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On Reactor Safeguards

Reliability and Probabilistic Risk
Assessment (PRA) Subcommittee

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION
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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
(ACRS)
+ + + + +
RELIABILITY AND PROBABILISTIC RISK ASSESSMENT (PRA)
SUBCOMMITTEE MEETING
+ + + + +
WEDNESDAY
NOVEMBER 19, 2014
+ + + + +
ROCKVILLE, MARYLAND
+ + + + +

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

COMMITTEE MEMBERS:

JOHN W. STETKAR, Chairman
RONALD G. BALLINGER, Member
DENNIS C. BLEY, Member
JOY REMPE, Member
MICHAEL T. RYAN, Member

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STEPHEN P. SCHULTZ, Member

DESIGNATED FEDERAL OFFICIAL:

JOHN LAI

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

(1:00 p.m.)

CHAIRMAN STETKAR: The meeting will now come to order.

This is a meeting of the Reliability and PRA Subcommittee. I'm John Stetkar, Chairman of the Subcommittee meeting. ACRS members in attendance are Steve Schultz, Dennis Bley, Mike Ryan, Ron Ballinger and Joy Rempe. John Lai of the ACRS staff is the designated federal official for this meeting.

The Subcommittee will discuss with the staff the development of the containment protection and release reduction rulemaking and risk evaluation to support the rulemaking.

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

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

The Subcommittee will gather information, analyze relevant issues and facts and formulate proposed positions and actions as appropriate for deliberation by the Full Committee.

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1 The rules for participation in today's
2 meeting have been announced as part of the notice of
3 this meeting previously published in the *Federal*
4 *Register*.

5 A transcript of the meeting is being kept
6 and will be made available as stated in the *Federal*
7 *Register* notice. Therefore, we request that
8 participants in this meeting use the microphones located
9 throughout the meeting room when addressing the
10 Subcommittee. The participants should first identify
11 themselves and speak with sufficient clarity and volume
12 so they may be readily heard. And also please check all
13 of your personal communications devices and silence
14 them, if you would.

15 Also, you may have heard there's some
16 construction work going on up on the fourth floor, and
17 concrete and steel being what they are, we're going to
18 hear some vibrations. We've been able to live with it.
19 I apologize for it. It's just something -- we've tried
20 to get it stopped. There are other issues at play in
21 the great NRC world and we're going to have to put up
22 with it. It's not as bad as it could be. So please
23 excuse the noise.

24 We'll now proceed with the meeting and I
25 call upon Abe Mohseni to start the discussion.

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1 MR. MOHSENI: Thank you, Mr. Chairman,
2 distinguished members. Thank you for the opportunity
3 to discuss today the status of the staff's rulemaking
4 on containment protection and release reduction,
5 formerly known as filtering strategies. I am Abe
6 Mohseni, deputy director for Policy and Rulemaking
7 Division in NRR.

8 The NRC staff began this rulemaking effort
9 in response to SRM 12-0157. Currently we are in the
10 process of developing the draft regulatory basis. The
11 NRC staff here is discuss the use of the preliminary
12 quantitative risk evaluation to determine whether any
13 potential alternatives within the containment
14 protection and release reduction rulemaking could be
15 considered a substantial safety enhancement.

16 The NRC staff has not performed and does
17 not plan to perform a human reliability analysis for
18 this rulemaking effort. The staff believes that an HRA
19 is not necessary for this decision making process for
20 this rulemaking, however, the staff is not making a
21 determination as to whether the technology exists to
22 develop an HRA for this rulemaking.

23 As will be discussed later in detail, the
24 quantitative analysis shows that based on the safety
25 goal policy statements quantitative health objectives

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1 there are no individual prompt fatalities and the
2 individual latent cancer fatality risk is well below
3 the QHO for what is safe enough.

4 The staff is planning to seek direction from
5 office-level management based on the preliminary
6 quantitative information to determine the path forward
7 for this rulemaking.

8 Aaron Szabo, who is unfortunately leaving
9 the Agency within about a week, is here to lead the
10 discussion as he has actually led this development of
11 the regulatory basis work. We will miss him certainly.
12 It's hard to backfill behind his efforts and without
13 losing any momentum, but nonetheless he has chosen a
14 different path in life. We've already given him some
15 hard time and --

16 (Laughter)

17 MR. MOHSENI: -- questioned his decision.
18 At the end of the day if his decision is anything like
19 the decision that he's making on CPRR, we should question
20 CPRRs.

21 (Laughter)

22 MR. MOHSENI: We do have JLD representative
23 Bill Reckley and research Marty on the corner there
24 available to address any questions, if needed. Thank
25 you. Aaron?

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1 MR. SZABO: Good afternoon and thank you
2 for giving me the opportunity to present to you today
3 on the containment protection and release reduction
4 rulemaking. I'd also like to thank Abe for putting all
5 of that on the record and transcribed, so it will be
6 memorialized forever.

7 Once again, I'm Aaron Szabo. I'm the
8 project manager and the cost analyst for this rulemaking
9 effort. And as Abe mentioned, those will soon be
10 transferred to other people who you will get to interact
11 with.

12 Just in the general agenda, I'm going to
13 go through some background. We met last August, so many
14 of you are I'm sure familiar with what's going on, but
15 I'll just go through a quick background. The process
16 for this CPRR rulemaking kind of what we've done, the
17 purpose of the risk evaluation, kind of the two parts,
18 and then the path forward.

19 So just on some general background, in
20 November of 2012 the staff submitted SECY-12-0157 which
21 recommended filters on BWRs in Mark I and Mark II
22 containments. Quantitatively that was not shown to be
23 a cost-justified substantial safety enhancement, but
24 the staff used qualitative considerations to make that
25 determination. To note, there was no real discussion

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1 on the QHOs within SECY-12-0157, so as we go through
2 the discussion the QHO is there. Just want to make note
3 that in the formal SECY paper there was no real
4 discussion of that.

5 Subsequently in March of 2013 the
6 Commission provided the NRC staff direction in
7 SRM-SECY-12-0157, the first part of that being to
8 implement severe accident capable events for BWR Mark
9 I and Mark II containment. And that's Order EA-13-109.
10 And they also directed the staff to engage in a
11 rulemaking process with specific metrics for the reg
12 basis, the proposed rule and the final rule.

13 Some specifics for the rulemaking; these
14 are paraphrased from the SRM, is to ensure that
15 performance and risk of filtering strategies and filters
16 are fully evaluated, fully explore requirements
17 associated with measures to enhance the capability to
18 maintain containment integrity and to cool core debris.
19 This has been called severe accident water addition or
20 SAWA. You've probably heard that in various meetings.
21 They directed us to examine multiple performance
22 criteria. They gave two examples within the SRM. One
23 was decontamination factor. One was equipment and
24 procedure availability similar to 50.54(hh).

25 We are currently looking at six performance

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1 criteria. The two that I mention there: conditional
2 containment failure probability, which initially was
3 brought up by industry and we're currently evaluating
4 that as well. Total population dose. Practically
5 eliminate long-term relocation and margin to the QHOs,
6 which was another industry performance criteria that
7 was brought up about the middle of last year. The
8 middles ones were ones that were staff-initiated.

9 The Commission also asked to be
10 periodically updated on the progress of the rulemaking.
11 We are currently doing that via the six-month JLD
12 updates, status updates, the SECY papers. They also
13 stated that if any policy issues arise, that they should
14 be raised to the Commission in a notation note paper.

15 And then of course there was the separate
16 paper on the use of qualitative considerations. And
17 that was SECY-14-0087, which was published in August
18 of 2014. And that's currently under consideration by
19 the Commission, and any direction that we receive from
20 the Commission that would affect this rulemaking would
21 clearly be incorporated as appropriate in the
22 rulemaking.

23 This is general process for the rulemaking.
24 This is a different graphic than I believe you all might
25 have seen previously or what's in NUREG/BR-0058, which

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1 is the Regulatory Analysis Guidelines, which is a little
2 bit more detailed or complex than this. This is kind
3 of more of a theoretical kind of how we look at things.

4 First would be a high-level conservative
5 estimate, kind of looking at it from a conservative point
6 of view and not necessarily diving into a significant
7 amount of detail, but kind of saying what is our general
8 risk levels that we're adding? And the question is is
9 the estimate reliable or sufficient? And that would
10 really be is it good enough for us to really make a
11 rulemaking decision?

12 For this, as you'll see in a couple slides,
13 we did perform a more detailed assessment. And then the
14 question is is the assessment technically adequate?
15 And the term "technically adequate" should really be
16 looked at in relation to scope, level of detail and
17 quality necessary to support its role in the regulatory
18 decision process. So this isn't necessarily saying
19 that the detailed assessment is a perfect analysis.
20 It's more of is this analysis good enough to support
21 its role in the decision making process?

22 Of course with any document the NRC
23 publishes any places where there might be shortcomings
24 or any areas that could be explored more, those will
25 of course be noted within the documents so that we're

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1 not misleading any members of the public or the
2 Commission to believe that this analysis may be more
3 rigorous than it was. And once again, that would be used
4 to support the rulemaking decision. And of course the
5 rulemaking decision considers both any quantitative as
6 well as qualitative information as appropriate.

7 On this slide 5, which is kind of the purpose
8 of the risk evaluation, and this kind of gets into the
9 backfit process, the first is is it a substantial safety
10 enhancement? And this is kind of mentioned in a
11 previous slide. We have the high-level conservative
12 estimate, a more detailed assessment. And if it does
13 not reach the level of substantial safety enhancement,
14 that would usually suffice for a backfit or regulatory
15 analysis and we would stop the work then. However, part
16 2 is more of a full evaluation of alternatives. This
17 was based on the Commission direction received in
18 SRM-SECY-12-0157. What you'll see today with
19 the risk is merely one part of what would be a full
20 evaluation. A full evaluation is both looking at all
21 the benefits and all the costs of the rule, so the
22 benefits in relation to the risk space, but also as well
23 as all of the costs. And normally, as I said, if part
24 1 did not meet the substantial safety enhancement, we
25 would stop and not move on to part 2.

