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

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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587TH MEETING

ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

(ACRS)

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THURSDAY

OCTOBER 6, 2011

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ROCKVILLE, MARYLAND

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The Advisory Committee met at the Nuclear Regulatory Commission, Two White Flint North, Room T2B3, 11545 Rockville Pike, at 8:30 a.m., Said Abdel-Khalik, Chairman, presiding.

COMMITTEE MEMBERS:

| | |
|---|---|
| SAID ABDEL-KHALIK | Chairman |
| J. SAM ARMIJO | Vice Chairman |
| JOHN W. STETKAR | Member-at-Large |
| SANJOY BANERJEE | Member |
| DENNIS C. BLEY | Member |
| CHARLES H. BROWN, JR. | Member |
| MICHAEL L. CORRADINI | Member |

COMMITTEE MEMBERS (CONTINUED):

| | |
|---|---|
| DANA A. POWERS | Member |
| HAROLD B. RAY | Member |
| JOY REMPE | Member |
| MICHAEL T. RYAN | Member |
| WILLIAM J. SHACK | Member |
| JOHN D. SIEBER | Member |
| GORDON R. SKILLMAN | Member |

DESIGNATED FEDERAL OFFICIAL:

Weidon Wang

# I N D E X

P R O C E E D I N G S

(8:29 a.m.)

CHAIRMAN ABDEL-KHALIK: This is the first day of the 587th meeting of the Advisory Committee on Reactor Safeguards. During today's meeting, the Committee will consider the following:

1) Draft Final Revision 4 to Reg Guide 1.82, "Water Sources for Long-Term Recirculation Cooling Following a Loss-of-Coolant Accident";

2) Fuel Cycle Oversight Process;

3) Future ACRS Activities/Report of the Planning and Procedures Subcommittee;

4) Reconciliation of ACRS Comments and Recommendations;

5) Draft Report on Biennial ACRS Review of the NRC Safety Research Program; and

6) Preparation of ACRS Reports.

This meeting is being conducted in accordance with the provisions of the Federal Advisory Committee Act. Mr. Weidon Wang is the Designated Federal Official for the initial portion of the meeting.

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

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.

A transcript of portions of the meeting is being kept and it is requested that the speakers use one of the microphones, identify themselves, and speak with sufficient clarity and volume so that they can be readily heard.

I will begin with an item of current interest. Dr. Dade Moeller passed away on September 26th, 2011, at his home in New Bern, North Carolina. Dr. Moeller was an ACRS member from 1973 through 1988 and served as ACRS Chairman in 1976. Dr. Moeller was also the founding chairman of the NRC's Advisory Committee on Nuclear Waste and served in that capacity until 1993.

At this time, we will move to the first item on the agenda, Draft Final Revision 4 to Reg Guide 1.82, Water Sources for Long-Term Recirculation Cooling Following a Loss-of-Coolant Accident. Dr. Banerjee will lead us through that discussion.

MEMBER BANERJEE: Thank you, Mr. Chairman.

Just to give you a little background, this Reg Guide 1.82 was first issued in 1974. There were

three revisions since that time, the first in 1985, the second in 1996, and this third which Mr. Burke will refer to, in 2003.

These revisions address several issues, the most significant being debris blockage of sump screens and the granting of credit for containment over pressure in determining the net positive suction head for the recirculation pump.

The proposed revision, which is revision 4, seeks to update revision 3. And it consolidates, as you will hear, in one location many existing staff positions. With regard to only debris blockage of sump screens, and these are scattered all over the place, and ex-vessel downstream effects.

It specifically excludes in-vessel downstream effects and also excludes any updating of the guidance on containment over pressure. I'm not being politically correct in saying containment accident pressure you will notice. Okay. In any case, those are two important things which are in separate compartments. And you will hear from Mr. Burke on this.

The third thing it does not do is it does not address the closure options for GSI-191 that was recently approved by the Commission.

MEMBER CORRADINI: Say that again.

MEMBER BANERJEE: It does not address.

MEMBER CORRADINI: Oh.

MEMBER BANERJEE: Okay? These are still being evaluated in response to SRM whatever it was, which was issued last December. So what you will hear really is related to a fairly sequestered topic, okay, and you should understand that. It's not meant to discuss all the other items which are there in the Reg Guide.

Okay. So I think with that in mind to prevent any confusion, we can go forward. So I'll call on Mr. Burke to proceed. Thank you.

MR. BURKE: All right. Thank you.

Stu Richards is the Deputy Director in the Division of Engineering and Research. And he is going to do a little introduction I believe.

MR. RICHARDS: Yes, I'd just like to say thank you for having us here today. He gave a very good overview. But one of the questions that came up with the Subcommittee is why go forward with this revision now when there's a lot of outstanding items that we would have to incorporate later. And we had a pretty good discussion about that.

But I think the bottom line is that we

have a lot of focus right now on trying to keep our regulatory guidance up to date. That includes our regulatory guide program. And if you keep putting off revisions while you're waiting for things to be resolved, pretty soon you find out you're five, ten years out of date.

So we think it is important to bring together the staff positions that we've established in other NRC documents, update the Reg Guide to reflect that, then as some of these other issues are resolved, we'll come back and revise this Reg Guide yet again.

And, again, thanks for having us here today. And that's it, John.

MR. BURKE: All right. Good morning. And with that, what I'm going to talk about today is the reason for the revision and then some of the topics in this revision of the Reg Guide and a short review of the public comments we've received.

So like Dr. Banerjee said, the last revision of this Reg Guide was in 2003. Since 2003, there's been a lot of work in both the NRC and industry related to GSI-191. And so that's increased our knowledge of how strainers operate. And we want to incorporate that current knowledge base into this Reg Guide revision.

If you compare rev. 4 or the draft rev. 4, which -- and the prior revision rev. 3, it's a complete rewrite. And there are very few words the same except the title. And that's primarily in the way I organized it.

The rev. 3 had a BWR section and a separate PWR section. And what I've done in this revision is we've combined common positions where it was applicable. So in the background section, if the discussion on the background applies to all reactor types, then it just says that. And then the reactor-specific-type information is much shorter. So we found that it would be a lot easier to use in that type of format.

And we had the Subcommittee meeting a month ago. And several of the comments from the Subcommittee I've incorporated into this revision that you have today. And some of those were -- some of the comments about placement of the strainer at the lowest elevation in containment, I tried to clarify what I mean by that.

And then also there was some discussion on when you're doing head loss testing, are you trying for the worst case or are you trying to minimize debris. And there was some discussion at the

Subcommittee on the choice of those words. So I've reviewed the Reg Guide and adjusted words where appropriate on is it the worst case we're trying to find or is it to minimize head loss? So you'll see some changes in that type of language from what the Subcommittee said.

MEMBER BANERJEE: Do we have a copy of this revised version?

MR. BURKE: Yes, you do.

MEMBER BANERJEE: Well, I don't have it.

MR. BURKE: Okay. You should have it.

MEMBER BANERJEE: All right.

MR. BURKE: And then the other comment from the --

MEMBER BANERJEE: I'm sorry to interrupt the flow of your -- we just want to make sure that we have it because --

MEMBER SHACK: I am not sure how I'd know the difference unless I spot word by word kind of thing.

MEMBER BANERJEE: Yes, because those were very important words you are discussing.

MEMBER SIEBER: Could you provide us with copies?

MR. BURKE: Yes.

MEMBER BANERJEE: Just in case we don't, we'll get it for us.

MEMBER SIEBER: Okay.

MR. BURKE: And the other item from the Subcommittee was -- the way I term this Reg Guide, it's a roadmap. There's in the order of 25 separate new reg reports over the years on this issue. There's four or five industry topical reports with staff safety evaluations. And this is the roadmap on how all those work together. And I've improved the cross-referencing some.

MEMBER BANERJEE: So you've taken care of some of the comments we've had already.

MR. BURKE: Yes, correct.

MEMBER BANERJEE: So we really need to see this.

MR. BURKE: Correct.

MEMBER BANERJEE: Okay.

MR. BURKE: I think I sent it to Ilka but Ilka is out. So I don't know what --

MEMBER BANERJEE: Yes, so maybe there was some disconnect there.

MR. BURKE: Right. We'll get it to you.

MEMBER BANERJEE: All right.

MR. BURKE: So, and like I said, this

draft rev. 4 endorses some industry topical reports, the NEI guidance report for GSI-191, and then the corresponding safety evaluations for those topical reports.

And one of the -- another comment made at the Subcommittee and discussed earlier today was why do it now instead of wait until all the issues are resolved. And like we said earlier, we just want to update the Reg Guide now to get everything as current as possible, realizing there are some open issues right now.

And like was mentioned by Dr. Banerjee, these are the issues that are not in this revision, containment accident pressure, downstream effects, and the SRM from December.

MEMBER CORRADINI: And these would be added? Or they will be in a separate document?

MR. BURKE: They would be added.

MEMBER CORRADINI: Sometime.

MR. BURKE: They would be added eventually, yes.

MEMBER BANERJEE: In further revisions.

MEMBER CORRADINI: And interim guidance for all of these issues are available?

MR. BURKE: On the containment accident

pressure there is.

MEMBER CORRADINI: That one I'm pretty sure there is.

MR. BURKE: Yes. On the downstream in-vessel effects, we have the industry topical report under review. There will be a staff safety evaluation coming -- probably next year.

MEMBER CORRADINI: Okay.

MEMBER BANERJEE: We'll get to see it.

MR. BURKE: I'm sure.

MEMBER SKILLMAN: John, I'm Dick Skillman. May I please ask to what extent this revision of this Reg Guide has embedded in it input from the AEs and from the NSSS vendors that actually do this work?

MR. BURKE: The -- like I mentioned earlier, there's several industry-prepared topical reports related to GSI-191 and sump blockage. And the staff has written safety evaluations for those topical reports. So those are incorporated into this revision.

So the AEs and the vendors had input into those topical reports. That would be the -- I guess the most direct way that their input is incorporated into this revision.

MEMBER SKILLMAN: Thank you, John.

MEMBER BANERJEE: But you have also responded to all public comments --

MR. BURKE: Right.

MEMBER BANERJEE: -- to the extent you could. And you have a whole list of these and what actions were taken.

MR. BURKE: Correct.

MEMBER BANERJEE: And some of those were industry comments.

MR. BURKE: Correct.

MEMBER BANERJEE: Thank you.

MR. BURKE: So the selective topics out of the Reg Guide I thought we might review today are the ones I've highlighted in this flow chart. And this flow chart is out of the Reg Guide. And it's all the different steps that are involved in qualifying a suction strainer. And this is generic to any reactor type, a BWR or a PWR.

MEMBER BANERJEE: John, just a question. During the Subcommittee meeting, there was a discussion about whether this flow chart should really form the basis of the roadmap to guide applicants or whoever uses these through this Reg Guide. Now we haven't seen, as I said, the revised version. But did you also take that comment into account in the version

that's now developed between the Subcommittee meeting and now?

MR. BURKE: I did not change this flow chart.

MEMBER BANERJEE: No, no, no, the flow chart was fine.

MR. BURKE: Yes. I tried to improve the cross-referencing in the sections of the Reg Guide. In particular, zone of influence testing. I added a cross reference to some guidance -- to the staff safety evaluation on NEI-04-07. Or in the latent debris issue, I added a reference to the NEI document on sampling for latent debris and then the staff safety evaluation.

MEMBER BANERJEE: Okay. So we'll have to really look at this.

MR. BURKE: Yes.

MEMBER BANERJEE: Please proceed.

MR. BURKE: All right. In the area of strainer head loss, one of the big changes from rev. 3 to rev. 4 is the use of this NUREG-6224 correlation. In rev. 3, the staff accepted the use of a correlation, which was a semi-empirical correlation based on some generic testing on qualifying a suction strainer.

We have since come to the realization or conclusion that that's not appropriate any more, especially when you consider different types of insulation that weren't considered when the correlation was developed, failed coatings, the chemical precipitates, you know, from the chemical effects issue, latent debris.

The sensitivity of how the debris is introduced into the test has a large impact on the head loss. And then the thin bed effect itself was not evaluated in a lot of detail in the original correlation.

So we no longer accept the correlation for a strainer qualification. We want the test. And that's consistent with what is the current staff guidance in the SE.

Some additional staff guidance on strainer head loss was issued to the industry in a letter from the staff to NEI in March 2008. And that is incorporated into this revision also. And that March 2008 letter was based a lot on staff visits to test facilities and witnessing strainer head loss testing, reviewing the vendor test protocols. And that's how that document was put together. And so now that's incorporated into this revision of the Reg Guide.

And here's a couple photographs of what these new strainers look like. Some of you have seen these before when the GSI-191 updates have been presented to the Committee. The photograph on my left is a stacked disc strainer. And the one on the right is a pocket strainer.

The pocket strainer kind of looks like a mail slots. And the inside of each slot is perforated holes and the water just flows through there. And then the one -- the stacked disc strainer, each layer is a perforated plate. And the water flows into that center tube.

Now those stacked disc strainers could be stacked horizontal or vertical. I've seen them where they just curve around the floor containment. You know it could be 100 or 200 feet in length depending on the plant-specific debris loads and how much strainer surface area the plant needs.

And I've seen the pocket strainers where the total assembly could be as big as this table. I mean the new strainers are very large. The average is about 3,000 square foot surface area. That's strainer surface where the existing ones are maybe 100 square feet.

But like I said, there's five different

designs. These are just two of those five designs.

MEMBER CORRADINI: Just to repeat what you had said before. You don't have to go back. You get all of these and then pretest it relative to performance.

MR. BURKE: That's correct. Every licensee -- every PWR licensee has plant-specific testing. And those test results are reviewed by the staff.

MEMBER CORRADINI: As part of the logic approval.

MR. BURKE: Correct.

MEMBER BANERJEE: The thing to clarify though is that BWRs used in the past 6224, the pressure loss correlation. And they -- I guess the position is they are still evaluating this or --

MR. BURKE: Yes. That's correct.

Chemical effects is one of the big things added into this revision of the Reg Guide. The last revision just said chemical debris could be a debris source without any guidance.

And so what we're doing in this revision is we're incorporating that industry report, WCAP-16530-NP-A. And in that March 2008 to NEI that I mentioned earlier, there's a section in that letter on

staff guidance for chemical effects. And the staff expects chemical effects to be explicitly included in head loss testing for strainers.

Downstream effects is another new area in the Reg Guide. In the prior revision, it just said consider downstream effects. And downstream effects can be broken into two categories, ex-vessel, which is the safety injection system, pipes, and pumps, and valves, or in-vessel, which is the debris that gets into the reactor.

This revision, as stated earlier, is not including anything for in-vessel. That's still under review by the staff. But the ex-vessel is addressed in this topical report, WCAP-16406-P-A. And it addresses the pump internals, the valve internals, where blockage of flow, orifices, and items like that.

One thing to note that -- which was several public comments, was if you are familiar with the Westinghouse numbering system, the dash P is proprietary. And there is no non-proprietary topical report for this issue. So we're endorsing a proprietary report, which is a little unusual. But we have no choice. A non-proprietary report would be blank pages.

MEMBER BANERJEE: The Subcommittee raised

this issue as to whether or what the applicants or the licensees would do if they were not part of the group that would access this report. And could you clarify the answer?

MR. BURKE: Sure.

MEMBER BANERJEE: I know the answer but --

MR. BURKE: In the U.S., all of the PWRs are using this report or GSI-191. The BWRs are investigating buying the rights to it.

