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NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

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RELIABILITY AND PROBABILISTIC RISK ASSESSMENT (PRA)

SUBCOMMITTEE MEETING

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WEDNESDAY

NOVEMBER 19, 2014

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ROCKVILLE, MARYLAND

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

STEPHEN P. SCHULTZ, Member

DESIGNATED FEDERAL OFFICIAL:

JOHN LAI

T-A-B-L-E O-F C-O-N-T-E-N-T-S

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.

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

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

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

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

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

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

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

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

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

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

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

(Laughter)

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

(Laughter)

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

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

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

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

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

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

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

Some specifics for the rulemaking; these are paraphrased from the SRM, is to 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. This has been called severe accident water addition or SAWA. You've probably heard that in various meetings. They directed us to examine multiple performance criteria. They gave two examples within the SRM. One was decontamination factor. One was equipment and procedure availability similar to 50.54(hh).

We are currently looking at six performance

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

MEMBER BLEY: So explain a little more

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

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

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

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

CHAIRMAN STETKAR: Operator actions.

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

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

CHAIRMAN STETKAR: No actions?

MR. SZABO: No actions post-core damage.

CHAIRMAN STETKAR: Post?

MR. SZABO: Post-core damage, yes.

CHAIRMAN STETKAR: Post-core damage?

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

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

MR. SZABO: Yes.

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

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

MR. SZABO: Pre-core damage, yes.

CHAIRMAN STETKAR: -- pre-core damage.

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

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

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

MEMBER SCHULTZ: Oh, in that fleet?

(Simultaneous speaking)

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

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

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

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

MR. SZABO: Yes. Yes.

MEMBER BLEY: -- use those words.

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

MR. BARR: Yes, this is the --

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

CHAIRMAN STETKAR: Come up to the mic and --

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

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

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

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

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

MR. BARR: I suppose.

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

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

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

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

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

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

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

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

MR. BARR: Well, the --

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

MR. BARR: Right, the releases would last

for 72 hours.

MEMBER REMPE: Seventy-two? Okay.

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

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

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

agreed with that fact.

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

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

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

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

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

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

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

MR. SZABO: Yes.

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

MR. SZABO: No, that is --

CHAIRMAN STETKAR: It isn't?

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

CHAIRMAN STETKAR: Okay.

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

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

CHAIRMAN STETKAR: That's all that you did?

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

CHAIRMAN STETKAR: Okay. Because --

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

CHAIRMAN STETKAR: Okay.

MR. SZABO: Yes.

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

MR. SZABO: Yes.

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

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

CHAIRMAN STETKAR: The 0.3, the 0.1?

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

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

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

MR. SZABO: Yes.

CHAIRMAN STETKAR: Correct.

MR. SZABO: Yes.

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

MR. SZABO: Yes.

CHAIRMAN STETKAR: Okay.

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

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

MEMBER SCHULTZ: Yes.

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

MEMBER SCHULTZ: Right.

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

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

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

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

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

MEMBER RYAN: One question, if I may?

MR. SZABO: Yes.

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

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

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

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

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

MEMBER RYAN: Okay.

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

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

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

MEMBER RYAN: Or a year or --

(Simultaneous speaking)

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

MEMBER RYAN: No, I appreciate that.

MR. SZABO: Yes.

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

MR. SZABO: Yes. And so regardless of the

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

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

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

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

define what --

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

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

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

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

MR. SZABO: Yes.

MEMBER BLEY: Including the status quo?

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

MEMBER BLEY: It does?

MR. SZABO: Yes.

MEMBER BLEY: It does?

CHAIRMAN STETKAR: For this chart?

MR. SZABO: For this chart, yes.

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

MR. SZABO: Yes.

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

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

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

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

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

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

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

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

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

MR. MOHSENI: Yes.

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

MEMBER BLEY: Or getting picked apart by --

(Simultaneous speaking)

CHAIRMAN STETKAR: Or getting picked apart.

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

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

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

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

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

MEMBER BLEY: Just a suggest.

MR. SZABO: Yes, okay.

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

MR. SZABO: Yes, okay.

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

MR. SZABO: Okay.

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

MR. SZABO: It kind of --

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

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

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

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

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

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

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

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

MR. SZABO: So that is part of --

MEMBER SCHULTZ: I'm trying to --

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

MEMBER SCHULTZ: Yes.

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

regulatory basis document.

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

MEMBER SCHULTZ: You mentioned this in discussion.

MR. SZABO: Yes.

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

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

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

MR. SZABO: And that's why I personally

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

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

MR. SZABO: Yes, it would be --

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

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

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

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

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

However, one of the performance criteria

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

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

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

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

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

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

(Simultaneous speaking)

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

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

MR. MOHSENI: Indeed.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

MEMBER BLEY: You could do essentially a sensitivity study.

