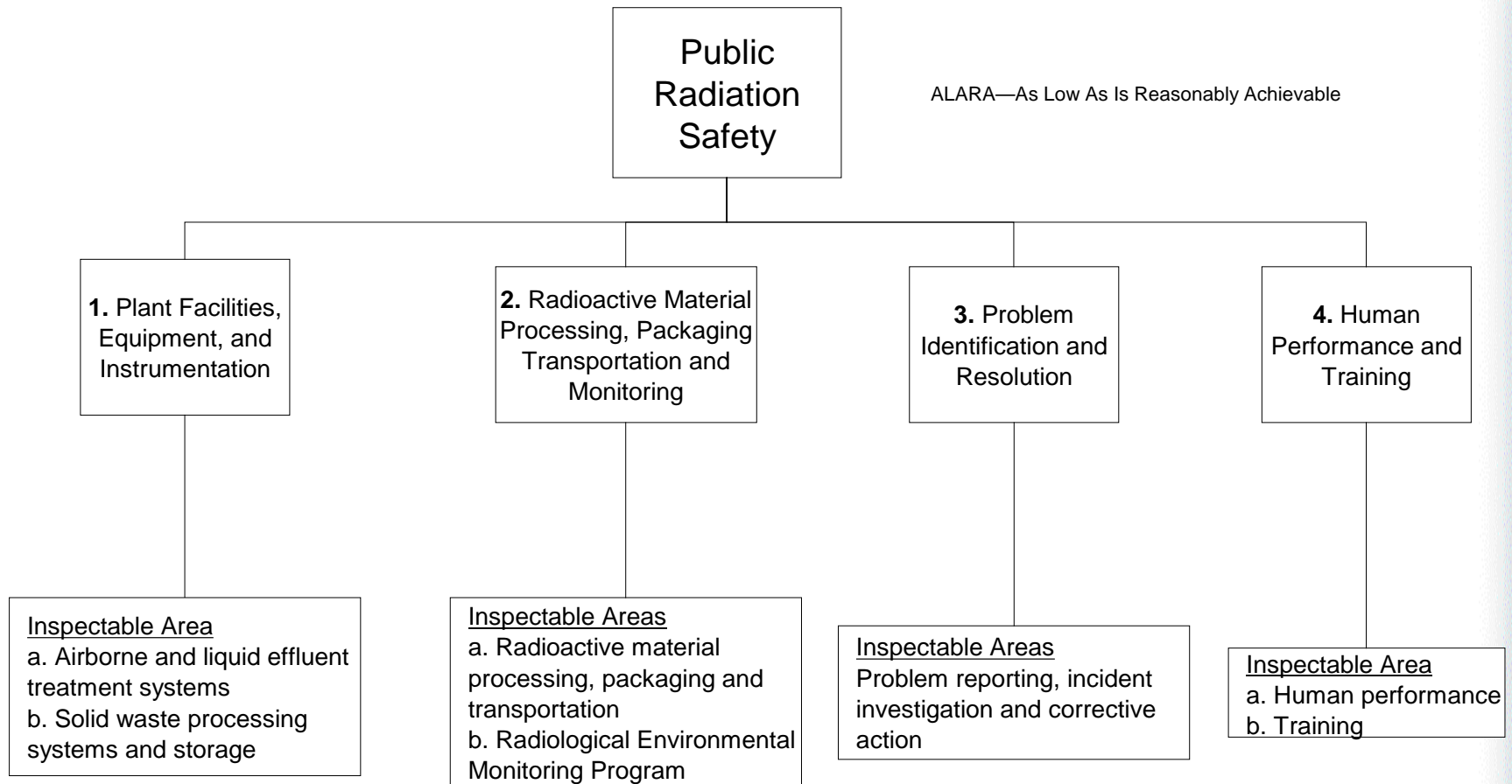
# Chemical Operational Safety



# Occupational Radiation Safety

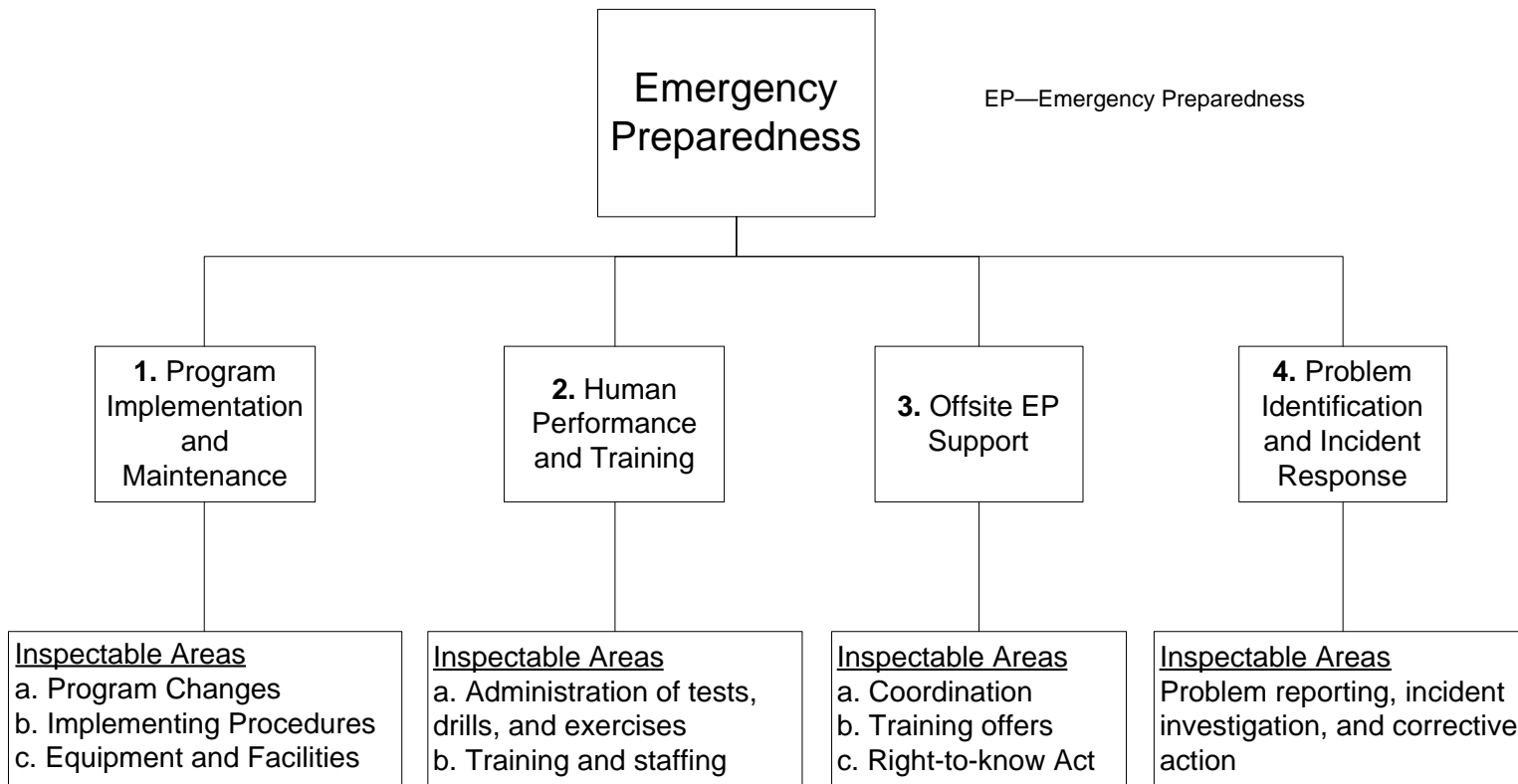


# Public Radiation Safety