MEMBER CORRADINI: What?

MEMBER ARMIJO: Rather than generating something unique --

MR. BURKE: Yes.

MEMBER ARMIJO: -- to BWRs.

MR. BURKE: Or if there is some unique components that are not addressed -- if the BWRs have some unique geometries or components or valves --

MEMBER ARMIJO: It would be the big difference.

MEMBER BANERJEE: Well, downstream chemistry is less important in this part of it. I mean this is erosion where stuff gets into valves and pumps.

MEMBER REMPE: During the Subcommittee meeting, didn't we also discuss about version control

also? And you're endorsing something that could change? And how was that resolved?

MR. BURKE: We, in Reg Guides we endorse specific versions.

MEMBER REMPE: Okay. So if there is a newer version --

MR. BURKE: Correct.

MEMBER REMPE: -- it's updated.

MR. BURKE: And that's the standard practice no matter what document you're talking about, whether it is an industry standard, like an IEEE standard, or an ASTM standard, or, in this case, a topical report.

Another item that we're adding more specific guidance in is protective coatings. Again, the prior revision just said protective coatings may be a debris source. The staff guidance in that March 2008 letter provided some details on how to evaluate protective coatings. And we're including that in this revision.

And then the bottom line there is NUREG/CR-6916 was a coating debris transport study. And that's being incorporated into this revision. And that concluded that for coating -- I'm trying to remember the numbers -- if you had a general bulk

velocity of less than .2 feet per second, coating chips larger than 1/64th of an inch would not transport. Did I say that right? If the velocity was lower than .2 feet per second, coating chips larger than 1/64th of an inch would not transport. And the ACRS Committee reviewed that NUREG in 2006 I believe. And industry is using that in GSI-191.

MEMBER POWERS: It seems to me that the industry approach has been to look at their face velocities and then transport them back to look in the channel at what velocities it gets. Don't you get natural convection velocities that are higher than that minimum?

MR. BURKE: I don't know.

MR. RICHARDS: We couldn't really hear the question. Could you repeat the question?

MEMBER POWERS: The question -- it seems to me what I've seen is they established this drag coefficient due to chips.

MR. RICHARDS: Yes.

MEMBER POWERS: And they said if my velocity is below this level, then I just don't entrain the chips. And to evaluate that, they look at the face velocity on their filter and they propagate it back to say what's the velocity in the channel.

And my question is don't you get just natural convection velocities in the liquid that are sufficient to exceed that rather low minimum. It's only .2 meters per second or something like that, which is a relatively low velocity. And you have natural convection within the channel if not due to thermal effects, just due to chemical effects. And won't that -- is the bulk velocity the velocity to use? Or should we really be looking at the natural convection velocity?

MEMBER BANERJEE: Well, if I understand it and somebody can correct me, the velocity that is taken is not the velocity necessarily normal to the strainer. But if there is a parallel velocity due to whatever reason, it should be taken into account in principle. Now whether it is properly is not to know. But in principle, whatever the cause of these velocities should be evaluated and that should go into --

MEMBER POWERS: Well, I mean is that the guidance?

MEMBER BANERJEE: Yes.

MEMBER POWERS: Or is it --

MEMBER BANERJEE: Maybe somebody like John can clarify the guidance on this point.

MR. LEHNING: This is John Lehning from NRR. It is -- the velocity that they used in the testing was like what John Burke was saying. It was the velocity -- and that point, too, is pretty conservative. That's bounding all of the different kinds of chip sizes. I think if you look at most of those results, the actual velocities are significantly higher even than that.

So now what the licensees would use in their evaluations, it's not just -- again, it's not the normal velocity toward the strainer. They look at what the magnitude of the velocity is and, you know, within certain regions will assume transport. And when the magnitude falls below this value, then they assume that these chips stall out and don't transport further.

MEMBER BANERJEE: I guess the question is that yes, for -- in evaluating these velocities, do they take natural convection effects also into account? They do take bulk effects. And I know that. So that if you've got a flow parallel to a strainer, that velocity is taken into account.

But there could be natural convection effects, which give you, you know, entraining effects on whatever is suspended, including chips. Does

anybody evaluate that? I think -- is that the question, Dana?

MEMBER POWERS: Yes.

MR. LEHNING: The simulations that they do for this, they are isothermal.

MEMBER BANERJEE: They're all isothermal?

MR. LEHNING: Correct.

MEMBER BANERJEE: That answers your question. Yes, they're all isothermal evaluations.

MEMBER POWERS: So they don't take them into account.

MEMBER BANERJEE: Because it's the CFD calculations that are used. He said that.

MEMBER CORRADINI: Nothing -- I guess where Dana is going with this, just so I understand, you have a criteria. The criteria is based on data. Dana is asking the question, at least as I understand it, if there's gradients and the gradients are large, I assume the staff requires the licensee to consider that to make sure that they don't essentially miss a hole and how the pieces may be transported.

MEMBER BANERJEE: The guidance that you have available does not even, I think, specify you have to do CFD, right?

MR. LEHNING: Correct.

MEMBER BANERJEE: Whatever evaluation methodology you use is fine as long as it is acceptable to the staff.

MR. LEHNING: Correct. I mean typically they have used that or they have taken a conservative method of saying essentially all things transport, either CFD or essentially transporting everything.

MEMBER BANERJEE: Well, I know that they do that with particulates and fibers. But do they also do it for these protective coatings?

MR. BURKE: There are two assumptions in protective coatings. One is if the coating area is within the jet, then it is destroyed to particulate and it all transports.

MEMBER BANERJEE: Correct.

MR. BURKE: If you have an unqualified coating, you know, where the coating was not -- did not satisfy Reg Guide 1.54 for a qualified coating, then it all fails and transports.

MEMBER BANERJEE: But does it become particulates as well?

MR. BURKE: What the guidance says, assume whatever is the controlling case. If particulates would give you a higher head loss, then assume it is particulate. If chips give you a higher head loss,

assume it's chips and it all transports. That's the guidance in this March 2008 letter.

MR. LEHNING: I just want to make one more point, too, John, related to the natural convection aspect. You know other than maybe the break flow that's splashing down, we wouldn't expect there to be too much significance from that. And in particular, the way that the break flow is modeled in the CFD simulations that licensees have done, they have essentially assumed the full potential energy is transferred to the pool. There's no losses along the way. There's no losses due to splashing.

So this conservatism and how they model the transfer of all this energy into the pool is very conservative. And in my opinion, is much more significant than any thermal convection.

CHAIRMAN ABDEL-KHALIK: This guidance does not specify an acceptable way of calculating the velocity. This guidance just gives, you know, a limit if the velocity is less than, you know, .2 --

MR. BURKE: Correct.

CHAIRMAN ABDEL-KHALIK: -- then you can assume that some of this stuff will fall out, right?

MR. BURKE: Yes.

CHAIRMAN ABDEL-KHALIK: So the concern

with regard to, you know, inclusion of natural convection effects, et cetera, doesn't really pertain to this guidance but pertains to the staff's acceptance of the method by which licensees evaluate the velocities to take advantage of that allowance. Is that correct?

MR. LEHNING: That is correct.

CHAIRMAN ABDEL-KHALIK: And, therefore, the burden really falls on the staff in terms of accepting the analyses by which licensees take advantage of that particular acceptance.

MR. BURKE: Right.

CHAIRMAN ABDEL-KHALIK: Rather than, you know --

MEMBER BANERJEE: So if they take a very conservative approach, they can do that. So it's a matter of the acceptance.

MR. LEHNING: And just one more comment, too, that again I think the thermal convection aspects relate really to the very finest particles and the very finest materials for which typically full transport is assumed is any case. These larger sized chips, you know even with some amount of convection, my judgment would be these things would settle.

And this testing -- rather than suspend.

And this testing was primarily looking at velocities along the floor and transport of material along the floor.

MEMBER POWERS: Let me know if I'm wrong, Said, but doesn't a lot of natural convection scale with geometry?

CHAIRMAN ABDEL-KHALIK: Oh, yes. I mean sure. The issue is whether this Reg Guide should be essentially modified, adding a caution as to how to calculate the velocity to include the possible effects of natural convection rather than just simply being silent on how those velocities could be taking calculated when taking advantage of this exception.

MEMBER BANERJEE: There are then many cautions.

CHAIRMAN ABDEL-KHALIK: Yes, that's my concern.

MEMBER BANERJEE: Yes.

CHAIRMAN ABDEL-KHALIK: Right.

MEMBER SHACK: Well, it's somewhat similar for the jet effects. There's no discussion really specifically on your jet models --

CHAIRMAN ABDEL-KHALIK: Correct.

MEMBER SHACK: -- which are sort of left, again, to other guidance.

CHAIRMAN ABDEL-KHALIK: Let's just follow up with Dana. I mean would you agree that this is outside the scope of this Reg Guide insofar as how licensees evaluate the velocity distributions to take advantage of this exception?

MEMBER POWERS: Well, it seems to me a comment on the way you go about doing it should -- could be a part of the Reg Guide or not. I mean it is up to them.

MEMBER STETKAR: It is always interesting to hear a question raised and hear people be silent about the responses, which indicates that perhaps, you know, cautions might be warranted in the guidance. You know a simple statement saying also accounting for convective effects. It didn't tell you how to do it.

CHAIRMAN ABDEL-KHALIK: Right.

MR. LEHNING: My personal view on that -- again, this is John Lehning, would be that the topic is one, the calculation of velocities for transport debris is a topic that is pertinent to the Regulatory Guide. Whether or not that particular aspect is significant, I think is per the current evaluation models, we think it is bounded by what they're doing.

I wouldn't object at putting some kind of note into the Regulatory Guide for future reference.

That is a valid aspect to consider.

MEMBER BANERJEE: Yes, so as CFD models get more and more refined and people try to take advantage of settling or whatever, they should certainly take into account all important effects, including convection.

CHAIRMAN ABDEL-KHALIK: I think that sort of settles the issue. I mean, you know, adding a caution as to how these velocities are calculated would address that concern.

MEMBER BANERJEE: Okay. Let's --

MEMBER POWERS: I will just point out there is in the last -- in the period of concern here, say like from 2003 to today, and people looking at the issue of resuspension of deposit particulate in a fluid do to sonic and vibration effects on the fluid body and I don't know that that work has come to a clear fruition but it is pretty clear that shocks and vibrations that transmit into the liquid can cause resuspension of particulate deposited on the floors of a channel.

And it is pretty clear to me that in reactor accidents, we cannot preclude there being shocks and vibrations to transmitted fluid. And somehow that, too, is an issue that you need to think

about a little bit in the performance of your strainers. And it may be that your strainers are big enough that it doesn't matter. But it is an area I would say of ongoing and active research to understand that better.

MR. BURKE: All right. The next area is latent debris. And latent debris is just a general dirt and dust in containment. The prior revision of the Reg Guide relied on the cleanliness program. And now we're adding specific guidance on latent debris.

The first NEI document on there, NEI-02-01, revision 1, provides a sampling method to go into containment and sample, you know swipe samples, maslin samples, to see how much dirt you really have on your cable trays and floors and duct work. And then, you know, calculate the total amount in containment based on that process. And that is what is used now. And we're endorsing that.

And that was included in NEI-04-07. And the staff accepted it in the safety evaluation for NEI-04-07.

MEMBER BANERJEE: Well, with latent debris there was -- this becomes, of course, much more important for the new reactors because they are so clean. Okay, this is perhaps the only source of

debris.

And a question arose as to how this latent debris would be best characterized. At the moment, in testing, it's thought of as being fiber and particulate matter. But in reality, there are other sources of latent debris.

They have perhaps more effect on downstream effects, like on the core. So maybe we leave it to that. But we do know that things like hair have sort of unusual effects compared to fibers in some of the downstream effect testing.

So the issue is how should they characterize the latent debris that goes into the testing programs? Probably very unimportant for the strainers because the strainers are so big. But perhaps more important for the core, what gets held up there.

MR. BURKE: Right. For the existing operating reactors, the guidance -- there was a NUREG report, I forget the number now, NUREG/CR-6877 discussed that a little bit about when you are running a latent debris head loss test, you know what surrogate do you use for the latent debris. And that NUREG concluded fiberglass insulation fibers was an appropriate surrogate for the latent debris.

And it evaluated human hair as being close enough to the fibers to give you a reasonable surrogate for strainer head loss testing. It did not go into the downstream effects.

MEMBER BANERJEE: Right. And I think that's probably the bigger concern so we can put it off if you'd like so you get to the downstream effects.

MR. BURKE: Okay. And I've been told that on NRO testing they did include testing with human hair, especially for the AP1000. But I don't have any of those details.

MEMBER BANERJEE: Yes, they did. But they only did one or two tests. And it does show a sort of a different characteristic from the other fiber.

MEMBER SHACK: With one or two tests, it is hard to know what's different.

MEMBER BANERJEE: That's true but that's based on whatever testing was done. It wasn't very much. There they had sufficient margins. So it didn't matter too much. Anyway, let's carry on.

MR. BURKE: All right. Another area that changed in this revision is the discussion on vortexing and air ingestion. And in particular in regards to Generic Letter 2008-01.

There is an appendix in this Reg Guide that incorporated guidance from that generic letter on how to address gas accumulation in the ECCS system. And that guidance right now, there is a combination of interim staff guidance documents and just staff guidance memoranda. So we're incorporating those into this appendix.

MEMBER BANERJEE: There was also some discussion as to whether a Froude number is an appropriate criteria for vortexing because it has nothing related to vorticity in it.

MR. BURKE: Yes.

MEMBER BANERJEE: So if I sort of look back at the Subcommittee meeting, this was an issue which we didn't pursue because there was so much -- it had like nine feet or something above these strainers. But nonetheless, the comment was that the Froude number is not an appropriate measure for vortexing.

And if you truly get a vortex, which goes down, you know, something like a little tornado in reverse or something, that doesn't give you any measure of what happens. A Froude number is not a proper criterion for a swirling sort of thing so perhaps some caution there --

MR. BURKE: All right.

MEMBER BANERJEE: -- would be needed. Do you have any comments to staff? And with the big heads you've got today, it may not -- big submergence you've got, it may not matter. But if somebody comes up with a little submergence in the future, it may not be the appropriate criteria.

MR. LEHNING: This is John Lehning from the staff again. I think I agree with that comment. What was done in the original licensing was testing, scale testing. In some cases, a section of that part became a full scale because, as you said, that dimensionless parameter doesn't give a full accounting.

However, what we have seen in some of the testing that was done is that there is some correlation that can be used in certain situations, for example from the strainer vendors, they have done testing for a number of different cases and scale-parameter-type testing and non-dimensionalized it. And they did find some way to correlate it with Froude number, even though there are limitations as you noticed.

So I agree with the point that some kind of a caution is appropriate here.

MEMBER BANERJEE: But I think this depends

on the upstream vorticity. If you have a test with no upstream vorticity, then there is no way to generate vorticity. Therefore, the Froude number would work. Clearly because that's the only governing parameter.

But if you have a flow with vorticity due to sheer or whatever, then it can change the results. And that's the caution, I think, that the effects of vorticity must be taken into account.

MR. LEHNING: I agree with that. And we've discussed that with some licensees as well. So I agree with that.

MR. BURKE: And like I said, the generic -- one of the other changes in this Reg Guide as a result of what we've discovered with the Generic Letter 0801 is a steady state versus transient operation. And so we added some -- the staff guidance on the Generic Letter addresses those differences. And we've built that into this table A2 in the appendix.