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1 So some of the assumptions for the
2 high-level conservative estimate. Based on the NTTF
3 recommendation 2.1 seismic submittals we pulled the
4 highest ELAP frequency of any of the BWR Mark I and Mark
5 IIs, which was about 7E-06. And then based on our MELCOR
6 MACCS analysis we used the highest conditional
7 individual latent cancer fatality risk release bin and
8 also used the highest re-habitability criterion.

9 We ran some sensitivities on the MACCS
10 codes, some of the inputs. A delayed evacuation of an
11 hour turned out to not be sensitive at all. There was
12 no real change. Also in relation to not evacuating
13 cohorts we had a baseline assumption of 98 percent and
14 looked at an assumption of only 95 percent that was able
15 to evacuate and was not really sensitive to that either.
16 However, where it was most sensitive was in this highest
17 -- the habitability criterion. So for this we're using
18 the EPA standard, which was the two rem per year, and
19 that provided a multiple of about two in relation to
20 individual latent cancer fatality risk.

21 Also, we made an assumption that FLEX is
22 about 60 percent successful due to the human factor
23 scoping that is occurring under EA-12-049, as well as
24 the other post-Fukushima actions including the
25 reevaluation that would occur, the seismic reevaluation

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1 that would occur after Recommendation 2.1. After these
2 submittals there would be follow-up work. And what this
3 would do is this would provide us a high-level concerted
4 estimate of what the status quo potential risk would
5 be. We were not looking at any specific alternatives.
6 We were only looking really at the risk in the status
7 quo.

8 So as you can see on this chart, the
9 quantitative health objectives, which is $1.8E-06$, that
10 is one-tenth of one percent of the sum of cancer fatality
11 risks resulting from all other cancers. So that was
12 just pulling data from the cancer deaths in the United
13 States, about 600,000. Divide that by the total
14 population of the U.S., which was about 319 million,
15 and then taking one-tenth of one percent of that.

16 This high-level conservative estimate
17 which was based on the assumptions stated in the previous
18 slide provide us an individual latent cancer fatality
19 risk level of $7E-08$. So you can see it's already a level
20 -- an order of magnitude, over an order of magnitude
21 below the QHOs. And so what this is telling us, that
22 if we had some alternative that could even be able to
23 remove all of the residual risk of a BWR Mark I, the
24 most benefit you could possibly get is $7E-08$.

25 MEMBER BLEY: So explain a little more

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1 about the status quo and the high-level conservative
2 estimate. What's the assumption in this analysis?

3 MR. SZABO: So we used the highest ELAP
4 frequency based on the seismic evaluations and other
5 ELAP conditions for all the Mark Is and chose the plant
6 with the highest ELAP. We then looked at the MELCOR
7 analyses and the subsequently MACCS individual latent
8 cancer fatality risk bins. We took the highest bin from
9 that, the highest bin individual latent cancer fatality
10 risk and then we took the highest habitability criterion
11 of that. So it is kind of a combination of what ended
12 up being a number of different plants to provide a rather
13 high-level -- what would be a conservative estimate
14 based on the information that we have.

15 CHAIRMAN STETKAR: And how were the
16 personnel interactions treated in that thing that you're
17 calling the high-level conservative estimate?

18 MR. SZABO: Personnel interactions? Are
19 you talking about --

20 CHAIRMAN STETKAR: Operator actions.

21 MR. SZABO: We have an assumption that FLEX
22 pre-core damage is 60 percent successful if you wanted
23 to assume that FLEX was -- if you want assume before
24 FLEX, you would just divide by 0.6. So it gets you to
25 about 1E-07, which is still an order of magnitude below.

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1 And what we're looking at is this is just the amount
2 of risk assuming that no actions are taken post-core
3 damage.

4 CHAIRMAN STETKAR: No actions?

5 MR. SZABO: No actions post-core damage.

6 CHAIRMAN STETKAR: Post?

7 MR. SZABO: Post-core damage, yes.

8 CHAIRMAN STETKAR: Post-core damage?

9 MR. SZABO: Yes. So FLEX is successful 60
10 percent. And this is just your starting -- assuming
11 nothing exists post-core damage, you can do nothing
12 after you get the core damage.

13 CHAIRMAN STETKAR: Just to be clear, we did
14 have a Subcommittee meeting in August where we looked
15 at the models, the post-core damage models --

16 MR. SZABO: Yes.

17 CHAIRMAN STETKAR: -- the various venting
18 strategies. And one of the reasons we're having this
19 meeting, and why it's the PRA Subcommittee, is we had
20 several questions at that meeting about how human
21 performance was integrated into that model, treatment
22 of human dependencies, all the things you get into in
23 PRA models, the methodology that we've used to quantify
24 the human error probabilities. And I want to make sure
25 that I understand what you're saying, that if I set all

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1 of the human error probabilities in those models to 1.0,
2 no human action, but account for the FLEX strategies
3 --

4 MR. SZABO: Pre-core damage, yes.

5 CHAIRMAN STETKAR: -- pre-core damage.

6 MR. SZABO: Your risk, your individual
7 latent cancer fatality risk is 7E-08, yes.

8 MEMBER SCHULTZ: And that's presuming the
9 incidents that you described, which was categorized to
10 represent the highest of the fleet of --

11 MR. SZABO: Yes, of the Mark I and Mark
12 II --

13 MEMBER SCHULTZ: Oh, in that fleet?

14 (Simultaneous speaking)

15 MR. SZABO: -- which was the highest ELAP,
16 yes, of that -- the highest ELAP that -- and then we
17 also chose from a different plant what ended up being
18 the highest MACCS release bin. So of all the MELCOR runs
19 and the MACCS binning the highest bin for individual
20 latent cancer fatality risk, that one was also chosen.
21 And then we also chose the EPA habitability criterion,
22 as that was the highest and that was the most sensitive
23 for individual latent cancer fatalities. So it's a
24 combination of a number of, within the analysis that
25 we have completed thus far, conservative assumptions.

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1 MEMBER BLEY: Just to be clear again, the
2 latent cancer fatality risk, is that the probability
3 of one or more cancer incidences, or is that the expected
4 number of deaths, or what is that?

5 MR. SZABO: I thought it was -- but I will
6 let John just confirm that.

7 MEMBER BLEY: There are lots of different
8 ways people --

9 MR. SZABO: Yes. Yes.

10 MEMBER BLEY: -- use those words.

11 MR. SZABO: Yes, I'll give it over to Jon
12 Barr.

13 MR. BARR: Yes, this is the --

14 MR. SZABO: Be sure to speak in the mic.

15 CHAIRMAN STETKAR: Come up to the mic
16 and --

17 MR. BARR: Sorry, this is Jon Barr,
18 research. MACCS would calculate the conditional risk
19 of an average individual contracting and dying of
20 cancer.

21 MEMBER BLEY: So that's the probability of
22 any one person?

23 MR. BARR: Anyone within 10 miles of the
24 site.

25 MEMBER BLEY: So if you'd done a PRA with

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1 the CCDFs, that would be the chance of one or more
2 fatality?

3 MR. BARR: I suppose.

4 MEMBER RYAN: I mean, how do you deal with
5 the population that's in that area, because a third of
6 those folks are going to get cancer, whether they're
7 nuclear reacted or not.

8 MR. BARR: So the MACCS will compute the
9 risk of cancer based only the radionuclide release in
10 that case, so there's no thought given to the naturally
11 existing rate of cancer in any given area.

12 MR. MOHSENI: So this is the additional
13 cancers added from this event.

14 MEMBER RYAN: So what we're looking at is
15 a very tiny addition to a rather large number. So I worry
16 about how we're going to express uncertainty or deal
17 with that question of uncertainty or accuracy, however
18 you want to cast it.

19 MR. MOHSENI: Good question, but if you
20 realize the purpose of doing a hybrid, which goes back
21 to Dr. Schultz' question, taking the worst aspects of
22 various sites to give you the indication that concluded
23 even under those circumstances could you reach a benefit
24 from any of these alternatives? And if the answer to
25 that is no, you don't want to invest more doing research

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1 on any particular site because clearly no single site
2 has got all the worst conditions that this hybrid shows.

3 So in other words it's an upper bound
4 calculation, if you will, and the purpose of this is
5 to inform decision making on whether or not to invest
6 more, to study this more in a regulatory basis or not.
7 It is not to actually determine the final answer in terms
8 of what's the cancer risks or not. It is almost a
9 screening mechanism whether or not you want to invest
10 more. Because if under these circumstances you can't
11 get closer to the QHOs than an order of magnitude at
12 least, then does it make sense to invest more money to
13 become even more refined in calculations? And that's
14 the purpose of the previous chart you showed, that if
15 you come to that conclusion, do you have enough
16 information to make a decision about whether or not to
17 proceed with the rulemaking. Otherwise, it's elegance
18 to know more, but is it necessary?

19 MEMBER REMPE: What is the duration that
20 you -- what time period? Was it 24 hours or --

21 MR. BARR: Well, the --

22 MEMBER REMPE: What was the release
23 duration that you accumulated, the time frame that you
24 accumulated the dose over?

25 MR. BARR: Right, the releases would last

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1 for 72 hours.

2 MEMBER REMPE: Seventy-two? Okay.

3 MR. SZABO: And also just another note is
4 that these are all -- except for the expedited spent
5 fuel pool, the other lines, those are all merely the
6 status quo level risk. That is not delta risk. So this
7 is only assuming that you -- and the alternative, which
8 I personally do not believe any of these alternatives
9 could do, remove all residual risk. So you'll see that
10 on the next slide, that the delta is even much, much
11 smaller than these numbers just on top of that. This
12 is really just looking at what's your status quo level
13 of risk.