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

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

CHAIRMAN STETKAR: -- really careful about how --

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

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

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

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

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

MEMBER REMPE: Oh, good. Okay.

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

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

(Simultaneous speaking)

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

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

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

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

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

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

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

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

MR. MOHSENI: Correct.

CHAIRMAN STETKAR: Because, fine, double it.

MR. MOHSENI: Correct.

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

MR. MOHSENI: Yes.

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

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

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

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

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

MR. SZABO: Yes.

(Laughter)

CHAIRMAN STETKAR: Comes as an afterthought, but --

MR. SZABO: Yes.

(Laughter)

CHAIRMAN STETKAR: -- that's important.

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

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

MR. SZABO: Yes.

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

MR. SZABO: Yes.

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

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

MEMBER SCHULTZ: Yes.

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

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

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

MEMBER SCHULTZ: Yes.

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

with the draft reg basis.

MEMBER SCHULTZ: Right.

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

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

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

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

MEMBER SCHULTZ: Yes.

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

(Simultaneous speaking)

MEMBER SCHULTZ: That's right.

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

MEMBER SCHULTZ: That's right.

CHAIRMAN STETKAR: -- analysis well.

MEMBER SCHULTZ: It would.

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

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

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

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

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

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

CHAIRMAN STETKAR: I think there are, but --

MEMBER BLEY: But it's not --

CHAIRMAN STETKAR: -- not necessarily --

MEMBER BLEY: -- necessarily for this.

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

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

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

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

CHAIRMAN STETKAR: Any more questions for the staff?

(No audible response)

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

(No audible response)

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

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

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

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

MEMBER SCHULTZ: Okay. Thank you.

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

PARTICIPANT: Hello.

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

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

(No audible response)

CHAIRMAN STETKAR: Hearing none, thank you all.

With that, as we usually do in a

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

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

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

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

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

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

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

CHAIRMAN STETKAR: Thank you. Dennis?

MEMBER BLEY: No further comments.

CHAIRMAN STETKAR: Mike?

MEMBER RYAN: Nothing additional. Thank you.

CHAIRMAN STETKAR: Ron?

MEMBER BALLINGER: Nothing additional.

CHAIRMAN STETKAR: Joy?

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

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

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

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

(Laughter)