So the public comments -- the public comment period for this Reg Guide was last summer. We received comments from five organizations. And you could break them down into some of these categories for most of them, the ones that weren't just editorial. The use of the correlation that we've

already talked about and the important thing about that is we're not imposing a backfit. Like we mentioned earlier, the BWRs, by and large, used the correlation in the '90s. We're not imposing a backfit with this Reg Guide.

But they are -- the BWR Owners Group has agreed to go back and revisit their strainer qualifications.

MEMBER BANERJEE: What does that mean exactly?

MEMBER CORRADINI: Good, I was going to ask the same question.

MEMBER BANERJEE: Are we treading on thin ice here? Do you know what they are going to do?

MR. BURKE: Stu, you want to handle that one?

MR. BAILEY: I'm sorry, what was the question again?

MR. BURKE: What are the -- what is the BWR owners group doing in regards to the use of the correlation?

MR. BAILEY: Hi, this is Stewart Bailey in NRR. The jury is still out on that. They are re-reviewing the applicability of that correlation for some of the different types of insulation and for thin

bed effects. So that work is ongoing.

MEMBER BANERJEE: Is it sort of analysis of the results they have? Or are they doing a few experiments? How are they going about this?

MR. BAILEY: We -- I don't have all the details on what they're doing right now. The commitment though from them was to go back and take a look at some of the issues that were not included in that particular correlation.

MEMBER BANERJEE: Okay.

MR. BAILEY: So I believe that there will be some combination of review of past test results and the type of strainers that they use for the boilers are also used in some of the PWRs. So there is testing that has been done on those designs under the new protocol.

MEMBER BANERJEE: For example, a lot of them used disc strainers, right?

MR. BAILEY: Correct.

MEMBER BANERJEE: So -- well, we'll be interested to be kept up to date on what's going on. I guess they're looking at 12 areas.

MR. BAILEY: That's correct. They're looking at 12 specific technical areas where the guidance has evolved since they did their evaluations

back in the '90s.

MEMBER BANERJEE: And all the -- I mean the way this Reg Guide is written does not give any guidance, which is premature until they've gone through this process of evaluation of these areas, whatever that comes out of that will eventually get into a Reg Guide.

MR. BAILEY: That would be my intention.

MEMBER BANERJEE: Yes. So it is not in -- nothing is here.

MR. BAILEY: That's correct.

MEMBER BANERJEE: Okay. Does that sort of clarify the situation? Okay. All right. Go ahead.

MR. BURKE: Another area of quite a few public comments was on the head loss testing protocols that we talked about and what was in that March 2008 letter. And then the use of settlement credit. So we've reworded some of the regulatory positions related to head loss testing to make it clearer what we're talking about there.

Another area which was surprising was the use of outdated references. I probably had ten separate public comments about references in this Reg Guide related to old NUREG reports. And like NUREG/CR-6-808 is the current knowledge base report on

suction strainers that was written in 2002. And we're referencing it in this revision. But some of the -- one of the -- two of the public comments said that that was too old. We shouldn't include that because it is dated information.

Well, it is still the best we have. But on the other hand, another project I have is updating that. And that should be published next year. So that will be included in the next revision of this Reg Guide.

And then we talked a little bit about containment accident pressure. There were quite a few comments about why don't we allow containment accident pressure. And our position or our response to that is we're not quite ready to allow containment accident pressure. There is a SECY paper that the staff is evaluating on that issue. But we're not ready to put it in the Reg Guide yet.

And on the Generic Letter 08-01, there were several comments about what was in the Reg Guide was not consistent with the staff guidance. But we think it is consistent with the staff guidance.

MEMBER BANERJEE: Can you explain this a little bit, the last point?

MR. BURKE: The generic letter?

MEMBER BANERJEE: Yes.

MR. BURKE: Okay.

MEMBER BANERJEE: What was supposed to be not consistent with the staff guidance?

MR. BURKE: Well, the comment wasn't that clear. It just said we're not consistent with the staff guidance on the generic letter. And some of it was related to what I had talked about earlier on steady state flow conditions versus transient flow conditions.

In that Table A2 that's in the appendix, some of those numbers have changed in the last two years or so as the staff guidance has developed.

MEMBER BANERJEE: Thank you.

CHAIRMAN ABDEL-KHALIK: In Generic Letter 2008-01 pertains to what? Gas accumulation?

MR. BURKE: Gas accumulation, yes. It's primarily focused on the suction side of the pump downstream of the strainer. But it could include the strainer also.

And that's all I had. Any other comments or questions?

MEMBER BANERJEE: Thank you. We have a few minutes, Mr. Chairman, for discussion. I guess the first thing that I would like to know, and maybe

the rest of the Committee, is the urgency of the ACRS letter. Do you need it for any reason at this meeting? Or would it be greatly difficult if it was put off until the next meeting?

And the reason I ask this is that between the Subcommittee meeting and now, there have been some changes made to the Reg Guide. So it probably took care of a lot of the comments and feedback you got during that Subcommittee.

MEMBER SHACK: We just got the new version.

MEMBER BANERJEE: Yes, and we just got the new version.

MEMBER CORRADINI: Just in time.

MEMBER BANERJEE: Yes, so this is, of course, a discussion for the ACRS itself as to what it wants to do. But I just want to determine the urgency of the letter because the letter might be somewhat different based on this version of the Reg Guide, which has responded to all the comments. And it would be -- if we were basing it on the Subcommittee.

MR. BURKE: The -- my current due date is the end of the year.

MEMBER BANERJEE: Okay. We'll take that into account. But a letter issued in November, would

that be too late?

MR. BURKE: No.

MEMBER BANERJEE: Okay.

MR. BURKE: Like if you have some recommendations like we talked about, adding caution statements here and there, I can accommodate that.

MEMBER BANERJEE: Okay.

MR. BURKE: It's not a problem.

MEMBER BANERJEE: All right. Okay. So I'm satisfied with what's going on.

CHAIRMAN ABDEL-KHALIK: Right. But we'll have to talk about that later.

MEMBER BANERJEE: We can talk about it ourselves. But I just want to --

CHAIRMAN ABDEL-KHALIK: Because November may be -- right. So -- but thank you for the input.

MR. BURKE: All right. Appreciate it.

CHAIRMAN ABDEL-KHALIK: Of course we can write the letter based on the information that we had up to this point.

MEMBER BANERJEE: Sure.

MEMBER CORRADINI: But you have ample time tonight to summarize all the new things for us.

MEMBER BANERJEE: Yes, I don't know that I'm such a fast reader.

MEMBER SIEBER: I thought you'd make all the changes.

CHAIRMAN ABDEL-KHALIK: Well, thank you very much. We appreciate it.

MR. BURKE: All right. Thank you.

CHAIRMAN ABDEL-KHALIK: At this time, we'll just go off the record.

(Whereupon, the foregoing matter went off the record at 9:28 a.m. and went back on the record at 10:15 a.m.)

CHAIRMAN ABDEL-KHALIK: We are back in session. At this time, we will go to item number 3 on the agenda, "Fuel Cycle Oversight Process." And Dr. Ryan will lead us through that discussion.

MEMBER RYAN: Thank you, Mr. Chairman.

3) FUEL CYCLE OVERSIGHT PROCESS

3.1) REMARKS BY THE SUBCOMMITTEE CHAIRMAN

MEMBER RYAN: The subcommittees had two very good briefings from the staff on these topics. And we have learned a lot about what they are developing and how it is developing. And before we do, I will turn it over to --

MS. KOTZALAS: Thank you.

MEMBER RYAN: -- Margie, Margie Kotzalas,

who will begin this full Committee briefing. So thank you very much.

Margie?

3.2) BRIEFING BY AND DISCUSSIONS WITH REPRESENTATIVES OF THE NRC STAFF

MS. KOTZALAS: As Dr. Ryan said, my name is Margie Kotzalas. And I am the Acting Chief of the Technical Support Branch in the Division of Fuel Cycle Safety and Safeguards in NMSS.

Today I will provide a status on the activities to enhance the fuel cycle oversight process. And we have met with the subcommittee two times. And we found these to be, these discussions to be, very helpful. Our mission paper and what we present today reflect these discussions.

To put our work in context, the Commission has not given us approval to completely revise the oversight process. In response to a Commission paper that we prepared last year, SECY-1031, the Commission directed us to make modest adjustments to the current program, such as providing incentives for licensees to maintain effective corrective action programs and reflect this in the enforcement policy.

The Commission also asked us to develop a set of cornerstones that could be applied to the fuel

cycle oversight process and to provide an assessment of the work accomplished and recommendations for next steps.

So today we will present to you some of our recommendations for next steps, such as the conceptual framework, because we think it helps put the cornerstones and the other proposed elements in context.

We will also highlight what we think the benefits are of an enhanced FCOP, such as lining the core inspection program for the cornerstones, assessing the frequency of inspections to align with the risk significance and licensee performance, to increase the transparency and predictability of the significance of inspection findings and the assessment of licensee performance.

Next slide.

MEMBER ARMIJO: Before you go, I would like to ask a couple of questions. On the issue of incentives to licensees to maintain effective corrective action programs, I am not familiar with all fuel cycle facilities, but I am familiar with fuel manufacturing facilities. To my knowledge, they all have very extensive corrective action programs.

So there must be some that have nothing or

have poor corrective action programs. There is a problem out there that you are trying to correct?

MS. KOTZALAS: I will discuss this later in the presentation, but there are varying degrees of the -- I don't want to say quality but the comprehensiveness of corrective action programs among the fuel cycle licensees.

And in order to provide this incentive, we are working with the industry to define what are the key elements of an effective corrective action program. And I will talk about that later.

MEMBER ARMIJO: Okay. But this isn't being driven by a concern that the fuel cycle facilities have ineffective --

MS. KOTZALAS: No.

MEMBER ARMIJO: -- or poor or no corrective action programs?

MS. KOTZALAS: No. This is providing an incentive for licensees to have robust corrective action programs and for us because when licensees fix their own problems, it's a benefit to the public. It's a benefit to them and to us.

MEMBER ARMIJO: No. I am not debating that. I am just saying, you know, what is occurring in the situation. And the impression I got from the

chart, it was that there is a problem out there that needs to be fixed.

MS. KOTZALAS: No. It is a mature industry. And we want to give them credit for the work that they have done.

MEMBER ARMIJO: Okay. Thank you.

MS. KOTZALAS: Gaining efficiencies in the oversight process is important now. And it will be even more important in a few years. Right now there are ten fuel cycle facilities that are subject to the inspection program. In the next few years, five more facilities may become operational.

With a flat or even declining budget, we need to be smarter about how we verify compliance with the regulations and license requirements. And we need to right size our inspection program to focus on resources so that it is appropriate to licensee performance.

And now that I have provided some background, I would like to walk you through the conceptual framework for the enhanced oversight process and describe its evolution from the current process.

Okay. My intent with this slide is to give you a high-level overview of the current

oversight process. Then on the next slide, I will show how the current process evolves into the enhanced process.

The current process starts with a core inspection program. And a core program provides the minimum amount of inspections to determine whether a fuel cycle facility is operating safely and securely in accordance with the regulatory requirements. With this core program, the staff can identify indications of declining safety or security performance.

Reactive inspections include follow-up to events. A graded approach for reactive inspections is taken depending on the actual or potential significance of the event.

Generic safety issue inspections are initiated when it is determined that a safety issue requires inspection validation or follow-up. And the agency develops the requirements and guidance for these inspections and issues temporary instructions.

A recent example is yesterday we issued a temporary instruction on beyond design basis events due to natural phenomena at fuel cycle facilities. And this is one of the long-term steps of the Fukushima action plan task force.

An inspection result from the core

inspection program temporary instructions or reactive inspections are screened to determine whether it is noncompliance. If the inspection result is not in noncompliance, then NRC action is not normally warranted.

If the inspection result is noncompliance, then the NRC inspector along with his or her supervisor determines whether the compliance is greater than minor.

If it is determined that the compliance is not greater than minor, then the NRC normally does not document it in the inspection report and the NRC does not take enforcement action.

However, these issues still need to be corrected. And that is why the slide says, "Licensee control." And this is where they would enter it into their corrective action program.

If it is determined that the noncompliance is greater than minor, then the staff evaluates the noncompliance in the enforcement process to determine the significance of noncompliance. The significance of the noncompliance is described using the severity levels.

And there are four severity levels in the process. These severity levels in increasing order of

significance are severity level four, three, two, and one. And the results from the enforcement actions are assessed in the licensee performance review. And based on the licensee performance review, the staff determines whether supplemental inspections are warranted.

Supplemental inspections provide more diagnostic inspections of identified problems and issues beyond the core inspections. And the inspection results from the supplemental inspections follow the same path as inspection results from the core reactive or generic safety issues inspections.

Okay. Now I am going to talk about the enhanced FCOP and --

MEMBER STETKAR: Margie, can I ask you a question?

MS. KOTZALAS: Yes.

MEMBER STETKAR: I am woefully with lack of knowledge about this process. In the current process, roughly what fraction of the inspections that the agency conducts are allocated among those three sort of feed-in streams and reactive temporary instructions and the basic core inspections?

MS. KOTZALAS: I would say that 95 percent of them are core --

MEMBER STETKAR: Okay.

MS. KOTZALAS: -- and very, very few generic. Just right now because we have a TI, --

MEMBER STETKAR: Yes, yes.

MS. KOTZALAS: -- there will be some --

MEMBER STETKAR: Yes.

MS. KOTZALAS: -- and then about five percent.

MEMBER STETKAR: About five. So it's roughly 95/5?

MS. KOTZALAS: Yes.

MEMBER STETKAR: Okay. Thanks. That helps.

MS. KOTZALAS: Okay. Again, similar to the current oversight process, the enhanced process would have core reactive inspections and generic safety issue inspections.

And under Commission direction, the staff developed a set of cornerstones that could be applied to this process. And each cornerstone has an objective. And when licensees meet those objectives, it gives the staff reasonable assurance that the NRC's mission is met. Later I will discuss how the staff derived the cornerstones from the NRC's strategic plan.

Based on the cornerstone objectives, the staff would risk-inform the core inspection program and focus the reactive inspections.

CHAIRMAN ABDEL-KHALIK: How do events feed into cornerstones?

MR. DE JESUS: I think I can answer that. I'm Jonathan De Jesus.

The rationale for that, we can focus the reactive inspections on the objectives of the cornerstone, like how the objectives after the event will determine that the cornerstones' objectives are still met there for the NRC, our mission as safety regulator is still meant. That is the reason for that arrow that you see coming from the "Events" box to "Cornerstone."

MEMBER ARMIJO: I thought the arrow should point the other way. Cornerstones provide information to help you assess what these events --

MR. DE JESUS: Again, this is a conceptual diagram. As we develop more of the process, we can still modify this item. But this is how conceptually we see the enhanced oversight process.

CHAIRMAN ABDEL-KHALIK: It sort of implies that events somehow impact the cornerstones.

MS. KOTZALAS: Okay. I can understand

that. And I think what we are trying to reflect is a continuous improvement feedback loop where we will -- this process is a living process, where we will use information from operating experience licensee performance, that sort of thing, to make incremental improvements to the process. But I can see how that arrow pointing up is I think a little bit misleading.

MEMBER RYAN: Continue.

MS. KOTZALAS: Okay. Where are we? Okay. The inspection results will be screened to determine whether any criteria for traditional enforcement apply. The criteria for traditional enforcement are actual safety consequences, potential for impacting the NRC's ability to perform its regulatory function, and willful violations.