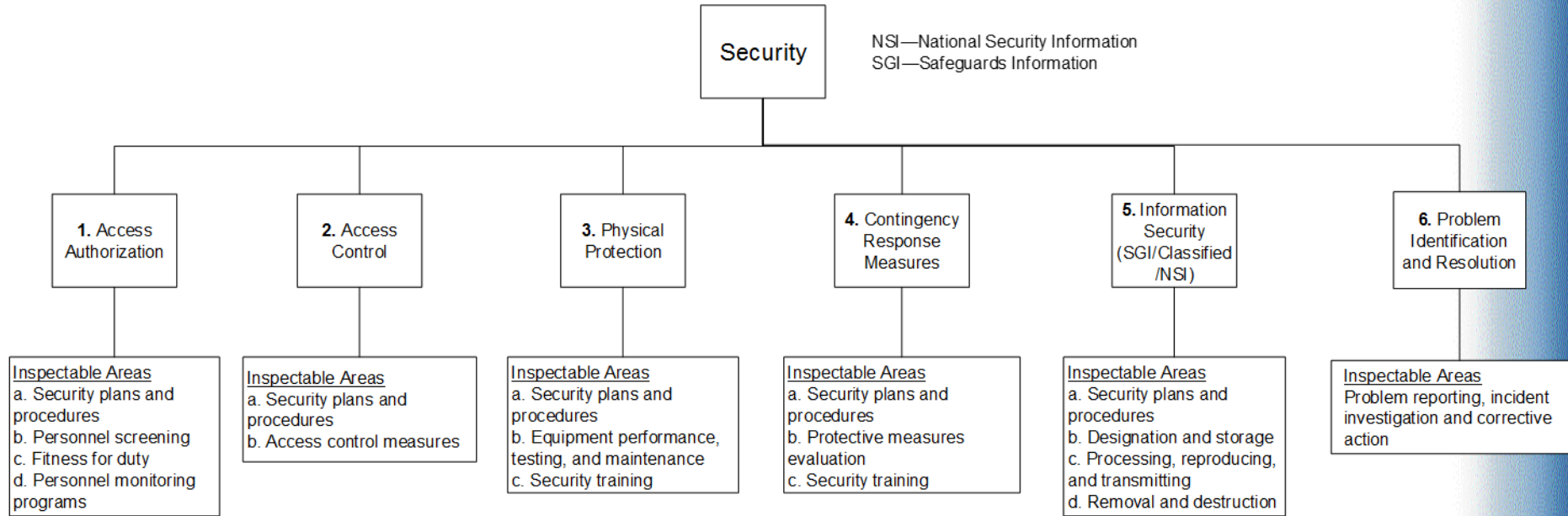
# Emergency Preparedness

EP—Emergency Preparedness



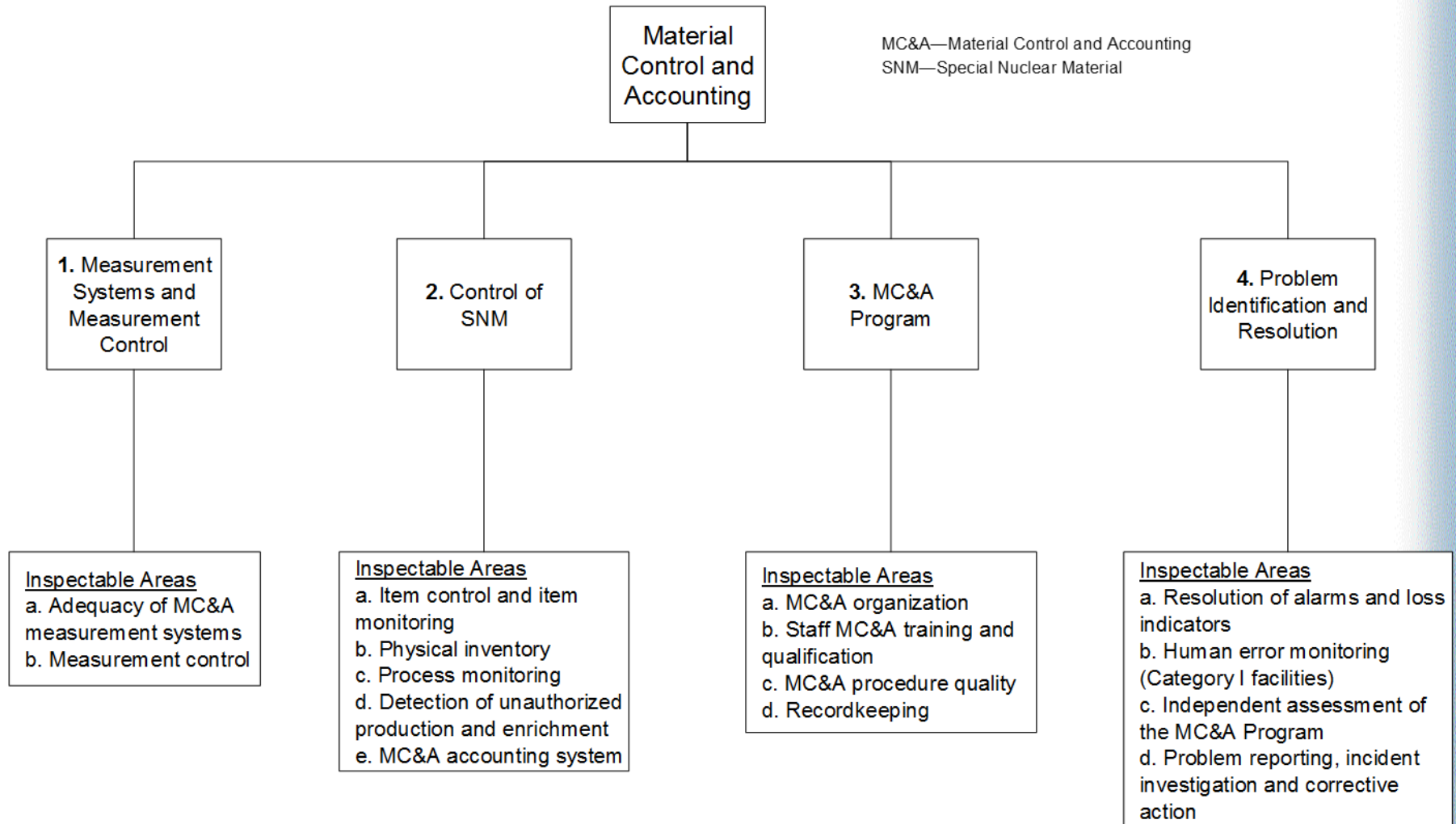


# Security



Note: Because there are various categories of licensees, the regulatory and license requirements will vary. Therefore, either all or a subset of the inspectable areas will apply, depending on the licensee category.