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

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

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

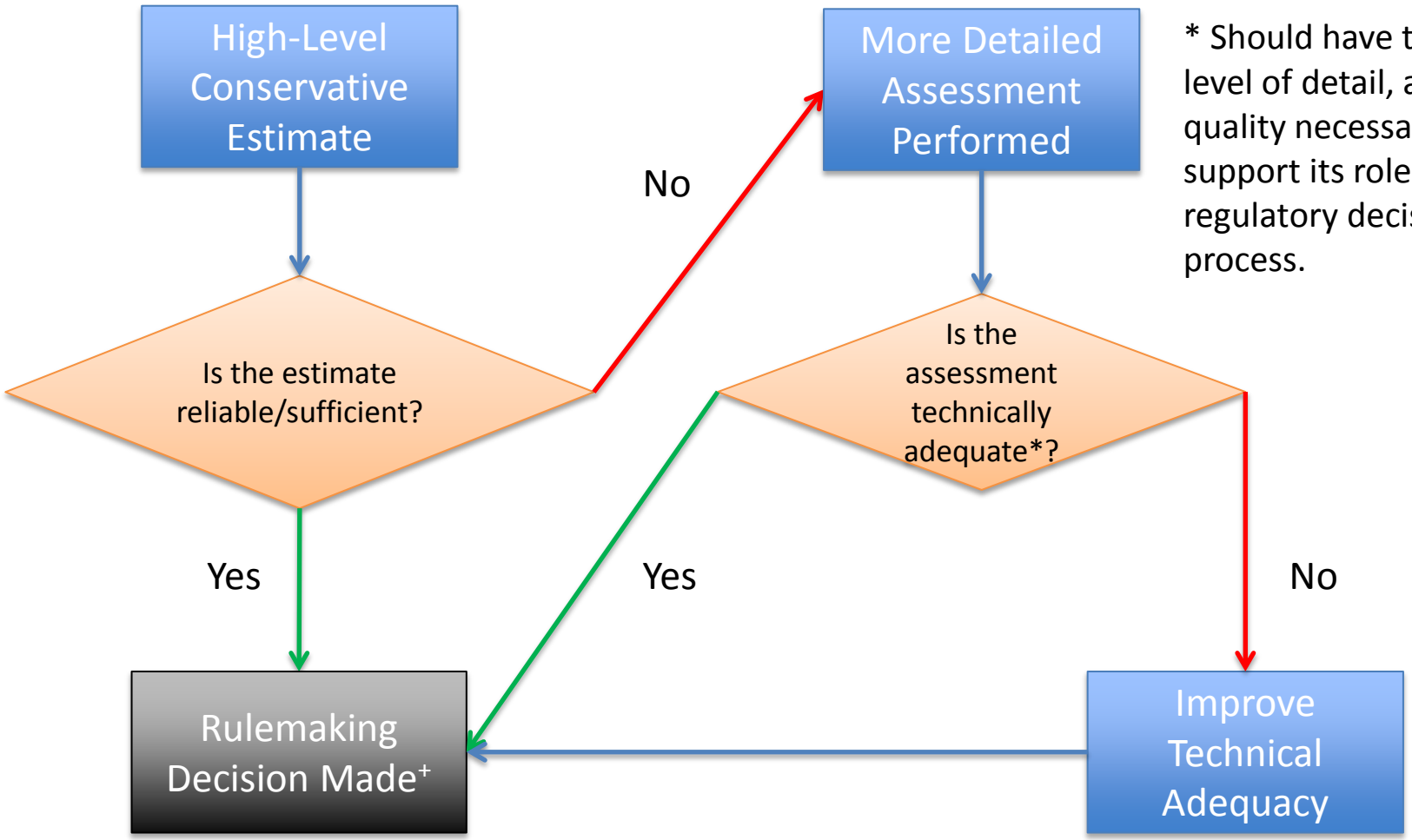
Agenda

- 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



* Should have the scope, level of detail, and quality necessary to support its role in the regulatory decision process.

+ 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

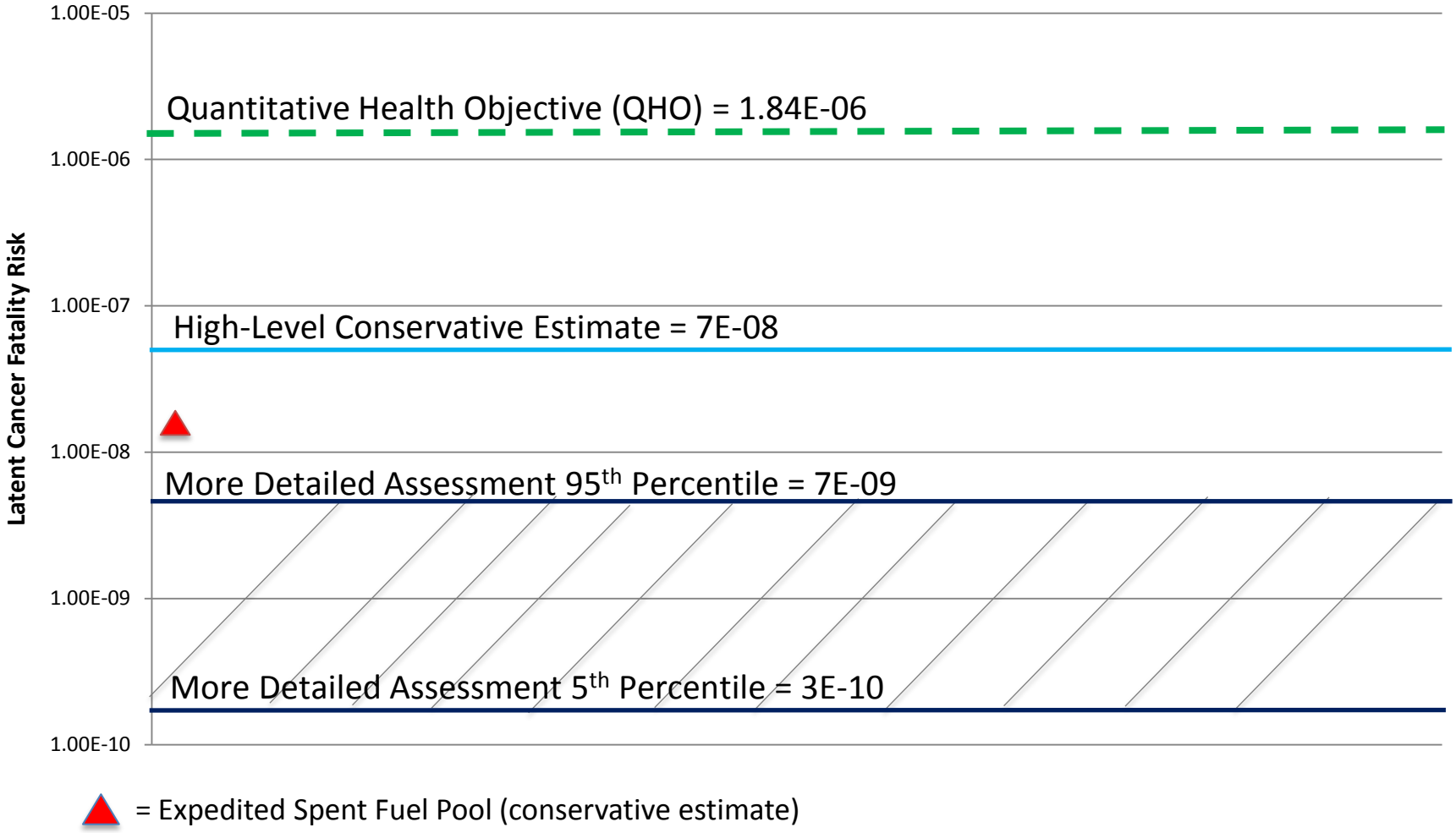
- Part 2: Full evaluation of alternatives per Commission direction