If any of these criteria apply, the inspection result would be dispositioned through traditional enforcement. If the criteria do not apply, the inspection finding would be evaluated to determine whether it is a performance deficiency.

If the inspection result is not a performance deficiency, then the NRC action is not normally warranted. If the inspection result is a performance deficiency, then the performance deficiency would be evaluated to determine whether it

is greater than minor. And the NRC envisions using a screening process with a set of screening questions supplemented by examples to determine whether the performance deficiency is greater than minor.

If the performance deficiency is not greater than minor, it would be handled by the licensees and not documented in the inspection report. And it would be dispositioned to the licensee's corrective action program.

If the performance deficiency is greater than minor, then it would become an inspection finding that would be processed through the fuel cycle significance determination process.

And this significance determination process, or SDP, assesses the safety or security significance of inspection findings and gives results in four significance levels. These four levels in increasing order are very low --

MEMBER BROWN: I guess I am a little confused. I need to go back and ask a question. If I look at the first standard thing, it looked like you have gone from looking at inspection findings in the initial program, your current program, where it says, "Is it noncompliance?"; no. You do nothing. If it is, then you evaluate it for greater than minor. And

then you go into enforcement if it is greater than minor.

In the news one, everything gets dumped into enforcement in one way or another. I mean, if it's a traditional enforcement, you do something. And then you go and evaluate it for being greater than minor. It seems like you have expanded the range of things for which the fuel facility is going to get --

MEMBER ARMIJO: Yes.

MEMBER BROWN: -- action items taken.

MEMBER ARMIJO: Yes. I am confused, too. See, Charlie what you raised, if you take that box in the enhanced FCOP called traditional enforcement, I see it as you're taking the whole chart that was here before and stuffing it in here. And now you've got an extra process and --

MS. KOTZALAS: Yes. That is not what we intended because the -- could you put the rest of the significance? Okay. So currently if there is an inspection finding, we apply traditional enforcement to everything.

MEMBER ARMIJO: Then you're only doing the other stuff?

MS. KOTZALAS: No, no, no. In the current process. Every violation is traditional enforcement.

So every severity level for violation is addressed through traditional enforcement. Now we will say, "Do any of those criteria on the sheets apply?" Do any of those criteria apply? So was it wilful? Did it have an actual safety significance or did it impede the regulatory process?

So the answer to that is usually no. If it's like a violation because an IROFS was out of service, that doesn't meet one of those three criteria.

MEMBER ARMIJO: Okay. Your criteria do the filtering.

MS. KOTZALAS: Right. And then we will go through. So if the answer to those is no, we will go through and say, "Is it a performance deficiency?" If the answer to that is no, then we don't take any action; whereas, before we would have issued a severity level four violation.

So this actually makes less violations. And then we add. If it's still a violation or noncompliance, is it greater than minor? And if the answer is no, then again.

So most severity level four violations will be screened out there. And it will never be issued. It will be an under licensee controls

non-cited violation.

MEMBER RYAN: I think the important point, too, Margie, to that is it not only gives it control to the licensee to manage. It then kind of puts it on your list for maybe the next inspection along after this so you will have corrected that and is that corrective action effective --

MS. KOTZALAS: Yes.

MEMBER RYAN: -- without all the incumbrance of severity level whatever violations to deal with.

MS. KOTZALAS: Yes.

MEMBER RYAN: It makes it very --

MS. KOTZALAS: Yes.

MR. DAMON: This is Dennis Damon. Doesn't the traditional enforcement policy already include an evaluation of whether it's a minor violation?

MEMBER RAY: Yes. There is non-cited violation.

MR. DAMON: Yes. That is my perception, that those three middle steps are done simultaneously. And its traditional enforcement means the same thing it does now. It's not being expanded.

MEMBER RYAN: Yes. The language is a little bit clearer here. Okay.

MEMBER ARMIJO: And is performance deficiency a safety issue or not?

MS. KOTZALAS: It doesn't have to be a safety issue. It is a deficiency that -- I will pull up the definition. Okay. Performance deficiency is the result of a licensee not meeting the requirements of a standard where the cause was reasonably within a licensee's ability to foresee and correct and should have been prevented.

MEMBER ARMIJO: So let's say he is trying to meet some sort of a quality standard for this product. Maybe it's an industry standard. Maybe it's his own internal standard. And he's not doing it. Pellet densities are wrong. Does that become a performance deficiency?

MS. KOTZALAS: We would need to develop the criteria for how do we screen for performance deficiencies. That's something that if the Commission allows us to move forward, we will develop those.

MEMBER ARMIJO: But why?

MEMBER POWERS: There has to be a deficiency in his meeting the requirements of his licensing basis.

MEMBER ARMIJO: I am just trying to get at, is that a safety --

MEMBER POWERS: If he makes a commitment in his licensing basis to follow a particular standard and he does not, an inspector can cite against that.

MEMBER ARMIJO: Sure.

MEMBER POWERS: It has to be something in his license that he is committed to and done. If his licensing basis gives him an exemption against a regulation, you can't cite against it. It's all in his license.

MS. KOTZALAS: Yes.

MEMBER ARMIJO: So that boundary would still say the same.

MEMBER POWERS: Yes. I mean, if his pellets don't meet density requirements would typically not show up --

MEMBER ARMIJO: Yes.

MEMBER POWERS: -- in a licensing basis.

MEMBER ARMIJO: And that's your problem.

MEMBER POWERS: It has nothing to do with the safety, public health and safety.

MEMBER ARMIJO: Okay.

MEMBER POWERS: I mean, in principle it could, but I think of no obvious route for it to do that.

MEMBER ARMIJO: Yes.

MEMBER POWERS: I mean, that's what an inspector has to do, is he has to be able to track anything he cites against something in the licensing basis for that particular facility.

MEMBER ARMIJO: That is where I am confused, Dana, because you are either compliant or non-compliant with your licensing basis. And that's handled in the current FCOP. This is adding -- you can be compliant --

MEMBER POWERS: No. They're doing --

MEMBER ARMIJO: -- and still have this other thing.

MEMBER POWERS: This is identical to the RFP that they go in and they will have, eventually have, worksheets that the inspector goes through, either explicitly or implicitly, to make a preliminary significance determination.

MEMBER ARMIJO: Right.

MEMBER POWERS: And he says, "Gee, this is a nit." And then he will say, "This is a nit." The licensee had put it in their corrective action program. And nothing else will be said about it.

It becomes through the worksheet-level process. And it comes out not a nit. Then it goes into the significance determination process. And

that's a two-stage process.

The NRC does a significance determination. And the licensee does a significance determination. Those two were compared, and the issues result. I mean, it's identical. I mean, you patterned this exactly after the --

MEMBER ARMIJO: Similar to the --

MEMBER POWERS: The only downside that we have ever been identified to me on this process is that sometimes the plant managers say, "We used to get a lot more feedback on the nit." And he says, "We'll be able to correct the nit."

But a lot of them, you know, the inspector quickly realizes "This is going to be a nit, no matter whether I'll work it up or not. So I'm not even going to write it down." And so nothing ever filters back up. That's the only downside of it because so many things that used to be level four citations, they never amounted to anything except generating a lot of paperwork and ending up in the licensee's corrective action program anyway and not just go directly to the corrective action program. I mean, that is the only downside of it, is getting rid of the compliance mentality and focusing on the things that are significant.

And the reason for doing this has nothing to do with the licensee. It has to do with how the NRC marshals its resources for applying to this plant. It's the action plan afterwards.

I mean, in the end of this thing, it comes down and says, "Okay. What the hell is NRC going to do with this particular facility?" And it's supposed to be reasonable predictable. You know, the licensee can look at his performance and say, "Aha.

I can start expecting to spend more time up in the Regional Administrator's office if I continue on this path. Since I don't like to spend time in his office, I will correct things and get on the stick."

And, similarly, the EDO can say, "Gee, I'm going to have to start devoting more resources to this facility out here than I have in the past because I'm getting this pattern of behavior." I know it's strictly marshaling your resources and allowing the licensee to have some basis for anticipation of what is going to happen; whereas, in previous processes, it is a little difficult to understand whether he is going to be the focus of a lot of these ancillary inspections or not.

And now he knows. I'm going to start

getting a lot more inspection hours. The penalty he pays for it is he probably gets a little more base inspection than he is used to, especially if he is a good performer.

Good performers get somewhat penalized by getting more inspections in this system than they did in the past, but the answer is that the attempt is to get rid of the nit, which just takes time, but we have gone through episodically periods where people went compliance-crazy and found that that didn't help anything at all and to be transparent. That's all.

MS. KOTZALAS: Yes.

MEMBER SIEBER: It is not like minor violations just disappear. You know, if it's non-cited and considered minor, it goes into the corrective action. But there is an inspection of the corrective action program.

MEMBER POWERS: Exactly.

MEMBER SIEBER: See if there are recurrent events or if the time between the occurrence of the event and the corrective action is excessive, then that hits one of the cornerstones.

The idea is if you have a good corrective action program, you are going to resolve the deficiencies. They aren't going to reoccur. And it

means that you're paying attention to your --

MEMBER POWERS: Yes. The core inspection becomes more an inspection of the corrective action program than of the plant.

MEMBER SIEBER: That's right. It's an element of that.

Now, one of the things that during the subcommittee I think I noted that I think needs clarified again for me is that the quality of the product is not a part of the license and, therefore, not a subject to violations enforcement and so forth.

For example, if you are manufacturing fuel, then pellet density was one of the attributes for you to make a quality product. That doesn't appear in your license.

MEMBER ARMIJO: It is in your corrective action program, --

MEMBER SIEBER: It could be there.

MEMBER ARMIJO: -- your factory.

MEMBER SIEBER: It could be there. And manufacturers don't want to put up products with good quality.

MEMBER ARMIJO: Right.

MEMBER SIEBER: But from the standpoint of the licensing and operating the facility, the things

that allow you to make a poor quality product don't necessarily endanger the public --

MEMBER ARMIJO: Absolutely.

MEMBER SIEBER: -- workers, or the environment in that facility. You know, it's latent, ready to happen in somebody else's facility, whoever buys the product.

MR. DAMON: I would like to say a couple of things because I wasn't involved in the rulemaking. And I have observed how things have gone over time.

One of the early things I observed was exactly that, that making a bad product is an expensive --

MEMBER SIEBER: Yes.

MR. DAMON: -- penalty for a licensee.

MEMBER ARMIJO: You aren't going to very long stay in business.

MR. DAMON: Yes. They won't stay in business.

MEMBER SIEBER: You lose business.

MR. DAMON: And so it is not really part of the fuel cycle oversight program, which is focused on safety. It may be part of the reactors program itself to make sure that they aren't putting a poor quality product into their facility.

MEMBER SIEBER: Yes. For example, particle size and mixed oxide fuel affects fuel performance. But that is not part of the particle size. Specifications and tolerances are not part of the manufacturers' license.

MR. DAMON: So there is a couple of other things I wanted to say. One of them is the fuel cycle regulatory program is quite different from the reactor regulatory system. The reactor regulatory system has a lot of things like -- what do they call them? -- generic design criteria, design basis accidents, --

MEMBER SIEBER: Right.

MR. DAMON: -- deterministic criteria that they have to meet, standards that they have to meet, so on and so forth.

The fuel cycle oversight program is designed in a very different way. We do not, in fact, license the design of the plant or --

MEMBER SIEBER: Right.

MR. DAMON: Okay? What we do is review the licensee's program for ensuring safety and that it's effective. And then we inspect to that. And the way that we establish requirements is through this new Part 70, Subpart H, ISA system. It's really called a safety program, not an ISA.

MEMBER SIEBER: Right.

MR. DAMON: So it is much more comprehensive. In other words, it's designed so that basically if you do something that is wrong, it is automatically wrong because it's got a bad consequence.

It's not a deterministic thing. So it's much more comprehensive. The result of that is you're not going to have -- this is my prediction. You're not going to have very many things that are performance deficiencies which are not violations because in order --

MEMBER ARMIJO: That is what I was going to get at. You know, if there is a performance deficiency that affects safety, why wasn't it collapsed as a compliance problem earlier.

MR. DAMON: And it should be.

And now I give some statistics. In the last six years that this new program, ISA program, has been in effect, there have been only 12 instances where something has been identified that was regarded as what I would call a performance deficiency was not already in the ISA. And of those, some will have turned out to be minor.

So the licensee -- and we have had these

public meetings with the licensees. The licensee's perspective is we are dragging in all of these minor and performance-related stuff in there corrective action program, dragging this massive quantity of new deficiencies.

I see it as being the other way around, that all we're doing -- and I was told this about the reactor oversight program. They were concerned that they would discover a significant safety deficiency that had not been covered by the deterministic requirements. Because the fuel cycle oversight program is defined in a risk-informed performance-based way, it is very broad. That is much less likely to happen. It only happens a handful of times. And, instead of dragging in a bunch of stuff, all we're doing is being able when something like that is identified that, in fact, strictly speaking, it's a deficiency, it can be dispensed with.

The only other thing I wanted to say was those three diagrams there in series, I think they are really done simultaneously.

MEMBER SHACK: That was my question. It seems to me the traditional enforcement box is in the wrong place. I would have it somewhere after the significance determination. If it's very low

significance, does it belong in the traditional enforcement?

Part of your thing is actual safety consequences is one of your screening filters. But you really don't know that until you have been through your significance determination process.

MR. DAMON: Well, the reason -- remember, what Margie mentioned is in traditional enforcement, really. What we're really thinking about are willful violations and things like that, you know, stuff that really belongs in a legal framework.

MEMBER ARMIJO: What do you do today with the current process if you have concluded there is a willful violation? I think you have plenty of hammers to apply.

MS. KOTZALAS: If there is a willfulness, then we send that to OI for investigation and then maybe the Department of Justice. So that's what we do with willful. It's a big deal.

MEMBER ARMIJO: Pretty powerful tool.

MS. KOTZALAS: Yes.

MEMBER ARMIJO: But beyond that, normal errors over omissions, whatever you want to call them. I'm just trying to find who benefits from this. Is it the staff? It helps them make a significance

determination a little more systematically than they might do otherwise? Is it the licensee who is running this facility gets better feedback from inspection?

And who does all of the extra work? Is there extra work?

MS. KOTZALAS: My view is that both the licensee and the staff and the public benefit from these new enhanced processes because for the staff, it allows us to focus our inspection program and right size our resources to match licensee performance.

For licensees, there is the benefit because currently, right now, we are issuing a lot of severity level four violations that are compliance-based. And in this enhanced process, we would screen out -- well, first we would use the traditional enforcement screen. So that would be was it willful, did somebody do something to impact our ability to perform our regulatory function.

And then the other one was, was there an actual safety consequence? That's not potential. It's actual.

MEMBER SHACK: Okay. That is actual. Okay. That is the real difference between it and the significance determination.

MS. KOTZALAS: Right. So if any of those

three things happen, you need to use traditional enforcement.

MEMBER SHACK: Okay.

MS. KOTZALAS: If none of those three things, which is not very often that it's any one of those three things, then we would determine what is the risk significance of this violation.

If it minor, if it is very small, it screams out to the licensee to put in their corrective action program and to handle it. If it is more than minor, then we would put it into our SEP to determine the significance. And then it would feed into the action matrix. And that would help us to right size our inspection program.