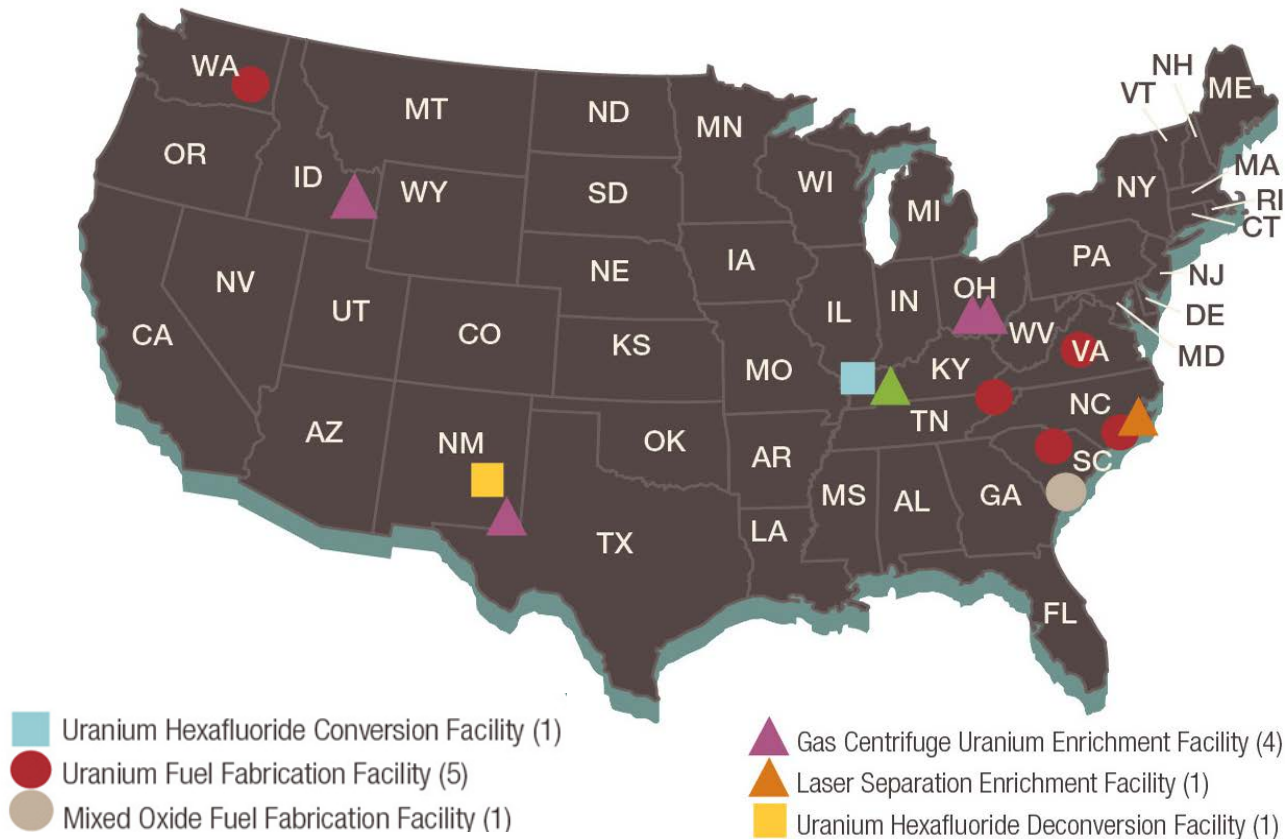
# Material Control and Accounting





# Overview of Fuel Cycle Facilities

## Locations of Fuel Cycle Facilities



[List of Facilities](#)

# Overview of Fuel Cycle Facilities (Cont.)

---

- Fuel Cycle Facilities Predominant Hazards
  - Uranium Hexafluoride ( $\text{UF}_6$ ) and Hydrogen Fluoride (HF) releases resulting from  $\text{UF}_6$  interaction with moisture
  - Fires
  - Criticality Events
  - Chemical Exposures (ammonia, etc.)
  - Exposure hazards from soluble uranium
  - Facilities not affected by station black out and multiunit events

# List of Fuel Cycle Facilities

## Major U.S. Fuel Cycle Facility Sites

Licensee	Location	Status	Docket #
<b>Uranium Hexafluoride Conversion Facility</b>			
Honeywell International, Inc.	Metropolis, IL	active	04003392
<b>Uranium Fuel Fabrication Facilities</b>			
Global Nuclear Fuel-Americas, LLC	Wilmington, NC	active	07001139
Westinghouse Electric Company, LLC Columbia Fuel Fabrication Facility	Columbia, SC	active	07109239
Nuclear Fuel Services, Inc.	Erwin, TN	active	07000143
Babcock & Wilcox Nuclear Operations Group	Lynchburg, VA	active	07000027
AREVA NP, Inc.	Richland, WA	active	07001257
<b>Mixed Oxide Fuel Fabrication Facility</b>			