14 MEMBER BLEY; But the blue line is the one
15 we're talking about.

16 MR. SZABO: Yes. Yes. And so just to go
17 down just a little on the chart, you'll see that triangle
18 there was the expedited spent fuel pool which was in
19 COMSECY-13-0030, which was issued in November 2013, so
20 that was after the SRM that we received on this
21 rulemaking that had a latent cancer fatality risk of
22 1E-08. Within that COMSECY the staff recommended not
23 proceeding with expedited spent fuel pool transfer based
24 on the fact that this level of risk was so low that it
25 is not substantial and the Commission subsequent SRM

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1 agreed with that fact.

2 So part of the reason why we're presenting
3 this information now and kind of here is that we've -- the
4 Commission has reaffirmed their policy after this SRM
5 which kind of could be considered conflicting in its
6 nature by the fact that they were telling us in this
7 SRM, which was a year before this COMSECY, look at these
8 other decision criteria, kind of look at other ways of
9 viewing the world other than in this QHO form.

10 And then subsequent to that, a year later
11 or a year-and-a-half later, the staff set up this COMSECY
12 and the Commission confirmed kind of a reaffirming
13 quantitative health objective policy, the safety goal
14 policy statement quantitative health objective policy.

15 And then to the more detailed assessment,
16 the 95th and 5th, this is based on Marty's PRA analysis
17 still using scoping values of 0.3 and 0.1, however, he
18 did run an uncertainty analysis based on the human error
19 probabilities, the seismic and the MACCS releases with
20 the uncertainty range being dominated by the seismic
21 uncertainty. And this was just more representative
22 showing that if we went into a more detailed analysis,
23 we now are falling below the expedited spent fuel pool.

24 And if you used Marty's analysis, assuming
25 a no success for a FLEX pre-core damage and all success

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1 post-core damage, you would end up with close to the
2 95th percentile anyway, which would be, at least on the
3 human error probabilities, bounding on that based on
4 his model and assumptions.

5 So you can see we're actually in the 7E-09,
6 3E-10 understanding a more refined HRA, what might drive
7 this either slightly up or slightly down, but we don't
8 think there would be a significant change and it would
9 at least be consistent with what the expedited spent
10 fuel pool transfer is.

11 CHAIRMAN STETKAR: And, Aaron, I hate to
12 keep bringing you back to this, but that blue line there
13 --

14 MR. SZABO: Yes.

15 CHAIRMAN STETKAR: -- you said that that is
16 accounting only for FLEX, what do you want to call it,
17 prevention or mitigation of FLEX before core melt. Is
18 that value based on Marty's event models?

19 MR. SZABO: No, that is --

20 CHAIRMAN STETKAR: It isn't?

21 MR. SZABO: -- just taking the ELAP
22 frequency --

23 CHAIRMAN STETKAR: Okay.

24 MR. SZABO: -- the highest ELAP frequency
25 and multiplying it times the highest bin MACCS

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1 individual latent cancer fatality risk. That's all we
2 did.

3 CHAIRMAN STETKAR: That's all that you did?

4 MR. SZABO: That's all we did, was just a
5 simple --

6 CHAIRMAN STETKAR: Okay. Because --

7 MR. SZABO: One over times another times
8 0.6 for FLEX is all we did, yes.

9 CHAIRMAN STETKAR: Okay.

10 MR. SZABO: Yes.

11 CHAIRMAN STETKAR: What I was trying to get
12 at is a lot of the human actions in Marty's models could
13 be characterized as core damage prevention rather than
14 post-core damage mitigation.

15 MR. SZABO: Yes.

16 CHAIRMAN STETKAR: And I wanted to make
17 sure we weren't playing games about which one were
18 toggled on or toggled off.

19 MR. SZABO: Yes, for the more detailed it
20 is promulgated throughout.

21 CHAIRMAN STETKAR: The 0.3, the 0.1?

22 MR. SZABO: Yes, the 0.3 and 0.1 are
23 promulgated in more detail, yes.

24 CHAIRMAN STETKAR: Yes, and those I think
25 we can go officially on record saying there's no basis

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1 whatsoever for those numbers. But that's a different
2 issue.

3 MR. SZABO: Yes.

4 CHAIRMAN STETKAR: Correct.

5 MR. SZABO: Yes.

6 CHAIRMAN STETKAR: Regarding what was done
7 to support that blue line, the 7E-08 one.

8 MR. SZABO: Yes.

9 CHAIRMAN STETKAR: Okay.

10 MEMBER SCHULTZ: Aaron, earlier; we don't
11 have a slide on it, but you went through fairly rapidly
12 the different major elements that were incorporated into
13 the evaluation here. And you mentioned that we got the
14 QHOs, and then you talked about total population dose
15 and also population relocation. So what were the
16 assumptions associated with that aspect of determining
17 the latent cancer risk?

18 MR. SZABO: So those were really
19 performance criteria that we're currently looking at.
20 So within the Commission SRM they directed us to look
21 at other performance criteria.

22 MEMBER SCHULTZ: Yes.

23 MR. SZABO: The way we've interpreted that
24 is if look at something, don't even look at individual
25 latent cancer fatality risk. Look at other things.

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1 MEMBER SCHULTZ: Right.

2 MR. SZABO: Right now we're at a rather
3 preliminary stage. We're thinking more of a definition
4 for the draft regulatory basis. What we were planning
5 for the performance criteria is we'll also look at the
6 total population dose. For example, defining what we
7 mean by total population dose, defining what some
8 success criteria could be. For instance, this is
9 nothing that staff has evaluated, but like let's just
10 say for example we would never want to allow more than
11 1,000 person rem to total population, just picking a
12 number out of the air.

13 So we are looking at potential success
14 criteria and kind of, okay, if we made that assumption,
15 which alternatives are we evaluating that could actually
16 meet that? Maybe they all could meet that. Maybe none
17 could meet that. And then as well as pros and cons. And
18 that was about the level we felt was appropriate for
19 the draft regulatory basis. Because we're kind
20 of in this area, my personal view is those are bringing
21 up a number of huge policy changes that the Commission
22 SRM did direct the staff, that if there's any policy
23 issues, we should bring it to the Commission. That, as
24 I said, personally this would probably be a point that
25 we could raise to the Commission, send up a SECY paper

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1 saying following the current safety goal policy
2 statement QHOs, it currently says nothing substantial.
3 We should stop. However, Commission, if you really want
4 us to continue with this effort, here are some
5 performance criteria we're kind of looking at.

6 It might even get to the point -- what I
7 would hope ideally, which I wouldn't expect, would be
8 that the Commission would say actually we think these
9 two performance criteria -- if they decided to deviate
10 from or create stricter thresholds, we think that these
11 two are kind of good ideas. Why don't you guys explore
12 those more as you're doing this rulemaking?

13 But one of the things that we've learned
14 I think as staff is that these are very big policy issues
15 that have a lot of implications well beyond BWR Mark
16 I and Mark IIs, that could at least have implications
17 beyond Mark I and Mark IIs. And so we get to that
18 question of should we be determining that policy before
19 we even continue moving forward on this rulemaking?
20 Maybe we can do it concurrently. But we haven't done
21 a lot in relation to that.

22 MEMBER RYAN: One question, if I may?

23 MR. SZABO: Yes.

24 MEMBER RYAN: It seems like you're
25 evaluating several different calculation strategies to

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1 come up with some representation of risk or dose, or
2 both. That's what it sounds like. So and then when you
3 get into the population dose, a lot of people, not many
4 people, population dose can go from nothing and mean
5 a lot to the three people that got exposed to going to
6 huge numbers and nobody cares because it's a million
7 people.

8 MR. SZABO: And that's part of the problem
9 with that performance criteria. I mean, and that's why
10 I'm saying we haven't really done --

11 MEMBER RYAN: So my point is it's really not
12 a performance criteria. It's simply a numeric. You
13 can't really make a performance criteria out of
14 something that ranges over the wide spectrum of risk
15 to an individual or the collective risk to a collection.
16 I'm struggling here.

17 MR. SZABO: I'm really stating we're
18 evaluating them right now.

19 MEMBER RYAN: Okay.

20 MR. SZABO: I mean, we're not at the point
21 that we would be recommending any single one. It's more
22 of these are things that we've come up with that could
23 potentially be used, understanding all of them have
24 their shortfalls. Like conditional containment
25 failure probability has a some potentially significant

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1 issues with it. I mean, they all happen to have various
2 pros and cons to them.

3 And that was part of the things that we would
4 be able to get, in my opinion, if we sent up a SECY paper,
5 things we'd be raising saying, hey, there's a lot of
6 history for a lot of these, too, where they've been
7 brought up in the past and the Commission has made
8 statements about them. So the idea, at least in my
9 opinion, would be to just kind of lay that out. And the
10 safety goal policy statements took a decade to finalize,
11 so personally I don't think it's something that we would
12 have the answer in six months.

13 MEMBER RYAN: Or a year or --

14 (Simultaneous speaking)

15 MR. SZABO: Yes, it's something that could
16 be --

17 MEMBER RYAN: No, I appreciate that.

18 MR. SZABO: Yes.

19 MEMBER RYAN: So to that end I guess my
20 thought at the moment from what you said is it's going
21 to be critically important to lay out all these various
22 -- I don't want to say options, but various scenarios
23 about when you could evaluate this and what the ups and
24 downs are of each one.

25 MR. SZABO: Yes. And so regardless of the

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1 path forward, even the draft reg basis, that would be
2 part of the pros/cons discussion of it in relation to
3 -- if the Commission decided we would move in that policy
4 direction, at least what are pros and cons of each of
5 these things? And once again, I think all of these would
6 require significant effort.