So if they are higher in the action matrix, like they have several significant or like a low to moderate significance or substantial significance or high, of course, that we would take different regulatory actions, we would have a management conference, we would do additional inspections, that sort of thing. And it all feeds back up to here.

So I see a benefit to all the parties.

MEMBER ARMIJO: Okay. Then minor really means insignificant as far as the NRC is concerned?

MS. KOTZALAS: Not insignificant because it still is --

MEMBER ARMIJO: Yes. I'm trying to stick with significance determination. Somewhere along the line something has got to be insignificant.

MEMBER RYAN: It is not significant to the criteria of safety in the eyes of the staff. I mean, you can't say insignificant. It's not significant in --

MEMBER SHACK: It is back to the licensee.

MS. KOTZALAS: Right. It has to be --

MEMBER RYAN: Back to the licensee for action in the corrective action program.

MEMBER ARMIJO: But it is no longer a regulatory matter.

MEMBER RYAN: Correct.

MS. KOTZALAS: Other than that they have to fix it in their corrective action program and --

MEMBER ARMIJO: What used to be severity level four would now be, those same things would now be, minor.

MEMBER RYAN: And go to the corrective action program

MEMBER ARMIJO: Okay. So that would be level four. Okay. I just want to understand what

goes -- and then those that were not level four go into this determination process and then get sorted into these four bins.

MS. KOTZALAS: That is a rough way to consider it. It might not be 100 percent that way, but that is a good approximation.

MEMBER ARMIJO: I understand what you are doing now. Thank you.

MS. KOTZALAS: Okay. Good. Okay. The other two little areas that we propose to use in the performance assessment process are develop some cross-cutting areas based on the safety culture policy statement. And that is similar to the ROP. And then here is our feedback loop.

Next I wanted to move on to another element, which is our approach for corrective action program incentives. So the staff determined that the incentive for fuel cycle facilities to maintain corrective action programs, or CAPs, should be similar to that applied to reactor licensees.

And in this instance, we would not cite NRC-identified violations of very low safety significance or severity level four violations of fuel facilities that enter these into their CAP.

An effective CAP is one that identifies

reports, evaluates, corrects, tracks, and trends safety and security issues and routinely assesses effectiveness so that these issues do not recur in similar issues with similar causes or prevents it.

Next slide. Okay. To implement this incentive for effective CAPs, we would need to revise the current enforcement policy to include a provision that we ask inspectors to not cite the NRC-identified severity level four violations.

A draft enforcement policy revision was published for public comment on September the 6th. As currently planned, the title of this section will describe non-cited violation policy for reactors. It would be revised to include fuel cycle licensees, applicants, and new reactor applicants who have effective corrective action programs. The final enforcement policy is scheduled for publication in March of 2012.

Okay. The benefits of an effective CAP go well beyond the benefits of having NRC not cite NRC-identified severity level four violations. The industry and the NRC recognize that a true benefit of an effective CAP is the safety benefit to the workers and the public in identifying and correcting safety and security issues before they result in significant

or serious health consequences.

All fuel cycle facilities have corrective action programs. The nature and scope of these programs vary from licensee to licensee. And with the current corrective action program in place at each facility, the NRC is part of the licensee performance review process routinely conclude that the safety at fuel cycle facilities is adequate.

However, the staff used the Commission direction regarding corrective action programs as an opportunity to support continuous improvement of safety performance of fuel facilities by creating more comprehensive, consistent corrective action programs that are based on the most current knowledge and lessons learned from implementation of the current programs.

MEMBER SIEBER: The real benefit of an effective corrective action program is you get the licensee to do the inspections and the work and fix stuff, as opposed to sitting around waiting for somebody to come in and find it until you have changed responsibility. And that is really the reason why you should be doing all of this, is to get licensees into that framework. It's a mindset.

MS. KOTZALAS: That's reinforcing --

MEMBER SIEBER: And it works in the reactor process.

MR. DAMON: I would certainly confirm that the licensees are physically present at their plant. They're running it. They know it way better than we do. They have way more personnel. And they're there continuously. They should be able -- for the stuff that is of minor safety significance, they should be able to do a far --

MEMBER SIEBER: Better job.

MR. DAMON: -- better job.

MEMBER SIEBER: That's right.

MEMBER RYAN: Dennis, my take on the industry participation in the subcommittee meetings was exactly that, that they are running their corrective action program. And I took away the message that, in fact, the corrective action program is now better aligned with what the inspection process is going to produce, that it is a lot clearer to them that they have one system by which to observe and understand their plant and it's accepted by the regulator and everybody is on the same song sheet, if you will, of where we are going to look to figure out where we are and that's what we're going to use, that's what the regulator is going to use, and that's

a good thing. That is the message I took away.

MS. KOTZALAS: Okay. And now I want to move on to cornerstones. This is an area where we have greatly benefitted form the interactions with the subcommittee. And as a starting point for developing the cornerstones, we considered the process used to develop the cornerstones and the ROP. And we adapted it to fuel cycle facilities. We used a top-down hierarchical approach to develop the regulatory framework.

So the fuel cycle framework starts at the highest level with the mission. And the staff used the strategical safety and security as a second level of the regulatory framework. And the safety strategical is to ensure adequate protection of public health and safety in the environment and the security strategic goals to ensure adequate protection in the secure use of management of radioactive materials.

This next level shows the strategic performance areas of fuel facility safety, radiation safety, and safeguards. These strategic performance areas were derived from the strategic outcomes.

Specifically, the fuel facility safety strategic performance area was derived from the strategic outcomes of preventing occurrence of

inadvertent criticality, acute radiation exposures resulting in fatalities, and release of radioactive material that results in significant radiation exposures.

In addition to radioactive materials, the fuel facility safety strategic performance area extends to hazardous chemicals used with or produced from licensed radioactive materials consistent with 10 CFR Part 70 and proposed amendments to Part 40.

Similarly, radiation safety strategic performance area was derived from the strategic outcomes of preventing occurrence of any acute radiation exposures resulting in fatalities, release of radioactive materials that result in significant radiation exposures, and release of radioactive materials that cause significant adverse impacts.

And, finally, the safeguard strategic performance area was derived from the outcome of preventing any instances in which the licensed radioactive materials were used domestically in a hostile manner, in a manner hostile to the United States. ` Okay. This next level shows the actual hazards analysis-based cornerstones. These cornerstones are more aligned with the way that the licensees typically develop their integrated safety

analyses. And the organization of the cornerstones leads to an oversight program that is very similar to the framework used in the ROP.

MEMBER REMPE: Before you go on, I wasn't at your subcommittee meeting. But I guess I was reading some of the background information. I guess there has been some discussion with industry about their proposed cornerstones versus the ones that you are showing here?

MS. KOTZALAS: Yes. Our Commission paper, we have two options for cornerstones.

MEMBER REMPE: Right.

MS. KOTZALAS: One is this hazards analysis base that is based on the ISA, development of the ISA. And the other one is operations-based cornerstones. Those ones are more aligned with the way --

MEMBER REMPE: Oh, no. If we are going to talk about -- I guess they said the industry was concerned there would be some confusion at the facilities. Could you talk about that and what you think the issue is?

MS. KOTZALAS: What the industry has told us in public meetings is that these operations-based cornerstones, chemical, EP, rad, and security are

aligned with the way that they currently operate the plant with the current training of the operators. And it is the way that they communicate with the public.

MEMBER ARMIJO: Is there anything that they don't do within these cornerstones that you would do with this new set of cornerstones? Aren't all of the things that you expect or most of them already covered in some way?

MS. KOTZALAS: Yes. It is a different way of thinking about and sorting the cornerstones. Everything is covered in both aspects. It's just a different way of thinking about the cornerstones.

MR. DAMON: So my way of describing it is --

MEMBER ARMIJO: Why did you pick option B, then? That's what I'm trying to get at. You know, you picked open B because you liked this and it is closer to what you do for reactors.

These are, fuel cycle facilities are, not reactors. And they operate this way. And they're addressing the necessary safety issues and licensing issues. The question is, what is the added benefit of just changing it into a format you like a little better?

MR. DAMON: I would say that, first off,

there is an interesting way of thinking about this that clarifies it. Imagine that in a fuel cycle facility there is a whole bunch of potential accident sequences that go horizontally this way and result in some kind of consequences over here.

In the traditional way, the one that has chem, rad, and crit, what you're doing is looking at the consequence end. And you're dividing it horizontally. Okay? You are grouping it by consequences and also by the reasons that Margie mentioned. And that is the persons on the staff who are familiar with these areas are separate persons generally. And so that is a useful thing. But you are dealing within one organization of people.

The other way of dividing it the other way is dividing it vertically. You're starting at the beginning, you know, sequence initiator, safety controls, emergency preparedness. Thy come in series this way. So you are dividing all of these sequences vertically.

The other way I see is that what at least I think is true is that the things we call safety controls conclude what are known in the FCSSes or in Part 70, Subpart H, known as items relied on for safety.

MEMBER ARMIJO: Yes.

MR. DAMON: That's one thing. But those are a subset of safety controls. They are allowed to be chosen by the licensee and to be just sufficient to meet the performance requirements, the regulation. What we don't want to do is leave everything else out. So that's why we have the other thing of access sequence initiators. That's my view. Sequence initiators may be somewhat misleading.

An example of something that would contribute to safety that wouldn't be an IROFS would be the fact that, gee, we actually only operate that process two weeks out of the year. Okay? Something like that. It clearly reduces the frequency of the accident. And we don't want to leave things like that out if, for some reason, they decide, "Oh, we need to operate that thing 50 weeks a year, instead of 2 weeks a year."

MEMBER BLEY: Sam? I'm going to talk to Sam a little. The operations approach that we saw up here strikes me as the way these sites were organized. That's true. But if I want an oversight process that is focused on the importance of events that happen, those aren't really cornerstones in that they tell you the significance of this thing in any way, where this

kind of approach forces you into thinking about the scenario that occurred and where it goes and what causes it along the way.

To me, this is a cornerstone approach to look at oversight, where the other one is an organizational approach to gather information. And I just see a dramatic difference in the two.

MR. DAMON: Well, there is the other difference. And that is that if the -- in the end, we are going to do some kind of performance evaluation. We are going to look at the ensemble or violations that have occurred. All the violations are in chemical. Why are we going to evaluate the criticality safety program as being deficient in some way? So there is that alternative.

My own personal view is you've got to look at both and in terms of evaluating "Okay. We have had two years to look a plant. All their violations are in chem safety. We need to focus on chem safety. Forget about crit," you know.

MEMBER ARMIJO: If you did this, set this up, do people have to rewrite their ISAs --

MR. DAMON: No, not --

MEMBER ARMIJO: -- and resort them out into these kinds of categories and -- what do they

have to do differently?

MR. DAMON: I would say the main thing they have to do -- they're not required to do this differently. OSHA does require it. Okay? OSHA requires that periodically the licensee go back and completely redo their process hazard analysis, regardless of the fact they did it before. We don't do that. Okay? So that is one difference that we don't have.

The other thing is we have identified about 12 instances where things have occurred that obviously had a safety significance and they were not identified in the ISA. So that is the only real difference.

We don't need them to redo the whole ISA, but when they make a significant change to a process, I do think they ought to revisit the ISA.

MEMBER ARMIJO: Sure.

MR. DAMON: And the other thing is see if they identify something they didn't see in the ISA, how that affects it. And that is about it.

MEMBER SIEBER: I have a question about your chart. The bottom right-hand box, the bottom initialism is material control and accountability. Is that correct?

MS. KOTZALAS: Yes.

MEMBER SIEBER: I can think of instances, for example. Let's pretend there is some kind of a fuel cycle facility that is dealing with special nuclear material, where the accountability, safeguards, and all of that is important.

One way to make a violation here is intentional diversion of material. Another way is perhaps inadvertent or perhaps not inadvertent, for example, material accumulating in ventilation ducts and periodically cleaned out into somebody's briefcase, for example. That's not fictitious. That's happened.

So is your regular fuel cycle oversight process totally separate from the security and safeguards end?

MS. KOTZALAS: No. It is a piece. Security and safeguards is --

MEMBER SIEBER: Different inspectors, though, with different inspection procedures?

MS. KOTZALAS: Yes.

MEMBER SIEBER: And so do you think perhaps that is a mistake? Shouldn't that be integrated, somehow or another, into inspection of the entire process for those facilities that are

vulnerable to that?

MS. KOTZALAS: The current process and this process do do inspections. We have periodic as part of the core program inspections of MC&A and physical security.

MEMBER SIEBER: You allow losses, for example, stuff that this --

MS. KOTZALAS: I'm not familiar --

MEMBER SIEBER: -- percent of the process material disappears in the --

MEMBER RYAN: Material unaccounted for.

MEMBER SIEBER: Right.

MS. KOTZALAS: Yes. I am not familiar with --

MEMBER ARMIJO: That exists. Those are pretty low limits, but --

MEMBER SIEBER: Yes.

MEMBER ARMIJO: -- you are right. Everybody is tracking --

MEMBER SIEBER: Well, the only reason why I question that is I don't want there to be a loophole here because this has happened before.

MS. KOTZALAS: Okay.

MEMBER RYAN: Sam, you would know better than I, but my familiarity is that it is really

unaccounted for.

MEMBER ARMIJO: Yes, yes. Right. And I don't know what the limits are.

MEMBER RYAN: Well, actually, it is well below any --

MEMBER ARMIJO: It's pretty low.

MEMBER RYAN: -- accumulation of --

MEMBER ARMIJO: It costs money as well as being security.

MEMBER RYAN: I think that's just one of the many things that are in the --

MR. DAMON: I have a memory about 15 years ago. There was actually kind of an intensive program to make sure that if a safety inspector -- it said safety inspector should be aware of material unaccounted for.

And it's not that they are going to be as up on it as MC&A inspectors, but --

MEMBER ARMIJO: Yes.

MR. DAMON: But they would be aware that, oh, my gosh, where is this material going? And they would then alert the MC&A guy.

MEMBER ARMIJO: The plant operators are concerned for a variety of reasons, not just the security, you know. If material is disappearing,

where is it accumulating? And you're getting caught maybe into a criticality problem, not to mention it costs money to lose all of that stuff.

So it is addressed in a broad way, but I agree with the staff keeping a specialized set of people that worry about the security. Focus on that is a good idea.

MR. DAMON: The thing I was more concerned about was like the think that happened at THORP, which is they had instrumentation in place to detect if material was going not into the accountability tank but was spilling out into the process cell.

They had this instrumentation in place. The instrumentation didn't work. So they disabled it. So they didn't have that capability if they continued to operate. That is the kind of thing that really disturbs me, that they are willing to continue to operate.

MEMBER BLEY: Actually, they had one report come in to the plant that showed the discrepancy. And it was so far off that they said there must an arithmetic mistake. You pulled it aside, and you didn't get another for another six or eight months.

MR. DAMON: Yes.

MEMBER SIEBER: Well, my question stems from my knowledge of the NUMEC case where there was some question. I don't think that was ever resolved. There is some question as to where the stuff went.

MEMBER RYAN: Margie, if you could maybe turn your attention to the subcommittee -- Joy, did you have another question at this point?

MEMBER REMPE: Well, I guess there were some comments and some things about the operators might be confused if we switched to the other cornerstones. Could you elaborate on why they would be confused or what --

MS. KOTZALAS: I don't have any more information than what I have heard from the --

MEMBER RYAN: One part, of course, that we have touched on that was touched on in the subcommittee at some length is the barrier. Could you talk about that at the appropriate time?