Shaw AREVA MOX Services, LLC	Aiken, SC	under construction (operating license under review)	07003098
<b>Gaseous Diffusion Uranium Enrichment Facilities</b>			
USEC, United States Enrichment Corp. Paducah Gaseous Diffusion Plant	Paducah, KY	shutdown, certificate termination pending	07007001
<b>Gas Centrifuge Uranium Enrichment Facilities</b>			
USEC, American Centrifuge Operating, LLC Lead Cascade: Test and Demonstration Facility	Piketon, OH	Active	07007003
USEC, American Centrifuge Operating, LLC American Centerfuge Plant	Piketon, OH	license issued, construction halted	07007004
Louisiana Energy Services (URENCO-USA)	Eunice, NM	active*	07003103
AREVA Enrichment Services, LLC Eagle Rock Enrichment Facilities	Idaho Falls, ID	license issued, construction not started	07007015
<b>Laser Separation Enrichment Facility</b>			
GE-Hitachi	Wilmington, NC	license issued, construction not started	07007016
<b>Uranium Hexafluoride Deconversion Facility</b>			
International Isotopes	Hobbs, NM (Lea County)	license issued, construction not started	04009086

# Reactor Oversight Process (ROP) Cornerstones

## NRC Mission

License and regulate the Nation's civilian use of radioactive materials to protect public health and safety, promote the common defense and security, and protect the environment