7 MR. MOHSENI: From a scoping -- I think Ed
8 is standing there. Ed, can you address that?

9 MR. FULLER: This is Ed Fuller in the Office
10 of Research. To directly answer the question you first
11 asked, as we are evaluating these various performance
12 criteria or performance measures, we are actually
13 considering what the acceptance criteria would be for
14 each one of them, and it's my own judgment that they
15 would be relative criteria to a baseline. And the
16 baseline of this case would most likely be that which
17 comes out when you do the so-called status quo analysis,
18 which in this case means a scenario where you have an
19 ELAP, you have no water addition, but you have a severe
20 accident capable wet well vent, okay, and when we would
21 strive to come up with acceptance criteria based on
22 reduction from what you get from that case.

23 MR. SZABO: But that has a lot of
24 overarching policy concerns as well, because when you're
25 always setting a new baseline and then how do you really

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1 define what --

2 MR. FULLER: I'm just trying to explain
3 what our working group is doing.

4 MEMBER RYAN: That's fine. Thank you.
5 That's very helpful.

6 MR. SZABO: So this is an example of the
7 Part 2 full evaluation alternatives. This is once again
8 only individual latent cancer fatality risk for reactor
9 year. There are similar charts for the other various
10 metrics. For instance, person rem, economic
11 consequences, and then the other metrics that would be
12 used from the benefit side would be fed into the
13 probabilities that --

14 CHAIRMAN STETKAR: But again, all of this
15 information is derived from Marty's analyses presuming
16 those 0.1 and 0.3 values and doing something with it,
17 right?

18 MR. SZABO: Yes.

19 MEMBER BLEY: Including the status quo?

20 MR. SZABO: The status quo for this one
21 does.

22 MEMBER BLEY: It does?

23 MR. SZABO: Yes.

24 MEMBER BLEY: It does?

25 CHAIRMAN STETKAR: For this chart?

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1 MR. SZABO: For this chart, yes.

2 CHAIRMAN STETKAR: My personal caution;
3 because this is a Subcommittee meeting and we can say
4 personal issues; this is not an ACRS caution, is that
5 if this type of information is going to be included in
6 the final regulatory analysis justification, you need
7 to explain this very, very carefully, because this
8 implies to me that an awful lot of detailed, very
9 rigorous, technically justified analysis was done to
10 support all of these wonderful conclusions here when
11 in fact it wasn't --

12 MR. SZABO: Yes.

13 CHAIRMAN STETKAR: -- because it has crude,
14 if that, estimates of human error performance and in
15 fact probably didn't even integrate the human error
16 performance correctly. So if you're using this to sort
17 of say look at all of the detailed technical analyses
18 that we did including an explicit figurative
19 uncertainties, in my opinion you ought not to do that
20 because it's misleading.

21 MR. SZABO: One of the reasons why I wanted
22 to present the slide was more just to get to the point
23 of the delta in relation to the -- just to show that
24 it is -- understanding that it may shrink or may
25 increase, probably not significantly advising like

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1 orders of magnitude between the alternatives and that
2 it's merely just a small portion of something that's
3 been -- the uncertainty analysis, while it includes
4 human error probabilities in MACCS is dominated by the
5 seismic uncertainty, which improving the human error
6 probabilities would not change.

7 CHAIRMAN STETKAR: on the other hand,
8 saying that the operators could not work at all with
9 no uncertainty under some of those seismic scenarios
10 could change some of those error bounds by a factor of
11 anywhere from 3 to 10. So that's my point is it's not
12 -- there's a broader sense of uncertainty here than just
13 what has been quantified by these error bounds, and that
14 is are the humans actually treated correctly within
15 those models? And that's one of the reasons why we had
16 requested this briefing, to kind of dig into that. And
17 we're skirting that issue.

18 But on the other hand the previous
19 comparison that you showed said that it doesn't make
20 any difference. So all of this detail doesn't make any
21 different. My only personal caution is that if you show
22 all of this detail, don't try to assign too much
23 confidence in the fact that any of these things represent
24 reality regardless of what uncertainty or within the
25 context the source of that uncertainty.

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1 MR. MOHSENI: Noted. I think we will have
2 the -- if you --

3 CHAIRMAN STETKAR: it's a strong caution,
4 but that's my personal caution.

5 MR. MOHSENI: Proper cautionary statements
6 would be used should we rely on the charts, but clearly
7 the original chart that you mentioned, it was intended
8 to say even under the --

9 CHAIRMAN STETKAR: To me personally,
10 that's a very compelling argument.

11 MR. MOHSENI: Yes.

12 CHAIRMAN STETKAR: This to me personally is
13 prone to misinterpretation, extreme misinterpretation.

14 MEMBER BLEY: Or getting picked apart
15 by --

16 (Simultaneous speaking)

17 CHAIRMAN STETKAR: Or getting picked
18 apart.

19 MEMBER BLEY: -- who has some other reason
20 to pick it apart.

21 Just one other -- I agree with John, but
22 just for the graphic, I think I know what you're trying
23 to show, but that black box that says "risk reduction"
24 and the double-ended yellow arrow doesn't -- I don't
25 know what the heck that means.

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1 MR. SZABO: Oh, yes, it's just supposed to
2 be from the red --

3 MEMBER BLEY: I'd almost get rid of -- I
4 would get rid of it unless you can make it more clear
5 what you're trying to show.

6 MR. SZABO: Okay. Yes, it was just
7 supposed to be from the -- because we take means of
8 everything for regulatory analysis. We're just showing
9 the mean of what we're calling here codify EA-13-109.
10 It's really making generically applicable EA-13-109,
11 which is the same as status quo and --

12 MEMBER BLEY: Just a suggest.

13 MR. SZABO: Yes, okay.

14 MEMBER BLEY: You could draw a little line
15 across between the mean on the left and one of the others,
16 and then draw an arrow between that to say this little
17 distance is the risk reduction. I mean, just if I look
18 at that it doesn't say what I know you're trying to say.

19 MR. SZABO: Yes, okay.

20 MEMBER BLEY: So either clean it up or get
21 rid of it, or live with it and get questions.

22 MR. SZABO: Okay.

23 CHAIRMAN STETKAR: And you will get
24 questions on that chart --

25 MR. SZABO: It kind of --

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1 CHAIRMAN STETKAR: -- without an awful lot
2 of qualifications.

3 MR. SZABO: Well, that kind of leads to what
4 our path forward is, which is we do have an office-level
5 steering committee on these potential options listed
6 below, but there may be some permutations of them. And
7 really the options are do we send up a SECY paper before
8 we publish any draft regulatory basis, understanding
9 that if we chose that option we would of course give
10 the option for the ACRS to comment on it as well as have
11 a public meeting, or do we wait until -- do we publish
12 this draft regulatory basis without -- at least right
13 now it wouldn't have been with any recommendations. Go
14 through the 45-day public comment period. Take those
15 comments and then not -- the Commission would only be
16 informed in an information paper for the final
17 regulatory basis discussion.

18 As you mentioned, as we go towards the full
19 evaluation aspect of Part 2 the chart on slide 8 becomes
20 -- or the information that is represented within the
21 chart on slide 8 becomes more and more important and
22 thus would need to be able to stand to more and more
23 rigor. And so, that is really the position we are right
24 now. And as I said, personally I believe we do have a
25 policy issue on our hands that would best be resolved

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1 by the Commission to at least help the staff in a path
2 forward.

3 So I'm hoping we at least send something
4 up to ask the Commission if they want to reaffirm the
5 QHOs and stop this rulemaking, everything except for
6 making generically applicable EA-13-109, which if that
7 was the path and depending on the timing of all of it
8 as well as the timing of the mitigation of
9 beyond-design-basis events rulemaking, it could even
10 be fit into that rulemaking if all we're doing is making
11 generically applicable EA-13-109. That's more of a
12 scheduling thing and a resource issue.

13 But these other alternatives going beyond
14 that could be stopped, or we could be getting this new
15 direction to look at to continue with what we're doing
16 to evaluate these other performance criteria, as I said,
17 hopefully with potentially some direction from the
18 Commission saying -- either narrowing down the six or
19 even hopefully picking one, but I doubt that, to help
20 guide the staff in how to consider all these
21 alternatives. And of course the other option would be
22 to just not continue the path forward.

23 MEMBER SCHULTZ: Am I understanding that
24 what is being proposed in option 2 is, in the light that
25 there are policy determinations being done, to move into

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1 a fully different way in which the risk would be
2 evaluated, that you would somehow be moving ahead with
3 this particular technical evaluation for this issue
4 while all of that decision making was ongoing rather
5 than make the decision as to whether we want to develop
6 a different policy for how we evaluate the circumstance?
7 And then if it makes sense based on the -- again, a first
8 round high-level evaluation of the issue and do that
9 once the policy decision is made?

10 MR. SZABO: So that is part of --

11 MEMBER SCHULTZ: I'm trying to --

12 MR. SZABO: Yes, so the second option is
13 more of just -- so right now let me explain what the
14 plan of the draft reg basis is --

15 MEMBER SCHULTZ: Yes.

16 MR. SZABO: -- is to have this full or more
17 complete evaluation of the alternatives, understanding
18 that there would be potential shortcomings of that
19 evaluation, have a discussion of the performance
20 criteria. As I said, a definition of pros, cons and some
21 potential performance criteria. And at least in my
22 opinion we wouldn't be able to make a recommendation
23 in the draft reg basis because we don't have -- it would
24 be more of here's a lot of information publicly we'd
25 like your comments on, understanding this is only a draft

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1 regulatory basis document.