MR. DE JESUS: Well, basically what we mentioned about the barriers considering a barriers cornerstone is that we incorporated that into the safety controls because a fuel facility shouldn't have the same paradigm as reactors. They have the fuel cladding, the reactor coolant system, and the containment.

In a fuel cycle facility, here's what would happen. They don't usually have that. And if they do have the process piping, that's a safety control.

And part of the ISAs that I have reviewed, that is basically an item relied on for safety.

MEMBER RYAN: So it is not absent? It's just kind of integrated with safety controls?

MR. DAMON: Yes. Another way of thinking about it is that they won't have any difficulty discriminating this system because what we mean by safety controls are IROFS, which they have already listed. And, secondly, things that --

MEMBER ARMIJO: And it is more than IROFS.

MR. DAMON: Yes.

MEMBER ARMIJO: You want more than IROFS.

MR. DAMON: Formal safety controls, you know, like criticality controls, things that could have been IROFS but they chose not to designate them. So they are formal safety controls that are managed by the plant.

The accident sequence initiators stuff includes things that are a little less definitively defined. However, the industry has spoken to us at great length about things that are of that nature.

And one of the areas that it comes up in is in the area of what's called design features.

There's a whole topical area of discussion between the industry and NRC on what the heck is a design feature, why isn't it an IROFS, that whole subject. So that whole area of other things other than safety controls is being actively discussed in detail.

MEMBER SIEBER: Yes. Now, I always think of IROFS as devices, you know, safety valves, controls. Where do you cover things like deterioration of process piping and tanks and so forth in the cornerstones?

For example, you know, a lot of the old PUREX plants have a lot of metallurgical problems because of the high activity of the chemical activity of the materials that were used in those. Where does that fit into all of this?

MR. DE JESUS: I believe that that would be covered under maintenance inspections of safety controls and that that is part of the inspections under the safety controls cornerstone: maintenance, preventative maintenance; surveillance; and all that kind of inspection.

MEMBER SIEBER: Yes. I guess I am not

interpreting safety controls properly if it's that --

MS. KOTZALAS: IROFS, sometimes they are things, but sometimes they are programs or procedures.

MEMBER SIEBER: Right. Right. Yes. They could be an administrative directive.

MS. KOTZALAS: Yes.

MEMBER RYAN: Or it could be something like frequency of inspection for a particular area or things of that sort.

MEMBER SIEBER: Yes.

MEMBER RYAN: So all of that is set with that in mind.

MR. DAMON: Yes. One attempt back in the early days when they were talking about Part 70 was to talk about -- you know, once something has been identified as either an IROFS or a safety control, okay. Now what do you need to do to make it reliable and address issues like you have raised?

We decided if, oh, my gosh, the variety of things in these plants is so great that trying to devise a single program that would like cover everything, you know. And you have to address this. You have to address that, and so on.

And we decided, oh, man, that stuff is just going to be too -- it's not going to work. It's

inefficient. And so basically the idea was to require that okay, once something is an IROFS, you are required to what are called management measures. We listed what they are.

But the program of management measures for an IROFS would be basically -- we call it graded, but what we really meant was it's individually selected for that particular process. If that particular process needs to address aging or whatever the issue is, it has to be identified and managed.

MEMBER SIEBER: The piping and pressure vessel inspections and all of that would fit into the safety controls cornerstone?

MR. DAMON: Right. It's a supporter for safety controls. All the things that support -- the way it is put in the rule is you must do management measures sufficient to assure the reliability and availability of safety controls. And it was left at that. So it's left up to licensees to define what these things are and the inspectors to review them and determine their adequacy and the performance of them and so on and so forth.

MEMBER SIEBER: Yes. I recall an old PUREX plant where they set the piping in concrete for shielding. It made it uninspectable and, therefore,

corroded and weak uncontrollably.

MR. DAMON: Yes.

MEMBER SKILLMAN: I would like to ask a question, please. I'm Dick Skillman. One of the differences that I have experienced between a Part 50 license and a Part 70 license is to focus on configuration control on the Part 70 license.

I would offer in terms of magnitude of configuration control if a Part 50 standard nuclear plant is a ten, at a fuel facility, it is 50 or 80, very significant focus on configuration control to protect the integrity of the IROFS.

So I wonder why there isn't a block for configuration control given its central importance to the safeness of the fuel facility.

MS. KOTZALAS: Configuration control is one of the management measures that Dennis was talking about. And that applies and all of them. And it's most significantly safety controls to make sure. So it's a piece of that safety controls.

MEMBER RYAN: And correct me if I'm wrong, but we had an industry representative that highlighted criticality. Within that is where most of the effort is spent.

MR. DAMON: Yes. And the other thing

about configuration control is -- I mean, in fact, my memory is that it was one of the two major reasons why they instituted Subpart H. The first reason was we had an incident at Sequoyah Fuels where you have a six-cylinder and a worker was killed. I think it was the only worker who has ever been killed by an NRC-regulated hazard, you know. And so what that did was NRC went to Congress and said, "Well, gosh. We don't regulate the chemical consequences of regulated material."

Congress says, "Wrong answer. Go back. Write a rule. And say 'We do regulate the chemical consequences of licensed material.'"

So that was one reason. The other reason was an incident that happened which was due to what I could call failure of configuration control. So those were actually the two major reasons why the rule was put in place.

And if you read the rule carefully, you will find out that configuration control is applied not just to the licensee-selected items for write-on for safety. It applies to basically anything that has any kind of significance of any kind.

MEMBER SKILLMAN: I believe that's what I was trying to communicate.

MR. DAMON: Yes.

MEMBER SKILLMAN: Let me say again I understand configuration control with regard to criticality. That's not what I'm talking about, although criticality is part of it. It is the configuration of the facility to operate safely, your vacuum pumps, with your piping, with the alignment that you use, how you put cylinders in autoclaves or whatever it might be.

So the real issue is operation of configuration control of the facility to assure that the IROFS are protected. So the question is, why isn't configuration control -- as you just mentioned, it is very important. It is on the block.

MR. DE JESUS: Looking at the -- for each cornerstone, there is a detailed diagram. Each cornerstone has several key attributes. And each key attribute has a scope of inspection. For example, at the accident sequence initiators cornerstone, it has the signed key attribute. And under that designed key attribute, there is the configuration control scope. And that is in the safety controls, it has the same scope of inspection. It is included in those two cornerstones.

We discussed in detail those diagrams at

the subcommittee meetings.

MEMBER SKILLMAN: Thank you.

MR. DAMON: Yes. That is actually what -- you know, the staff was directed by the SRM to work on cornerstones. And one of the aspects of that was the newer scheme of cornerstones that are what I would called righted vertically, you know, this one.

The other one, this was easy to figure out. The other ones, where most of the work was done, it was done by very experienced guys who used to be directors of the fuel cycle facility inspection program. And what they did was what Jonathan mentioned. They broke down these cornerstones into blocks of what it was that caused the cornerstone to be achieved or to be made safe. And so the work you describe, it was done, but it was done at the next level below this one.

MEMBER RYAN: You have about 20 minutes left.

MS. KOTZALAS: Okay. What I would like to do is skip the next slide because we have talked a lot about that and go into the SDP types.

MEMBER ARMIJO: Real quick. That previous slide --

MS. KOTZALAS: Yes.

MEMBER ARMIJO: You say this approach is the cornerstone to organized, the same way as licensees organized hazards analysis, development of the ISA. I thought they didn't like the cornerstone, that industry guys said, "Gee, option 8 cornerstones is the way we're organized. And you're saying here something different. Maybe I misunderstand.

MS. KOTZALAS: Okay. What we're saying in this one is that these hazards-based cornerstones, they are organized in the way a licensee organizes their hazards analysis.

MEMBER ARMIJO: Okay.

MS. KOTZALAS: But the other option, the operations base, is organized how they run the day to day at the plant. So it is more understandable or more applicable to more people, rather than just the hazards ISA guys. So that's the difference.

MEMBER ARMIJO: Okay. I understand what you are saying. Thank you.

MS. KOTZALAS: Okay. SDP.

MEMBER BLEY: I think, if I could, from my memory of the discussion at the subcommittee, it's not just that that is where they are organized day to day, but in terms of how they currently track the work in responding to events, it's through that organization.

So I think their argument was that they would have to rethink how they maybe assigned the tasks of using the cornerstones. Is that fair from what you heard or --

MS. KOTZALAS: Yes.

MR. DAMON: Yes. Well, another way of saying the same thing I think is that if something had to be fixed, it probably had to be -- if the problems have been in this area over here, you know, chem safety or crit safety, that is probably where the thing has to be fixed.

MEMBER BLEY: Eventually, yes. Okay.

MS. KOTZALAS: Okay. The Commission did not approve us to develop an SDP, but we have integrated the knowledge that we gave from our ISA PRA comparison paper that we provided to you last almost a year ago, last winter.

We integrated that paper with the cornerstone development. And we identified three conceptual SDP types then. And we will propose further development of one of those types next steps in the FCOP enhancements. These SDP types are applicable to the ISA-related cornerstones, which are the accident sequence initiator and the safety controls.

The non-ISA-related cornerstones, the SDP would be a deterministic process similar to what is used within the ROP's SDP.

We began thinking about SDPs by identifying what the desired characteristics would be. And we decided that any SDP must be realistic and accurate, practicable, cost-effective, and consistent.

With this in mind, we developed three conceptual types, which we refer to as a qualitative, case-by-case, and PRA-based. In the next few slides, I will go over a general description of each type and give the pros and the cons.

Now, the qualitative type will be based on the qualitative criteria, not actual numerical risk quantification, but has similar risk and safety significance objectives as the other two types. This process will be based on an evaluation of the deficient connection with respect to duration, reduced number and quality of controls, and potential for consequences.

In addition, a refined risk index method, as in our standard review plan, will be part of the approach along with consideration of licensee's ISAs.

Some of the pros of this type are that it is simpler and less resource-intensive than either a

case-by-case or a PRA-based type. It recognizes the limitations on the quantitative data, the tools available and applicable to the fuel cycle industry. And assignment of controls to general categories would be more objective than justifying assignment of generic failure data to plant-specific controls. And the significance evaluation would be more predictable, consistent, and consistent across licensees and different types of deficiencies.

Now, con, this is the least realistic and precise of the three approaches.

Next. The next is a case-by-case type. And this would be performed on a case-by-case basis and is being performed by the ISA. And this is what was described in the ISA PRA paper.

These evaluations will be performed by the staff with information from licensees and will evaluate the safety significance of each inspection finding when it occurs.

The conservatisms in the ISA would have to be adjusted using standardized NRC guidance and data as needed. And the staff considers this type will be a simplified quantitative method. A pro of this is that the significance evaluation not be as realistic as one based on PRA, but it would provide sufficiently

realistic results, such as like order of magnitude results.

Another pro is that the significance evaluation will be consistent across licensees. The types of deficiencies is less resource-intensive than the PRA-based type. And it would be generic; therefore, simpler than plant-specific quantitative analysis.

One of the cons is that the risk, the quantitative risk, technology for fuel cycles is not sufficiently developed to support this type of evaluation. And it might require a backup method because technical difficulties may preclude this from being used in a timely manner to support an oversight process.

For example, if there was a finding in the SDP and we needed to develop some quantitative data, we still have a timeliness that we need to issue our enforcement action or inspection, the significance for it. And we may run into a time difficulty, resource difficulty with this.

MEMBER ARMIJO: Quick question. On reasonably accurate significance determination, I go back to your flow chart. And the statements would be high significance, substantial significance, low to

moderate, and very low. Those are all pretty qualitative.

So why is accuracy -- you know, what do you need to say that you are reasonably accurate? What kind of -- I don't understand that because the output looked pretty qualitative conclusions.

MR. DAMON: Well, they are not related. For this type of SDP, they are not qualitative. You would be calculating a number here just like you do in the ROP. So you would get an exact number. You would have --

MEMBER ARMIJO: Like what parameter: core damage frequency or --

MR. DAMON: No. There's a whole set of them. There are actually at least four and possibly five different consequence categories. There is chemical safety of the public, chemical safety of the worker, criticality safety of the public, criticality safety of the worker, radiological safety and being a release of radioactivity to the worker and public. The last one is a collective risk consideration, which I don't recommend undertaking. At the time it's kind of a big deal.

What happens in practice is, even though you've got like six different consequence types, you

know, you don't just have LERF or you don't just have CDF and LERF or CDF and LERF and containment performance or something, which are dividing a different way. You've got like six different things to think about.

What I found is in most cases, you only need to look at one of those. You quickly realize that, actually, the thing that is most significant about this is this particular consequence, one of the exceptions I would say is chemical safety.

It's not so obvious that if the worker's in the room where the chemical thing happens, he's at very severe risk. If the amount of chemical release is moderate, it's not clear at all that the public is really impacted by this.

MEMBER ARMIJO: Let's say he's got a chemical spill, that same thing, contained some uranium in it and he spilled, he's in a spill, you turned that into a number on a case-by-case --

MR. DAMON: Right.

MEMBER ARMIJO: -- some sort of a health-related number.

MR. DAMON: Yes. Another thing about fuel cycle facilities is it is very different from reactors. Reactors, the main concern is release of

radioactive material, which has two kinds of effects, which we don't need. We found ways of not needing to discriminate between the two.

The first type effect is if you get a radiation dose that's large enough to kill you, you would die. It's discrete, right? There's a threshold. There's an exact number. If you go over -- not an exact number, but there's a number. If you go over that, you're dead. There's another number below that.

It's like the numbers -- I'll give you the numbers, 350 rem. You're talking about people dying. Rads. A hundred rads. You're talking about acute radiation syndrome of very serious health effects.

MEMBER ARMIJO: Dennis, not to take your time. So you would go and you would actually use some numerical basis that says this was high significance or low significance?

MR. DAMON: Right.

MEMBER ARMIJO: And you addressed -- criticality safety is pretty easy. You have that or you don't. That's pretty significant. It's the near misses that are the problems.

Okay. So you're going to get to numbers on the case-by-case; whereas, you use basically

judgment and experience on the qualitative.

MR. DAMON: The way I would put it is this is quantitative. The consequence categories are very discrete: death, very serious injury, so on. You get a number. The number is the incurred probability of that outcome, like due to the deficiency, how much additional probability that you killed a worker or a member of the public occur? And that becomes your metric of significance. Then you define categories of significance, the four categories from very low to high, by discrete numbers. And if you are above that number, then you are in that category.

MEMBER RYAN: Okay. I think we maybe can save some additional questions. I would like them to get through their presentation because the last couple of slides are where the action is.

MS. KOTZALAS: Okay. Next, the PRA. Okay. This is the third type of SDP that we considered. And this is based on fully quantitative PRAs that are applied before an SDP process. It is analogous to the SDP in the ROP, and it will require full PRAs for all processes at all facilities.

This type would also require inspector notebooks or similar guidance for performing the evaluations. And PRAs would have to be performed by

licensees due to the great variety of process designs in their unique and proprietary natures.

A pro of this approach is that it would be based on the licensee's best information performed with adequate time available and with results readily available to the staff when inspection findings occur.

A con is that it would be a large resource expenditure for both the NRC and the licensees to develop and implement because the tools and the data for fuel cycle PRAs would have to be developed.

Another con is that the PRAs would not be standardized because each licensee may carry out its PRA differently. And, therefore, the significance evaluations may not be consistent across all licensees.

We would develop standards tools. That would also help but would require extensive resources and time on the staff's part.