Assumptions for High-Level Conservative Estimate

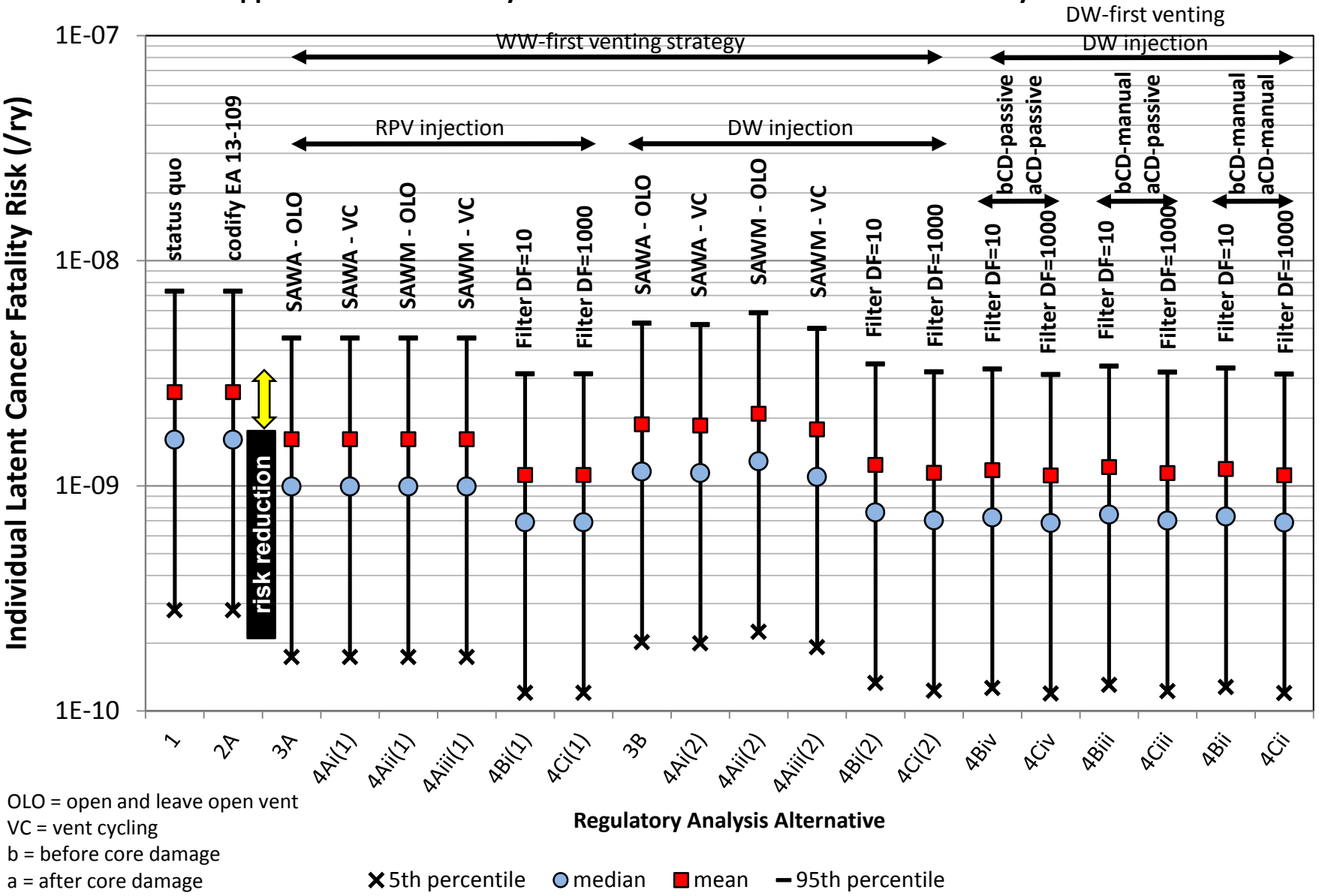
- Highest ELAP frequency of BWR Mark I and II
- Highest conditional individual latent cancer fatality risk (ILCFR) release
- Highest habitability criterion

- 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



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

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