2 And then for the final regulatory basis
3 document, after taking in all that information, as it's
4 going up as an information SECY -- well, the SRM directs
5 it's an information SECY. It could go up as
6 -- even just go up -- we can change it to a notation
7 vote SECY or as an information SECY have a recommendation
8 as to what the staff is going to move forward with for
9 a performance criteria and alternative. I mean, I
10 figure if we're changing performance criteria, it would
11 be likely we would have to change it to a notation vote
12 if we wanted -- I mean, because that would be, in my
13 opinion, a big policy change. But this is part of the
14 --

15 MEMBER SCHULTZ: You mentioned this in
16 discussion.

17 MR. SZABO: Yes.

18 MEMBER SCHULTZ: You said that if the
19 policy changes, this is not the only issue that the staff
20 and the Commission would have to redo, reawaken.

21 MR. SZABO: Potentially. I mean, that's
22 the real --

23 MEMBER SCHULTZ: An evaluation overall
24 would need to be constructed.

25 MR. SZABO: And that's why I personally

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1 think we should send it up as -- because I believe that
2 it becomes very difficult to limit it to just PWR Mark
3 I and Mark IIs, that we're talking about using different
4 performance criteria because it immediately raises the
5 question why are you applying this to these type of
6 containments and not to all containments? And so, as
7 I said, it's --

8 MEMBER SCHULTZ: I would think it would be
9 broader than that, because in the high-level evaluation
10 you've done; I agree with Dennis, this is not the right
11 way to determine the breadth of the yellow arrow band
12 there, but there's something that certainly is learned
13 in the evaluation that's done that frames the benefit
14 to be gained against one evaluation criterion that
15 provides good information about what benefit might be
16 achieved here. And one would think if you change the
17 metric evaluation you were doing it may not -- it
18 wouldn't appear that it would change the relative
19 benefit that would be gained for this class of reactors,
20 at least.

21 MR. SZABO: Yes, it would be --

22 MEMBER SCHULTZ: And it was determined, I
23 believe, in the Near-Term Task Force evaluation that
24 we should look at it first for the Mark I and Mark IIs
25 because of the circumstances of their design and as

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1 compared to the other reactor types. And so one would
2 expect if you're going to have a gain it would be seen
3 here first.

4 MR. SZABO: Yes. So we do have what would
5 really be the relative difference even if you looked
6 at in different lights. And of course the thing we
7 haven't discussed at all is actually the second part
8 of the backfit test, which is the cost benefit, which
9 we presented some preliminary -- well, I presented some
10 preliminary information at our last public meeting.
11 We're not surprisingly, orders of magnitude away from
12 being cost beneficial quantitatively.

13 So you get into this -- as I said, you would
14 -- with these new performance criteria it would -- if
15 you at least went with them, it would be more of saying
16 not to the -- I mean, it becomes very tricky, because
17 it's -- we're not saying it's adequate protection.

18 So then how do you get around still -- it's
19 still not being cost beneficial, but are you saying the
20 qualitative benefits of meeting this performance
21 criteria is enough to outweigh the difference in that
22 cost benefit, the two to three orders of magnitude that
23 it is? It gets to be very -- I mean, it's not an easy
24 thing to answer.

25 However, one of the performance criteria

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1 the Commission did recommend -- well, sorry, provided
2 as an example to evaluate was equipment and procedure
3 availability. That is currently within our -- we've
4 done that before. It's 50.54(hh)(2). That would not
5 be a deviation in policy in my mind. So if the staff
6 did decide to at least go within that idea, it would
7 not require a policy decision. That would just be
8 following the current policy.

9 MR. MOHSENI: We have a case here where
10 there's some quantitative screening done that would tell
11 us a lot about whether or not we add any substantial
12 safety value to proceed or not to proceed. It's very
13 tempting to try to get more information from various
14 angles, no question about it. But given where you are
15 in the scheme of things with Mark Is and Mark IIs, the
16 question on the table is does the NRC at some point say
17 this quantitative scoping is sufficient for us not to
18 pursue a certain strategy or not because we are -- we
19 continuously look for more.

20 And looking quantitatively tells us this:
21 Adding more qualitative features to this and trying to
22 expand performance criteria would certainly make it even
23 more difficult to make that decision because it doesn't
24 necessarily add up. You have various components. Here
25 you have latent cancer as a measure. And to that end

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1 the staff has done a scoping and resisted the temptation
2 of trying to build a Cadillac when you don't need it
3 to get to the decision of whether or not you want to
4 pursue this further.

5 And so that's where we're at. We
6 understand the limitations of what we have, but I think
7 it takes a little bit of, I don't know, a hard decision
8 to make to say how much is enough? Because we can do
9 more. We just don't have adequate resources. It will
10 take us another probably year or so to pursue and
11 continuously dig into this thing. But it seems like
12 it's unlikely that you will change the board message
13 you're getting here that you're going to add substantial
14 safety benefit by pursuing this further.

15 And, yes, we agree with the limitations.
16 We agree with the caveats, no question about it. Yes,
17 the science behind it is not as refined as you want to
18 actually go out there and open up the issue of the science
19 behind it as much as it is enough scoping assessment
20 to determine whether a next step is needed. A next step
21 would have taken you to something that you would be --

22 (Simultaneous speaking)

23 MEMBER BLEY: I think your scoping thing
24 looks good. Now, I haven't looked at all the details,
25 but it looks good. The trouble again with half a

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1 Cadillac or 98 percent of a Cadillac is if you didn't
2 put the distributor rotor in, it won't run and it can
3 get you into trouble.

4 MR. MOHSENI: Indeed.

5 MEMBER BLEY: Yes. It's nice to know more
6 about the hardware configurations, and you've got that,
7 but it isn't complete, so it's real dangerous to lean
8 on.

9 CHAIRMAN STETKAR: That's right. The real
10 danger is saying, well, look, we did this scoping -- as
11 you characterized, we did this scoping study and within
12 the context of that we can't justify it. But look, look,
13 look, we did this very sophisticated analysis that shows
14 we have these tremendously larger margins. That's the
15 danger. Because people then will look, look, look and
16 start poking holes and find the distributor isn't in
17 there, and maybe it even doesn't have any wheels.

18 MR. MOHSENI: Correct. But so just to try
19 to understand further your views on this, if we
20 maintained the messages contained here at the level that
21 we said the scoping really entails, which was we
22 maximized -- if you go back deep, we maximized the risk
23 from that kind of -- where actually filtration would
24 come in handy to reduce risk. We maximized the risk.
25 We gave the full benefit of this working from a human

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1 action standpoint post and we still didn't see a benefit
2 that gets even close from a latent cancer calculation,
3 right? That's the big picture.

4 Without trying to put too much emphasis on
5 the variation below this thing, as you mentioned, Dr.
6 Stetkar, if that is the kind of message that you believe,
7 from your reaction, that addresses such a strategy
8 sufficiently, we can package it appropriately, but the
9 content of it is we have this insight today and it's
10 very tempting to do more, significantly more, or do just
11 enough more so that it remains without -- we're not
12 claiming any more than what we have developed. We're
13 not adding more credibility to the pieces that are, as
14 you mentioned, not adequately explored. And yet you can
15 draw that conclusion that we are drawing that one could
16 say let's not pursue this further. Is that where you
17 are?

18 CHAIRMAN STETKAR: Again, you're looking
19 around the table as if we're --

20 MR. MOHSENI: No, it's good to know.

21 CHAIRMAN STETKAR: At a Subcommittee
22 meeting, you get feedback.

23 MR. MOHSENI: Understand. Understand.
24 It helps us kind of reframe our thinking to the extent
25 that I'm trying to understand. This is a very great

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1 opportunity for us. We haven't tested our thinking too
2 much outside our groups, and this is a great place to
3 actually see whether or not we need to refine this
4 calculation further or we have enough and it's a matter
5 of packaging better.

6 MEMBER BLEY: Well, it's a little hard for
7 me because I like good analysis and I'd really -- you
8 got so much done on it. I'd really love to see it
9 finished so you've got a better story to tell, but your
10 slide 7, if that's real, I can't point to something that
11 says there's strong reason why you ought to go ahead.
12 That's me.

13 MEMBER SCHULTZ: Except I would say there
14 is value in developing and presenting the risk reduction
15 element. And where you get that now is from this more
16 detailed analysis. And that's where we've expressed
17 concern about those assumptions that have been used in
18 that analysis being questions and poked at in order to
19 upset the entire picture. So if there were a way to frame
20 the potential risk reduction benefit in a different way
21 than presenting the total profile on slide 8, that would
22 be valuable.

23 MEMBER BLEY: One thing you could do, and
24 it's what you ended up doing, what staff ended up doing
25 on the spent fuel pool study, is to say if things worked

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1 in this way, here's what the answer would be, instead
2 of saying I've got an integrated PRA that covers
3 everything. Here's where we are without anything. And
4 if the operators do these things, here where it is. Now
5 there's only some probability that that happens, so you
6 can't get this full change.

7 MEMBER SCHULTZ: In other words, work it
8 down from the --

9 MEMBER BLEY: You could do essentially a
10 sensitivity study.

11 CHAIRMAN STETKAR: You have to sell that
12 pretty carefully though because you have to be
13 really --

14 MEMBER BLEY: But you have to be very
15 careful about what you say --

16 CHAIRMAN STETKAR: -- really careful about
17 how --

18 MEMBER BLEY: -- because it's very easy to
19 misunderstand if they get challenged.

20 CHAIRMAN STETKAR: Because people will
21 say, well, what confidence do you have in that? And
22 suddenly you get into arguments about the numbers and
23 you're pulled away from the overall conclusions. It's
24 a very, very difficult task to explain that context
25 without -- because quite honestly, we're engineers and

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1 we like to be very specific about things, and it's a
2 very difficult task to explain that in the appropriate
3 context without suddenly focusing on things that may
4 not be necessary to focus on.