And the last con is that the quantitative risk technology for fuel cycle facilities is not sufficiently developed to support this. In order to do that, we would need to develop failure data, computer analysis capabilities for a variety of fuel cycle risk phenomena and probabilistic variations of magnitudes of chemical events, criticality events, and

the weather for different fuel cycle situations.

MEMBER SIEBER: It seems to me that PRA-based -- you know, with reactors, you have one specific accident that leads to core damage and perhaps an earlier release.

Part of these facilities, instead of having one gigantic accident, you've got a lot of little accidents that don't have a lot of off-site consequences associated with them. So I think it is very difficult to do any kind of a PRA-type study with such diverse kinds of activities going on. I'm not even sure I would know how to do it.

MS. KOTZALAS: That is why we are recommending --

MEMBER SIEBER: Not to do it.

MS. KOTZALAS: -- a qualitative approach. Okay.

Our conclusions and recommendations. And this is what we are providing in our Commission paper. We are recommending the oversight process be enhanced consistent with the diagram that we had shown in slide five. And we recommend further development of the cornerstones in the hazards analysis-based approach, to include revision to the core inspection program, to begin the pilot of a performance deficiency concept,

to develop a qualitative-type SDP, to develop a performance assessment process based on SDP results. It includes an action matrix. It incorporates cross-cutting areas. To develop a supplemental inspection program based on licensee performance and to further revise the enforcement policy to incorporate these changes.

Are there any more questions about our process?

MEMBER RYAN: Anything else? Sam?

MEMBER ARMIJO: Only all the significance determination work is done by the staff, right? You would require information from the licensees. So if they didn't have a PRA, then they would have to create a PRA. And you are not recommending that.

Let's say in the case-by-case, I guess I thought that is what you were recommending. But you said you are recommending the qualitative?

MS. KOTZALAS: Yes. It's mostly based on resources. As I said earlier, it is a flat or declining budget. And in order to do the case-by-case, it would require a significant amount of resources for the staff.

MEMBER ARMIJO: Even though there are not very many events to deal with on a -- there wouldn't

be very many that have to go through this case by case, would there, or did I get that wrong?

MR. DAMON: Yes. You are right. There is a relatively small number of events. The ones I am worried about -- see, I always look at it from the opposite position of the industry. The industry likes this and the staff in that if we do this right, we can I think significantly reduce the resources that we have to devote to a number of things, like the administrative processing of minor things that are compliance things, but why are we spending all of this administrative process on this stuff so licensees can take care of this?

MEMBER RYAN: This may be a lot of our scope here today.

MR. DAMON: Yes. But I look at it from the other end. I am more worried about things coming up that may not look to most people like a significant issue. But this is really an important one. So that's why I think we need work and one of the benefits of this program.

MEMBER BLEY: I guess I would like to reiterate what I said at the subcommittee meeting on this last issue of the qualitative case-by-case or rate case.

To Jack's point, in a nuclear plant, there are lots and lots of small things that can happen that aren't analyzed using PRA. We look at the things that can affect off site. I think that is what I would like to see us do here. And there is a small number of cases where some of them would be off site and want to look harder.

Your case-by-case middle ground seems to me the sensible one, which probably does qualitative for almost everything. And if you get something very significant you do a little more analysis.

I think that is where you end up anyway, regardless of what you say. I think by the time the staff reviews it, if it is a really significant event, there is going to be some more work done on it.

So I suspect in the practical case, what you really do is something like the case-by-case, that certainly in the bulk of things, you are recommending the qualitative. And I can't disagree with that because in the bulk of things, they aren't effective off site at all, which is where you would want to bring a more thorough analysis.

MR. DAMON: Yes. I have had over the last week or so extensive discussion. I understand off-site consequences. I used to do -- I developed

computer codes to do dispersion analysis and consequence analysis, including all of the environmental pathways, the whole nine yards. I used to develop computer codes like that. So I understand that. So I had some discussions with some of our more experienced staff, who know about chemical.

We already have the MAXCCS code. So if we need to do that, a) we run the MAXCCS code, no problem. It does the radiologic. It is the chemical equivalent of that that bothered me. We didn't have an exact chemical equivalent.

I am still investigating whether there, in fact, is an adequate exact chemical equivalent to the MAXCCS code. But, in any case, it is very quantitative, but it can be determined basically in advance.

What I determined from talking to experienced staff is that the ops center has developed guidance tools that, so far as I have determined, can do this job. In other words, the key thing, like you said, is if something happens and it is going to affect the off-site public, then obviously this is something we need to take a careful look at. How do we determine that it is going to affect the off-site public? We need to know the distances at which you

produce AGL1, 2, and 3. Okay? So we have to go through that process.

What I was told is most of this -- I've seen the diagrams. You know, here is a curve of dose versus distance. If you release this amount of material and the stability category is this and the wind speed is this, this is what you get. So that stuff actually exists.

So I think most of the work actually involved improving the process, developing the qualitative criteria of --

MEMBER RYAN: I'm sorry. We're going to have to wrap up.

MR. DAMON: -- which things are more important than others is simple. It's going to be collecting all of this information together.

MEMBER BANERJEE: Can I just ask you a question here? There are, of course, chemical dispersion codes which handle a variety of releases and things like that. These are well-validated and used over different terrain and different weather conditions and so on. Is there some specific aspect here which precludes their use?

MR. DAMON: No. It doesn't preclude. The problem is they have to put everything together: the

weather condition, the amount and thing released, where the people are located, how far they are, and what is the probability of all of these things. All this stuff has to be put into a single computer code, summed, integrated up, summed up, and averaged. That is what MAXCCS does.

MEMBER BANERJEE: So you have to adjust the codes to give you what, risk contours, or something? These codes do generate that.

MR. DAMON: The point is these are not actual accidents. The codes were almost all developed for actual accidents, take the actual conditions. There is only one condition. You analyze it.

What we want is given a degradation or a disimplement of a safety control, there's a potential accident. That potential accident could happen under any weather condition.

MEMBER BANERJEE: Right. So we have to sample these in some Monte Carlo way of --

MR. DAMON: You have to average. Yes. You have to get the average. Given the condition, you have to get the average. That is the code I am looking for.

MEMBER RYAN: Okay.

MS. KOTZALAS: Thank you very much.

MEMBER RYAN: Thank you. I want to appreciate the staff's efforts to the two subcommittee briefings. They were very helpful. And hopefully we will be proceeding in the letter during this meeting.

MS. KOTZALAS: Thank you.

MEMBER RYAN: Thank you. Back to the Chairman.

CHAIRMAN ABDEL-KHALIK: Thank you.

At this time we are off the record. We will break for lunch for one hour, roughly one hour.

(Whereupon, a luncheon recess was taken at 11:47 a.m.)

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# Regulatory Guide 1.82 Revision 4

# Water Sources for Long-Term Recirculation Cooling Following a Loss-Of-Coolant-Accident

**ACRS Meeting**
**October 6, 2011**

**Presented by John Burke**
**Office of Nuclear Regulatory Research**

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# Overview

- Background
  - Reason for the revision
- Selected topics from the Reg. Guide
- Review of Public Comments

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# Background

- Regulatory Guide (RG) 1.82, “Water Sources for Long-Term Recirculation Cooling Following a Loss-Of-Coolant-Accident”, was last revised in November 2003 to improve the guidance for debris accumulation evaluations of PWR strainers.

- Research conducted by both the NRC and industry related to GSI-191 over the last several years has increased the understanding of the behavior of ECCS suction strainers. This in turn led to the desire to update the regulatory guide.

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# Background

- Draft of RG 1.82 Rev. 4 is a complete re-write of the prior revision to include updated information and improve readability.

- The discussions in the Background Section and the Regulatory Positions common to both PWRs and BWRs are provided first, followed by guidance specific to each reactor types, i.e. PWRs and BWRs, respectively.

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# Background (cont'd)

- Draft RG 1.82 (Revision 4) endorses various industry Topical Reports, the NEI guidance report and the corresponding Safety Evaluations (SE), and NUREG reports.

- The staff desired to update the RG now, even though there are still a few open issues with GSI-191.

- Incorporates staff guidance on head loss testing and vortexing, protective coatings, and chemical effects.

- Incorporates latest staff criteria for issues related to Gas Management in ECCS and Generic Letter 2008-01.

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# Background (cont'd)

- The issues listed below are deferred to a future revision of the RG.
  - This draft revision does not include changes in guidance for containment accident pressure (CAP) impacts on net positive suction head (NPSH).
  - It does not provide detailed staff guidance for downstream in-vessel effects.
  - Several GSI-191 resolution closure options were recently approved by the Commission. The staff is currently evaluating those options, such as a risk-informed approach, in response to SRM-SECY-10-0113, dated December 23, 2010.

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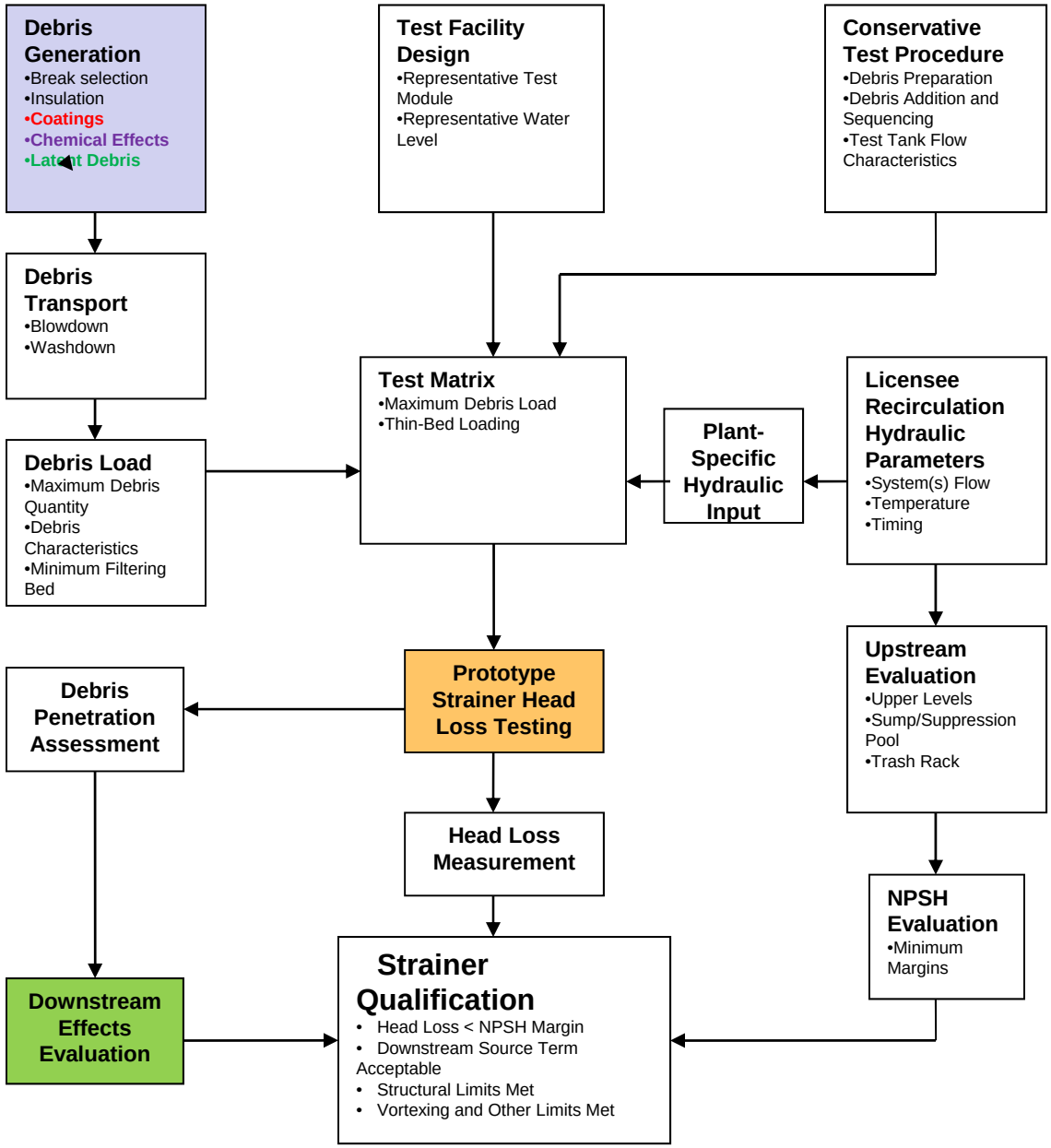
- Strainer Qualification Flow Chart



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# Determination of Strainer Head Loss

- The use of prototypical physical head loss testing is the recommended method for determining suction strainer head loss. The use of a semi-empirical correlation, i.e. NUREG/CR-6224, which was previously accepted in RG Rev. 3, is considered acceptable for scoping only.

- Limitations of the correlations are discussed in the SE for NEI-04-07 and include:
  - Cal-Sil insulation, coating particulates, chemical precipitates, and latent debris were not included in testing to determine correlation
  - Sensitively to debris preparation and introduction into test loop
  - Water temperature effects were not included
  - Thin bed effect was not sufficiently addressed

- This RG change is consistent with the staff SE for NEI 04-07.

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# Determination of Strainer Head Loss, cont.

- Regulatory Position 1.3.11. of draft RG 1.82, Revision 4 incorporates detailed staff guidance on methods acceptable for conducting head loss testing as disseminated to industry in a NRC staff letter to NEI dated March 28, 2008.
  - The NRC staff evaluated the industry's head loss testing protocols, and witnessed head loss testing at each of the vendor test facilities in 2006/2007. The staff then developed guidance in the areas of testing procedures, scaling, surrogate debris similitude, data extrapolation, etc. for staff and licensee use.
  - That guidance is incorporated into this RG revision in Regulatory Position 1.3.11.

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# Chemical Effects

- Revision 3 of the RG mentioned that debris caused by chemical reactions between the pool water and metals should be minimized. This revision provides more details on how to evaluate chemical effects.
- The staff SE for WCAP-16530-NP-A accepts this industry approach as one method that may be used to evaluate chemical effects that may occur in a post-accident containment sump pool.
- March 2008 letter to NEI provided additional guidance for an overall approach to evaluate the chemical effects on strainer head loss.
- Strainer designs should be validated through plant specific testing that includes chemical effects.
- Regulatory Positions have been added to incorporate the above staff guidance.

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# Downstream Effects

- Downstream effects have 2 sub categories, ex-vessel and in-vessel effects.
- The prior revision of the RG stated that debris clogging of flow restrictions downstream of the sump screen should be assessed, but provided no specific methods.
- For ex-vessel effects; WCAP-16406-P-A, provides a method, acceptable to the NRC staff, for licensees to use in evaluating the downstream impact of debris that passes through the strainer and enters the ECC systems and components. (abrasion, wear, blockage of flow paths).
- Regulatory Position 1.3.8 was added to endorse topical report WCAP-16406-P-A.

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# Protective Coatings

- The prior revision just listed coatings as a possible debris source.
- NRC Staff Review Guidance regarding protective coating provides a general approach to conduct plant-specific coating evaluations.
- This guidance covers the failure characteristics of both qualified and unqualified coatings.
- Regulatory Position 1.3.5 was added to include guidance for the treatment of protective coatings.
- Coating debris transport analysis is acceptable if it is within the scope and parameters of NUREG/CR-6916.