## Strategic Performance Areas

### Reactor Safety

### Safeguards

Initiating Events

Mitigating Systems

Barrier Integrity

Occupational Radiation Safety

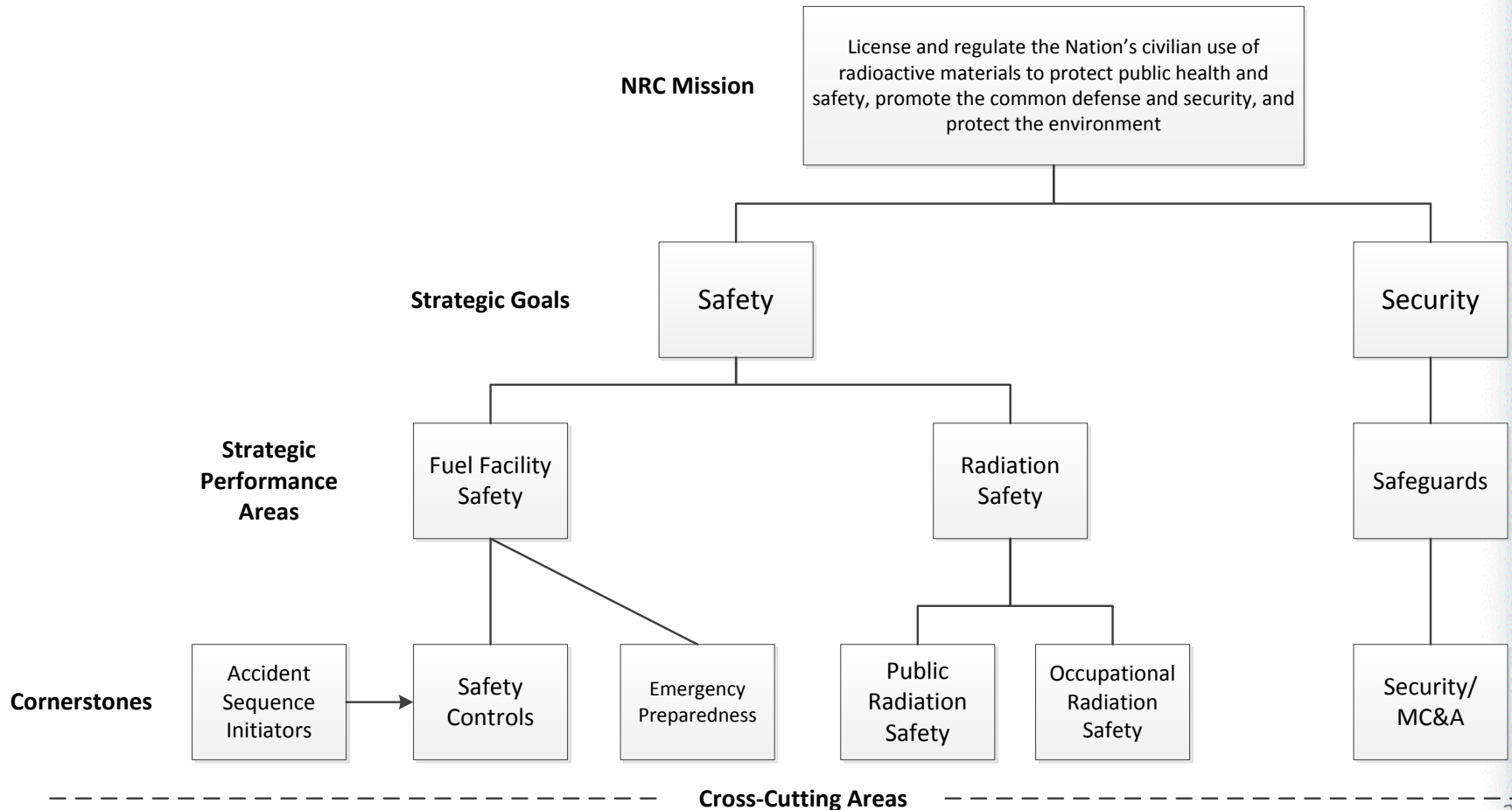
Public Radiation Safety

Emergency Preparedness

Security

----- Cross-Cutting Areas -----

# Hazards Analysis-Based Cornerstones





# Overview of Fuel Cycle Facilities (Cont.)

70.61 Performance Requirements	Highly Unlikely	Unlikely	Not Unlikely
<b>High Consequence</b> Publ Dose > 25 rem Worker Dose > 100 rem Publ U intake > 30 mg Publ Chem: Irreversible+LongLasting Worker Chem : Endanger life	Acceptable	Not Acceptable	Not Acceptable
<b>Intermediate Consequence</b> Publ Dose 5 - 25 rem Worker Dose 25 - 100 rem Publ Chem: Mild Transient effects Worker Chem:Irrever+LongLasting Env releases > 5000 Tbl 2 10CFR 20	Acceptable	Acceptable	Not Acceptable
<b>Low Consequence</b> Publ Dose < 5 rem Worker Dose < 25 rem	Acceptable	Acceptable	Acceptable
<b>Under normal and abnormal conditions: Nuclear process must remain subcritical</b>			