5 MEMBER REMPE: Out of curiosity; this is
6 the first time I heard the 60 percent success for the
7 deployment of FLEX assumption today, could you talk a
8 little bit about why you picked 60 percent instead of
9 50 percent or 90 percent? What was the basis for --

10 MR. MOHSENI: We anticipated that
11 question, so that's good.

12 MEMBER REMPE: Oh, good. Okay.

13 MR. MOHSENI: So, Bill, do you want to
14 address that, or anyone else in the audience?

15 MR. SZABO: I can talk a little bit to it,
16 since Bill is --

17 (Simultaneous speaking)

18 MR. SZABO: Well, the reason why 60 was
19 picked for the high-level conservative is more that it
20 is consistent with Marty's 0.3 and 0.1, understanding
21 that, but it's more of the fact of what's being done
22 for the human factor scoping in relation to the EA-12-049
23 and the fact that there will be a reevaluation based
24 on the seismic information from the Recommendation 2.1,
25 that we believe that that was a conservative enough

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1 assumption for the use of -- for FLEX within this -- for
2 the high-level conservative estimate.

3 MR. MOHSENI: Do you guys want to add
4 anything? Marty? Bill?

5 MR. RECKLEY: Bill Reckley, NRR. I would
6 just add that you have to make assumptions for this
7 analytical work. And one of the things in terms of
8 communicating that we wanted to make clear was these
9 are analytical assumptions and not to confuse that with
10 the implementation of FLEXes or mitigating strategies
11 as it's currently being done in the field for people
12 to make any confusion that we would go out and say, oh,
13 it looks like this will work 60 percent of the time.
14 That's good enough for us, right?

15 As you go into these assessments, and
16 especially in these severe accident sequences where
17 operators will be going out and doing operations outside
18 of the control room, there is some probability that
19 errors will be made and that has to get reflected in
20 this analysis.

21 So I don't really have anything to add on
22 how we modeled it within these scoping studies, but I
23 did just want to exercise the caution for no one to
24 confuse what we're doing in terms of compliance with
25 a regulation with how that gets mapped over into

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1 regulatory analyses. I mean, there's a relationship,
2 but not -- just a caution.

3 CHAIRMAN STETKAR: And still, I look at
4 this is the most compelling that we've seen. If that
5 blue line is uniformly reduced by a factor of whether
6 it's 0.4 or 0.6, because I didn't pay any attention,
7 does it really make any difference to the overall
8 conclusion?

9 MR. MOHSENI: Correct.

10 CHAIRMAN STETKAR: Because, fine, double
11 it.

12 MR. MOHSENI: Correct.

13 CHAIRMAN STETKAR: It's not that you took
14 99.99 percent credit for the operators to prevent core
15 damage, which then would call into question about where
16 is that blue line relative to the green --

17 MR. MOHSENI: Yes.

18 CHAIRMAN STETKAR: -- because this is not
19 sensitive to what the core damage frequency is, nor is
20 the issue at hand sensitive to the core damage frequency
21 in that sense. In some sense it doesn't depend too much
22 provided that the number wasn't 0.99999 for success on
23 exactly where that blue line is, because it's well below
24 where the green line is.

25 MR. MOHSENI: Yes. Well said. Thank you.

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1 I think that helps with putting things in context so
2 that -- you know, you don't sharpen the pencil if you
3 don't have to.

4 MR. SZABO: And I forgot to mention this,
5 just one quick -- there are no prompt fatalities.
6 That's why we're only looking at latent cancer
7 fatalities.

8 CHAIRMAN STETKAR: Yes, it's probably good
9 to put that on the record.

10 MR. SZABO: Yes.

11 (Laughter)

12 CHAIRMAN STETKAR: Comes as an
13 afterthought, but --

14 MR. SZABO: Yes.

15 (Laughter)

16 CHAIRMAN STETKAR: -- that's important.

17 MEMBER SCHULTZ: So, Aaron, going back to
18 the comment earlier about the band if improvement, we'll
19 want to represent that. I guess logic would say if you
20 stick with this diagram, then it's going to be
21 insignificant if one can put an individual's frame of
22 mind into the more detailed 5 to 95 band. Of course that
23 bar would be insignificant if one applied it to the
24 high-level conservative estimate. It wouldn't show up
25 on this chart, and it's certainly not going to provide

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1 a benefit that's in a sense reasonably measurable with
2 this metric. Still I'll leave that to you to think
3 about.

4 MR. SZABO: Yes.

5 MEMBER SCHULTZ: Just going back to option
6 2 again and trying to understand why it's being framed
7 in the way it is, I presume it's because of the SRM that's
8 been provided to say look at other things as well.

9 MR. SZABO: Yes.

10 MEMBER SCHULTZ: Given that you've done the
11 evaluation to make a recommendation of option 1, it seems
12 like the discussion would cause one to fall to an option
13 3, which would be if one wants to examine the way we
14 do our business and determine whether we should do it
15 differently, that should be done outside of this
16 rulemaking. And of course that decision could be made
17 at any time, but to suggest that an option 2 is to combine
18 it with a rulemaking doesn't make sense to me.

19 MR. SZABO: Well, this is just more of
20 -- and once again, the options might not be limited.
21 This was more of -- the real question that's going to
22 be to the office-level steering committee is should we
23 kind of put this on hold and send up a SECY paper --

24 MEMBER SCHULTZ: Yes.

25 MR. SZABO: -- is really the bottom line,

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1 really the two differences. One is we're not going to
2 send up a SECY paper saying here's what our preliminary
3 analysis is, here's some decision criteria. I mean,
4 once again, I don't know what the SECY paper would say.
5 This is my personal opinion as to what it would have.
6 It would say here's some performance criteria. By the
7 way, we might need to -- if we chose any of these,
8 Commission, we'd probably need to do that. Here's your
9 options. We can either do it with the rulemaking or
10 before the rulemaking, so that would put the rulemaking
11 on hold even longer to just resolve any of these policy
12 things.

13 Or the second option is we just continue
14 with the draft reg basis, put it out for comments and
15 then the final reg basis will end up going to the
16 Commission as an information paper and what that will
17 look like. And I do not know. It will all depend on
18 public comments. And I don't know, maybe after the
19 draft reg basis the Commission sees it and says, no,
20 now we want a paper. I mean, I don't know what the --

21 MEMBER SCHULTZ: Yes.

22 MR. SZABO: But that's kind of just the two
23 -- that's really the way to think of these two options,
24 is whether to kind of put the draft reg basis on hold
25 and send up a SECY paper or whether we just continue

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1 with the draft reg basis.

2 MEMBER SCHULTZ: Right.

3 MR. SZABO: And all of this will be directed
4 -- to make that determination. You've heard my part.

5 MEMBER SCHULTZ: Appreciate that. The
6 other question I had was in our last meetings we had
7 a lot of discussion -- it's on the record, but we had
8 a lot of discussion related to work that has been done
9 by the staff and by industry to determine ways in which
10 both prevention and mitigation of an event were to happen
11 could be achieved and trying to determine both
12 qualitatively and quantitatively what could be done.
13 What procedures would be in place? What can be done?
14 And from that, at least in our meetings, I think most
15 of us took away; not all of us took away, the fact that
16 this was providing great benefit to our understanding
17 of the events and the circumstances and what could be
18 done with regard to prevention and mitigation. How is
19 that being captured?

20 MR. SZABO: So the working group level
21 discussion; and I'll keep it at that level, is that
22 decision will need to be made at a high level. The idea
23 was, at least by initial discussions was potentially
24 research would continue with the work outside of this
25 rulemaking, if this rulemaking for instance was -- let's

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1 say we sent up the SECY paper. They say it's not
2 substantial. Stop the work. But we do have all this
3 great work that's been done. That is outside out of this
4 rulemaking and it's potentially a separate research
5 project that could be continued. But at least in
6 relation to this it would be separated from this decision
7 making.

8 MEMBER SCHULTZ: Yes.

9 CHAIRMAN STETKAR: That's why I asked Aaron
10 about -- want to really clear that I understand what
11 of the models that we saw were incorporated here, because
12 you're right, those models better integrate the
13 prevention and mitigation. They in some sense answered
14 Joy's question about what's the basis for your 0.6, or
15 whatever number it is, for the FLEX because the FLEX
16 is built into those models, as is the post-core damage
17 mitigation aspects of --

18 (Simultaneous speaking)

19 MEMBER SCHULTZ: That's right.

20 CHAIRMAN STETKAR: But again, for the issue
21 at hand it would be really interesting to complete that
22 --

23 MEMBER SCHULTZ: That's right.

24 CHAIRMAN STETKAR: -- analysis well.

25 MEMBER SCHULTZ: It would.

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1 CHAIRMAN STETKAR: It certainly would.
2 From a research perspective the question is is it needed
3 for this particular activity?

4 MR. MOHSENI: And that's important for us
5 to note that there are other issues associated, but not
6 necessarily feeding into this decision and not coupling
7 it with this, because otherwise efficiency-wise we lose
8 a lot. But nonetheless, based on their own merits it
9 can be pursued. But our purpose really is to move into
10 a -- I would say have the regulatory courage that when
11 the data, when the calculations don't support a certain
12 thing to say we did it. It's not getting us any
13 substantial benefit and let's stop at least this
14 activity. But it doesn't mean you stop everything else,
15 but at least this one comes to a reasonable end. And
16 I know Ed is up there going to say something about --

17 MR. FULLER: Yes, this is Ed Fuller again.
18 I just want to put on the record the fact that we still
19 have Tier 3 items on the NRC's plate related to these
20 issues with respect to other containment designs and
21 also one related to how one deals with hydrogen
22 production and possible combustion. These items are a
23 natural extension of what we've been doing now for the
24 Mark I and Mark II containments, and therefore any
25 research that we've done to date provides part of a

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1 database and ways to go about getting the rest of the
2 database.