# Overview of Fuel Cycle Facilities (Cont.)

---

- 10 CFR Part 70 (Cont.)
  - Licensees required to meet Subpart H:
    - Operating:
      - » AREVA, Richland, WA
      - » Westinghouse, Columbia, SC
      - » Global Nuclear Fuel, Wilmington, NC
      - » NFS, Erwin, TN
      - » BWXT, Lynchburg, VA
      - » LES, New Mexico
    - Construction/Waiting to start construction
      - » MOX, Aiken, SC
      - » USEC, American Centrifuge, Piketon, OH
      - » AREVA Eagle Rock,
      - » GE-Hitachi Laser Enrichment

# Overview of Fuel Cycle Facilities (Cont.)

---

## – 10 CFR Part 40

- 40.31(j)(1)(ii) which requires, in part, an emergency plan for responding to the radiological hazards of an accidental release of source material and to any associated chemical hazards directly incident thereto.
- 40.31(3)(ii) Types of accidents, which requires identification of each type of accident sequences for which protective actions may be needed.
- Major 2 facilities incorporate ISA provisions similar to 10 CFR Part 70 through license conditions



# Overview of Fuel Cycle Facilities (Cont.)

---

- Licensees required to meet Part 40:
  - Honeywell, Metropolis IL
  - International Isotopes, NM
    - » SECY 07-146 directed staff to require implementation of ISA requirements in Part 70 Subpart H

# Overview of Fuel Cycle Facilities (Cont.)

---

## – 10 CFR Part 76

- 76.35 (a)(6) which requires, in part, that the application must include a SAR with a description of equipment and facilities which will be used by the Corporation to protect health and minimize danger to life or property
- 76.85 which requires, in part, an analysis of potential accidents and consequences from a reasonable spectrum of postulated accidents which include internal and external events and natural phenomena in order to ensure adequate protection of the public health and safety
- Licensees required to meet Part 76
  - Paducah GDP in Paducah, KY (Shutdown)

# Overview of Fuel Cycle Facilities (Cont.)

---

- Conversion
  - Preparing Uranium (U) for Enrichment
  - Honeywell International in Metropolis, IL
    - Input: yellowcake in 55-gallon drums
    - Output:  $\text{UF}_6$  in 14-ton cylinders
- Deconversion
  - International Isotopes Inc.
    - Input: Depleted  $\text{UF}_6$
    - Output: High purity fluoride gas

# Overview of Fuel Cycle Facilities (Cont.)

---

- Enrichment
  - Boosting concentration of  $U^{235}$  (0.71% → 5%)
    - Input: Natural  $UF_6$
    - Product: Low-Enriched  $UF_6$
  - Gaseous diffusion plant:
    - Paducah GDP in Paducah, KY (Shutdown)
  - Laser enrichment facility
    - GE Hitachi in Wilmington, NC (In process of issuance of license)

# Overview of Fuel Cycle Facilities (Cont.)

---

- Enrichment (Cont.)
  - Gas centrifuge plants:
    - LES – National Enrichment Facility in Eunice, NM (operation and construction)
    - USEC – Lead Cascade Test, Facility and American Centrifuge Plant in Piketon, OH (Licensed, delay on construction)
    - AREVA – Eagle Rock Facility in Bonneville County, ID (Licensed, delay on construction)

# Overview of Fuel Cycle Facilities (Cont.)

---

- Fuel Fabrication

- Produce low-enriched uranium (LEU) in the form of  $\text{UO}_2$ , or Mixed Oxide (MOX)
- Facilities:
  - AREVA NP, Inc. in Richland, WA
  - Global Nuclear Fuel – Americas in Wilmington, NC
  - Westinghouse Electric Co., in Columbia, SC
  - Mixed Oxide Fuel Fabrication Facility in Savannah River Site, SC (Construction)



# Overview of Fuel Cycle Facilities (Cont.)

---

- High-Enriched Uranium (HEU) Facilities
  - Enrichment typically involves  $> 90 \text{ wt } \% \text{ }^{235}\text{U}$
  - Support naval nuclear propulsion program and research reactors
  - HEU fuel facilities
    - Nuclear Fuel Services in Erwin, TN
    - Babcock & Wilcox Nuclear Owners Group (BWNOG) in Lynchburg, VA