3 CHAIRMAN STETKAR: Thanks, Ed. That's
4 important.

5 MEMBER BLEY: Yes, I think it is. And I'd
6 almost add another to it. For other issues licensees
7 may do something and make some models that are related
8 to this work, and if staff had a model of a well-done
9 analysis as kind of a baseline for reviewing submittals,
10 it could be very helpful, too. But that's a separate
11 thing from what you guys are doing right now. I think
12 there are lots of good reasons to finish that and do
13 it well.

14 CHAIRMAN STETKAR: I think there are,
15 but --

16 MEMBER BLEY: But it's not --

17 CHAIRMAN STETKAR: -- not necessarily --

18 MEMBER BLEY: -- necessarily for this.

19 CHAIRMAN STETKAR: -- in the context that
20 we're meeting today.

21 MR. FULLER: This is Ed Fuller again.
22 Something else just occurred to me. We have another
23 rule going on; some of the people involved are in this
24 room, and that's the mitigation of beyond-design-basis
25 events rule. I won't pronounce the acronym today.

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1 However, one of the aspects of it is to include Severe
2 Accident Management Guidelines. And when you do that,
3 you're laying yourself open to what are the guidelines
4 talking about? What kinds of severe accident
5 phenomena? What kinds of candidate high-level actions,
6 etcetera, etcetera? And all of this work certainly
7 provides insights to better understand that.

8 MR. SZABO: And just to add onto that, part of this
9 SECY paper could also set the framework for evaluating
10 all other post-Fukushima actions in light of this either
11 reaffirmed policy or different direction we would get,
12 but would help direct the staff, whether it be SAMGs
13 or other potential post-Fukushima actions.

14 CHAIRMAN STETKAR: Any more questions for
15 the staff?

16 (No audible response)

17 CHAIRMAN STETKAR: If there are not, what
18 I'd like to do first is ask if we have anyone in the
19 room who'd like to make a comment. We'll entertain that
20 now. We're getting the bridge line open to see if
21 there's anyone out on the bridge line.

22 (No audible response)

23 MEMBER SCHULTZ: John, the question we
24 didn't ask with regard to the path forward is the when.
25 When might this happen. I guess, Abe, that would be for

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1 you, not for Aaron, unless you're doing it next week.

2 MR. MOHSENI: So a condition for his
3 departure is to finish this.

4 MR. SZABO: Yes. We are planning on
5 scheduling a meeting for December 11th, so we are going
6 to have the meeting with our officer directors before
7 that.

8 MEMBER SCHULTZ: Okay. Thank you.

9 CHAIRMAN STETKAR: I believe that we have
10 the bridge line open, and for those of you who don't
11 do this regularly, we will demonstrate our
12 sophistication of the technology. If there's someone
13 out there, could you just please say hello so that we
14 confirm it's open? We have no way in this room to
15 determine that it's open.

16 PARTICIPANT: Hello.

17 CHAIRMAN STETKAR: Thank you very much.
18 It is open. Now I can do all the things I need to do.

19 If there is someone out there who would like
20 to make a comment, could you please identify yourself
21 and do so?

22 (No audible response)

23 CHAIRMAN STETKAR: Hearing none, thank you
24 all.

25 With that, as we usually do in a

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1 Subcommittee meeting, what I'd like to do is go around
2 the table and see if any of the members have any final
3 comments or items that they'd like to raise. Steve?

4 MEMBER SCHULTZ: Well, I want to thank the
5 staff for the presentation and also the thought process
6 that's gone forward in this discussion today, and the
7 results have certainly provided a good framework for
8 that discussion.

9 The two pictures that you showed, one, the
10 first one, the one that displays the general results
11 and the more -- I call it the high-level results of the
12 more detailed evaluation again would demonstrate that
13 it is time to move forward and discuss what the next
14 step ought to be in terms of the communication of these
15 results.

16 We've also had a lot of discussion here and
17 in previous meetings related to the benefit of
18 developing the techniques and approaches for the
19 evaluation in a more detailed way addressing those
20 features of evaluation to perform a probabilistic risk
21 assessment evaluation that is fully supportable,
22 speaking in particular about human performance and
23 putting us in a position where we could provide better
24 technical support for the evaluations we perform.

25 Because here's one example where we've had an

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1 outcome that looks as if it's presentable given the
2 evaluation we've done. it's not the last one and it's
3 not the only one. Especially if we get into evaluating
4 other types of criteria that might be proposed, it's
5 not at all clear that those wouldn't require detailed
6 evaluation techniques that we would like to be able to
7 support.

8 So I would certainly encourage the staff to
9 figure ways to get over those hurdles that are preventing
10 us from providing a very robust and detailed calculation
11 we can believe in and present. But in terms
12 of the discussion, it's been very helpful for me today.

13 CHAIRMAN STETKAR: Thank you. Dennis?

14 MEMBER BLEY: No further comments.

15 CHAIRMAN STETKAR: Mike?

16 MEMBER RYAN: Nothing additional. Thank
17 you.

18 CHAIRMAN STETKAR: Ron?

19 MEMBER BALLINGER: Nothing additional.

20 CHAIRMAN STETKAR: Joy?

21 MEMBER REMPE: Not really. I concur with
22 the staff on the decision to split the rulemaking from
23 the other analysis.

24 And I wanted to wish Aaron good luck in his
25 career. And that's it.

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1 CHAIRMAN STETKAR: Thank you. And I don't
2 have anything else to add. I'd like to thank you. I
3 think this was very, very worthwhile. I think the
4 discussion was worthwhile.

5 And this is for you, Aaron, since you got
6 skewered going into the meeting. In my seven years and
7 couple of months on the Committee I sat in on a lot of
8 Subcommittee meetings. I believe this is the shortest
9 one that I've sat in on.

10 (Laughter)

11 CHAIRMAN STETKAR: Congratulations,
12 Aaron. On that high note, we are adjourned.

13 (Whereupon, the above-entitled matter went
14 off the record at 2:18 p.m.)

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Containment Protection and Release Reduction for Boiling Water Reactors with Mark I and Mark II Containments (CPRR) Rulemaking: Options for Disposition

ACRS PRA Subcommittee Meeting

November 19, 2014

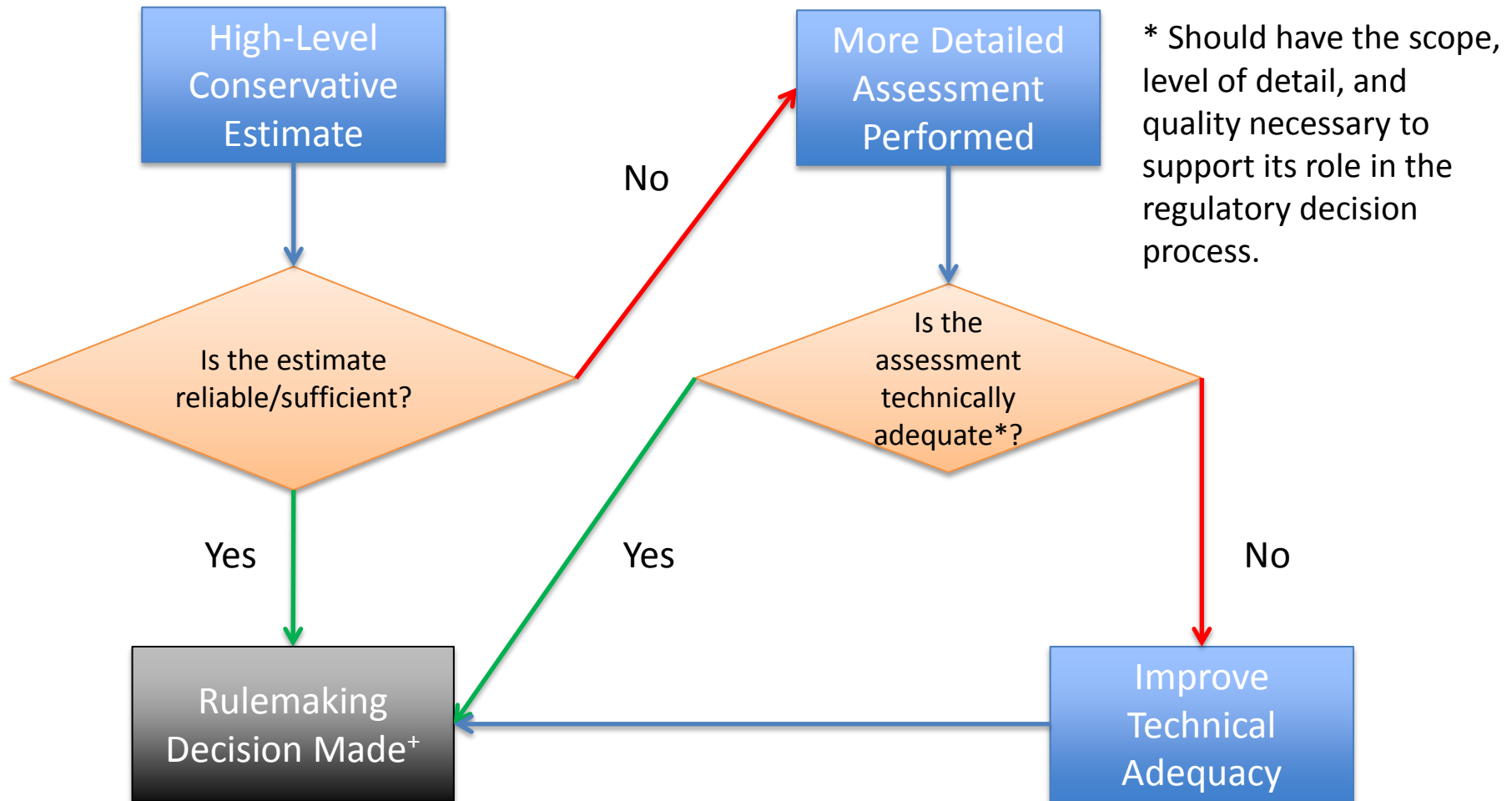
Agenda

- Background
- Process for CPRR rulemaking
- Purpose of risk evaluation
 - Part 1: Substantial safety enhancement
 - Part 2: Full evaluation of alternatives
- Path forward

Background

- SECY-12-0157
 - Recommended filters based on qualitative considerations
- SRM-SECY-12-0157
 - Ensure that performance and risk of filtering strategies and filters are fully evaluated
 - Fully explore requirements associated with measures to enhance the capability to maintain containment integrity and to cool core debris (i.e., severe accident water addition (SAWA))
 - Examine multiple performance criteria
 - Any policy issues should be raised to Commission
 - Develop separate paper on use of qualitative considerations

Process for CPRR rulemaking: Options for Disposition



+ Considers quantitative and qualitative information, as appropriate.

Purpose of the Risk Evaluation

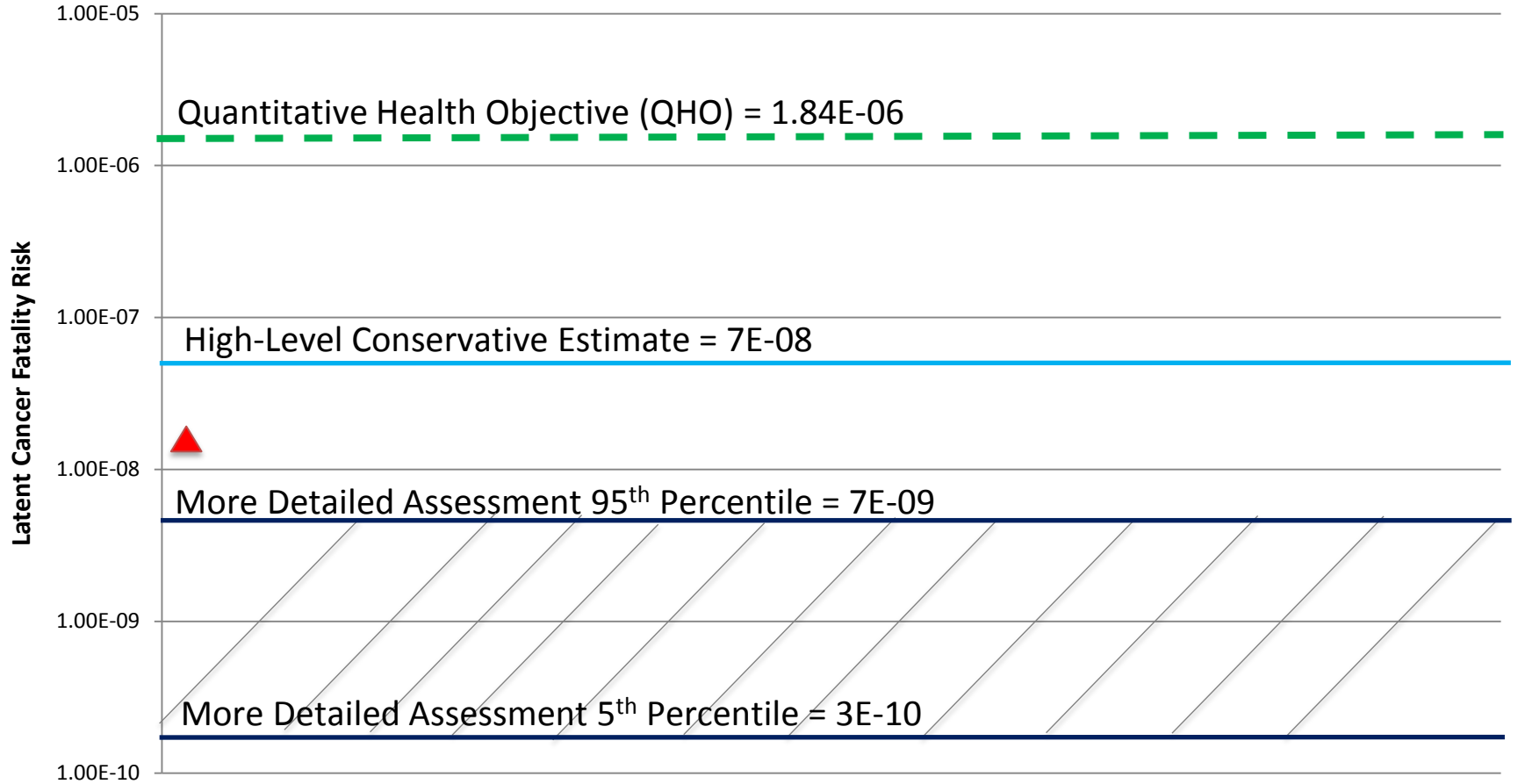
- Part 1: Is it a Substantial Safety Enhancement?
 - High-level conservative estimate
 - More-detailed assessment
 - Could suffice for the backfit/regulatory analysis
- Part 2: Full evaluation of alternatives per Commission direction

Assumptions for High-Level Conservative Estimate

- Highest ELAP frequency of BWR Mark I and II
- Highest conditional individual latent cancer fatality risk (ILCFR) release
- Highest habitability criterion

- Provides conservative estimate of possible benefit of any CPRR rulemaking alternative

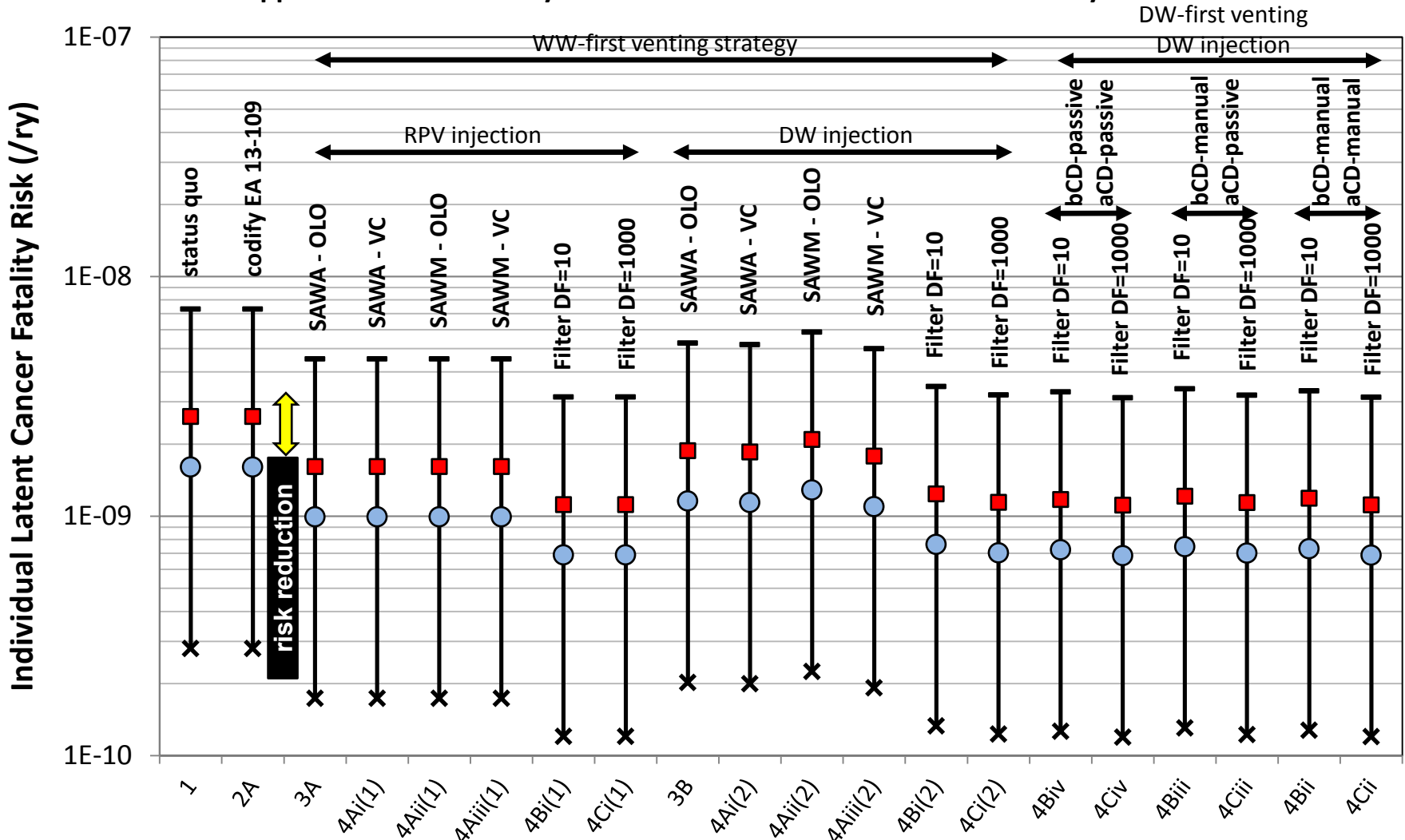
Part 1: Suggests that No CPRR Rulemaking Alternative can be a Substantial Safety Enhancement



 = Expedited Spent Fuel Pool (conservative estimate)

Part 2: Full Evaluation of Alternatives

Approximate Uncertainty Bounds for Individual Latent Cancer Fatality Risk



OLO = open and leave open vent
 VC = vent cycling
 b = before core damage
 a = after core damage

✕ 5th percentile ● median ■ mean — 95th percentile

Path Forward

- Brief Office Level Steering Committee on potential options, including, but not limited to:
 - Option 1: Use preliminary regulatory analysis calculations to conclude that rulemaking for additional requirements (i.e., not including EA-13-109) is not necessary and seek Commission approval
 - Option 2: Continue to explore alternatives within the rule (using qualitative considerations and different decision criteria) and develop rulemaking package for Commission review and approval