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# Latent Debris

- Latent debris is the general area dirt and dust, etc. present in containment. It may contribute significantly to head loss across the suction strainer during post-LOCA recirculation operation.
- Revision 3 of the RG relied on licensees' cleanliness programs to minimize this source of debris.
- NEI 02-01 Rev 1 "Condition Assessment Guidelines: Debris Sources Inside PWR Containment," provides an acceptable approach for determining latent debris quantities and characteristics.
- NEI Guidance Report 04-07 provides methods that can be used to evaluate the impact of latent debris on strainer blockage.
- The staff Safety Evaluation for NEI 04-07 accepts the industry approach in these documents.
- Regulatory Position 1.3.6 was added to address this issue.

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# Vortexing & Air Ingestion

- Vortex formation and air ingestion may occur depending on strainer submergence, strainer configuration, and fluid field geometry. In the previous revision of the RG, there was a 2% air ingestion criterion as the threshold for pump degradation.

- NPSH(req) adjustment due to air ingestion was maintained from prior revision.

- This criterion did not differentiate between transient and steady state conditions and was based on studies conducted many years ago.

- GL 2008-01 “Managing Gas Accumulation in Emergency Core Cooling, Decay Heat Removal, and Containment Spray Systems” was issued in January 2008 to address the issue of gas accumulation in the emergency core cooling, decay heat removal and containment spray systems.

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# Vortexing & Air Ingestion, (cont.)

- Appendix A of this RG has been updated to provide the latest staff guidance for evaluation of the potential for vortex formation and air ingestion.
- These changes also reflect the geometry of the strainers now installed.
- Table A-2 “Impact of Ingested Air on Pump Performance” now includes steady state and transient operation information.
- The changes to this Appendix are consistent with the latest staff guidance issued for GL 2008-01 as discussed during public meetings with NEI and licensees.

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# Public Comments

- The draft RG (DG 1234) was published for public comments in the summer of 2010.
- 84 comments were received from 5 separate organizations.
- The comments were carefully evaluated by the staff. The comments were incorporated into the draft RG 1.82, revision 4, as appropriate.

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# Public Comments, cont.

Many of the public comments could be grouped under a few headings such as;

- Use of NUREG/CR-6224 correlation.
  - This RG revision is consistent with the SE for NEI 04-07. No backfit is imposed on those licensee who used the correlation.
- Head Loss testing protocols.
  - The staff positions in this revision are consistent with the March 2008 guidance letter to NEI. However, in some sections the wording in the RG was confusing and was revised.
  - The staff will allow settlement credit in testing, if justified.
- Use of outdate references.
  - The staff closely reviewed the references in the RG. Some were deleted and some were added.
- Credit for Containment Accident Pressure.
  - As discussed earlier, this issue is still under evaluation
- Generic Letter 08-01.
  - The RG is consistent with guidance published for resolving GL 08-01.

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# ENHANCEMENTS TO THE FUEL CYCLE OVERSIGHT PROCESS

Presentation to the Advisory Committee on Reactor Safeguards

October 6, 2011

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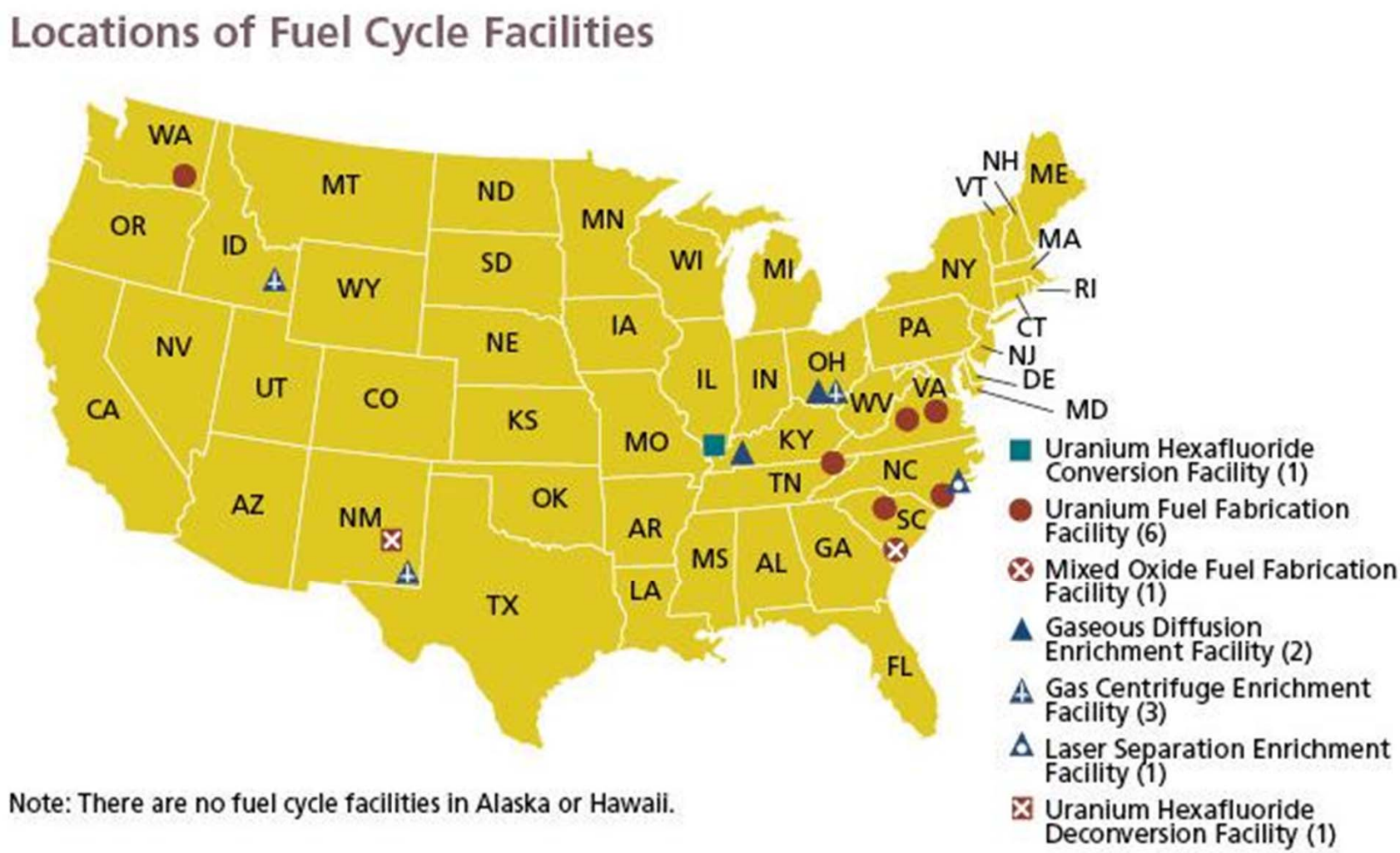
# Commission Direction



- Make modest adjustments to the existing oversight program to enhance its effectiveness and efficiency.
  - Provide incentives for licensees to maintain effective CAPs
  - Consider how to best reflect the fuel facility licensees' Corrective Action Programs (CAPs) in the NRC Enforcement Policy
- Develop a set of cornerstones that could be applied to the fuel cycle oversight process (FCOP).
- Provide an assessment of the work accomplished and recommendations for next steps.

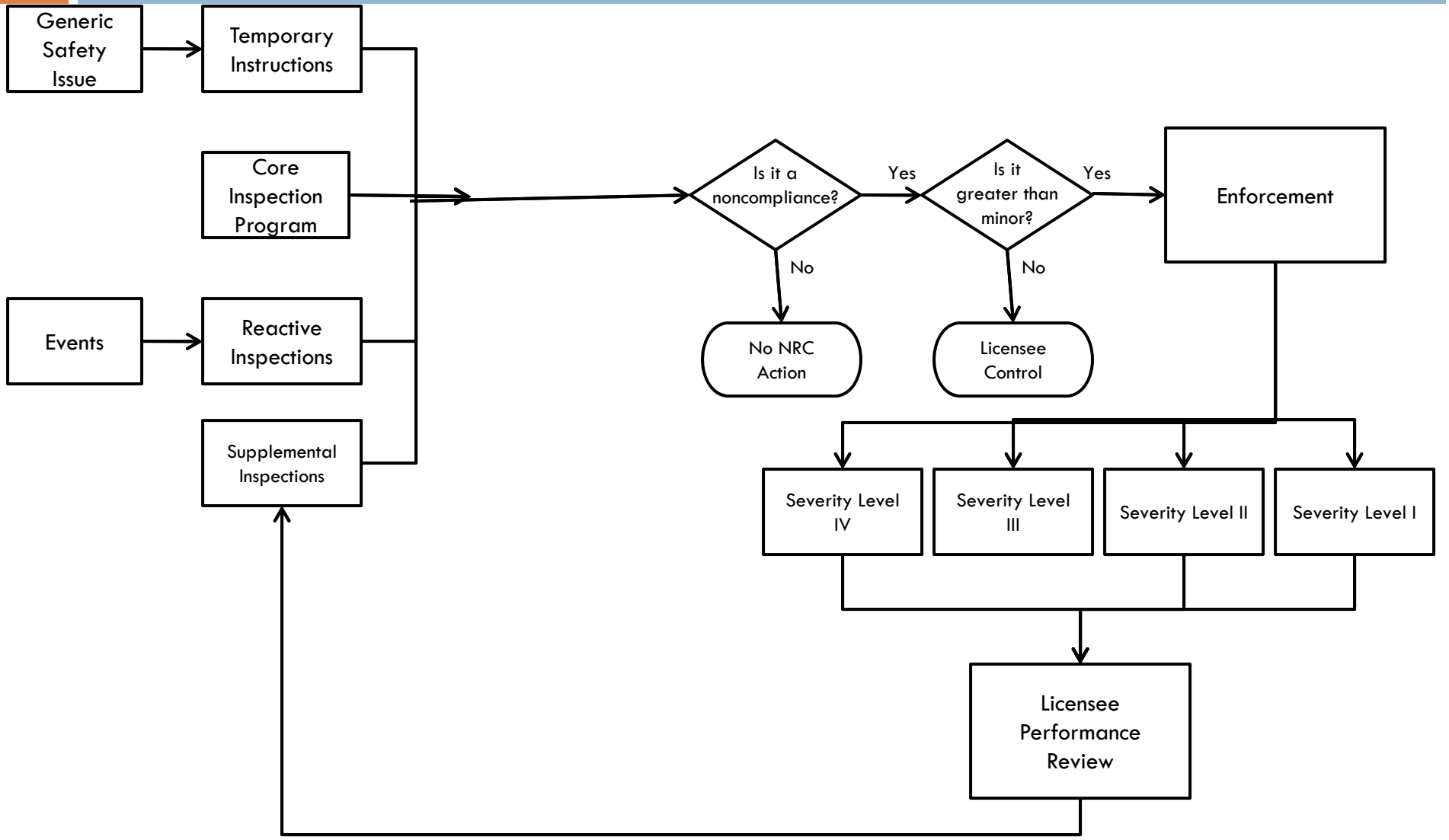
# Fuel Cycle Facilities





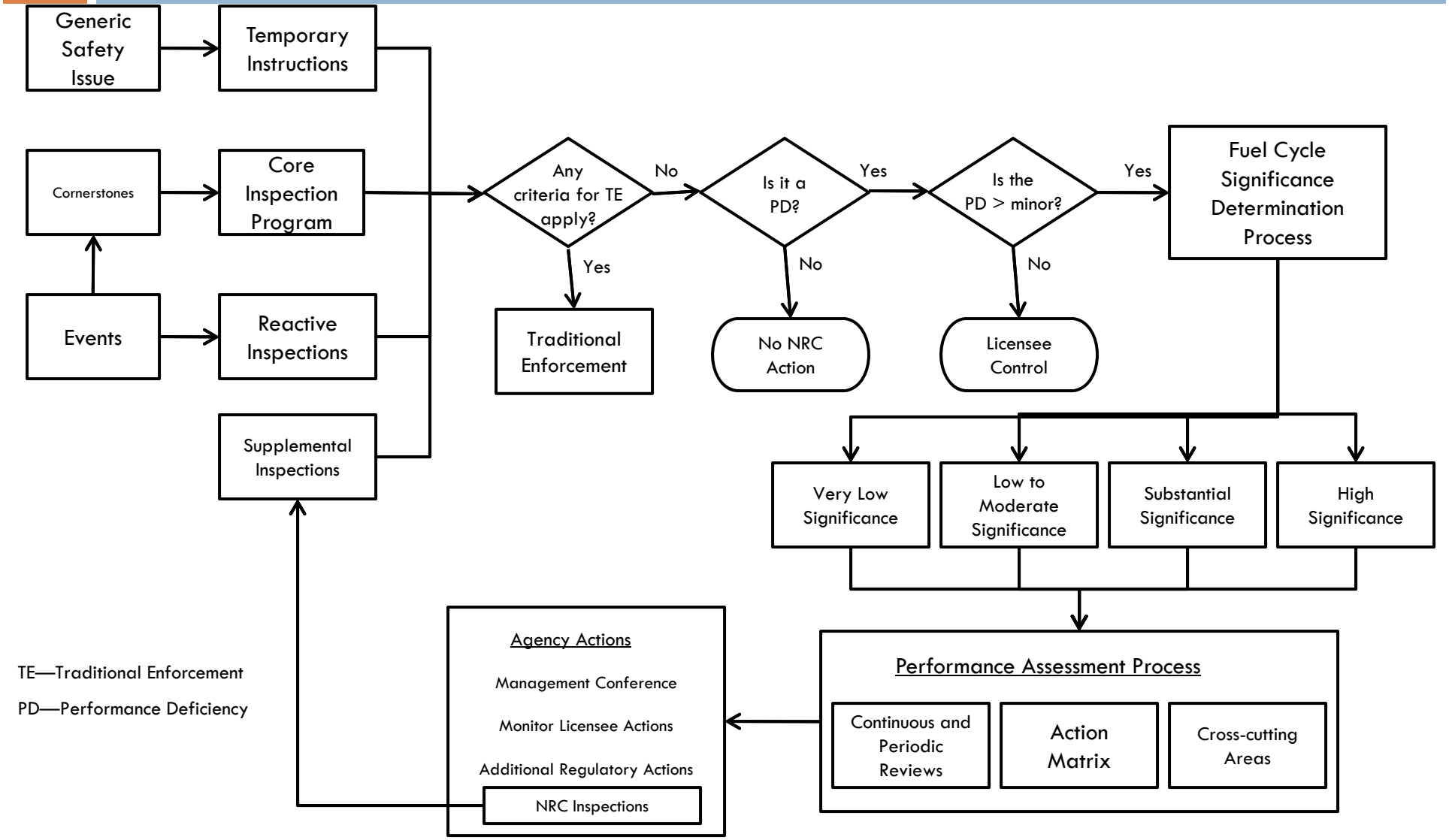
# Diagram of Current FCOP





# Conceptual Diagram of Enhanced FCOP





# Staff Approach for CAP Incentive



- Revise Enforcement Policy to not cite NRC identified Severity Level (SL) IV violations if,
  - the licensee has established and implemented an effective CAP, and
  - the licensee enters the SL IV violation in its CAP for evaluation and correction

# Enforcement Policy Revision



- Draft policy revision was issued on September 6, 2011
- Wording and conditions the same as that for reactor licensees who currently have an Non Cited Violation (NCV) policy on NRC identified SL IV violations or green findings
- Final policy due for publication in March, 2012

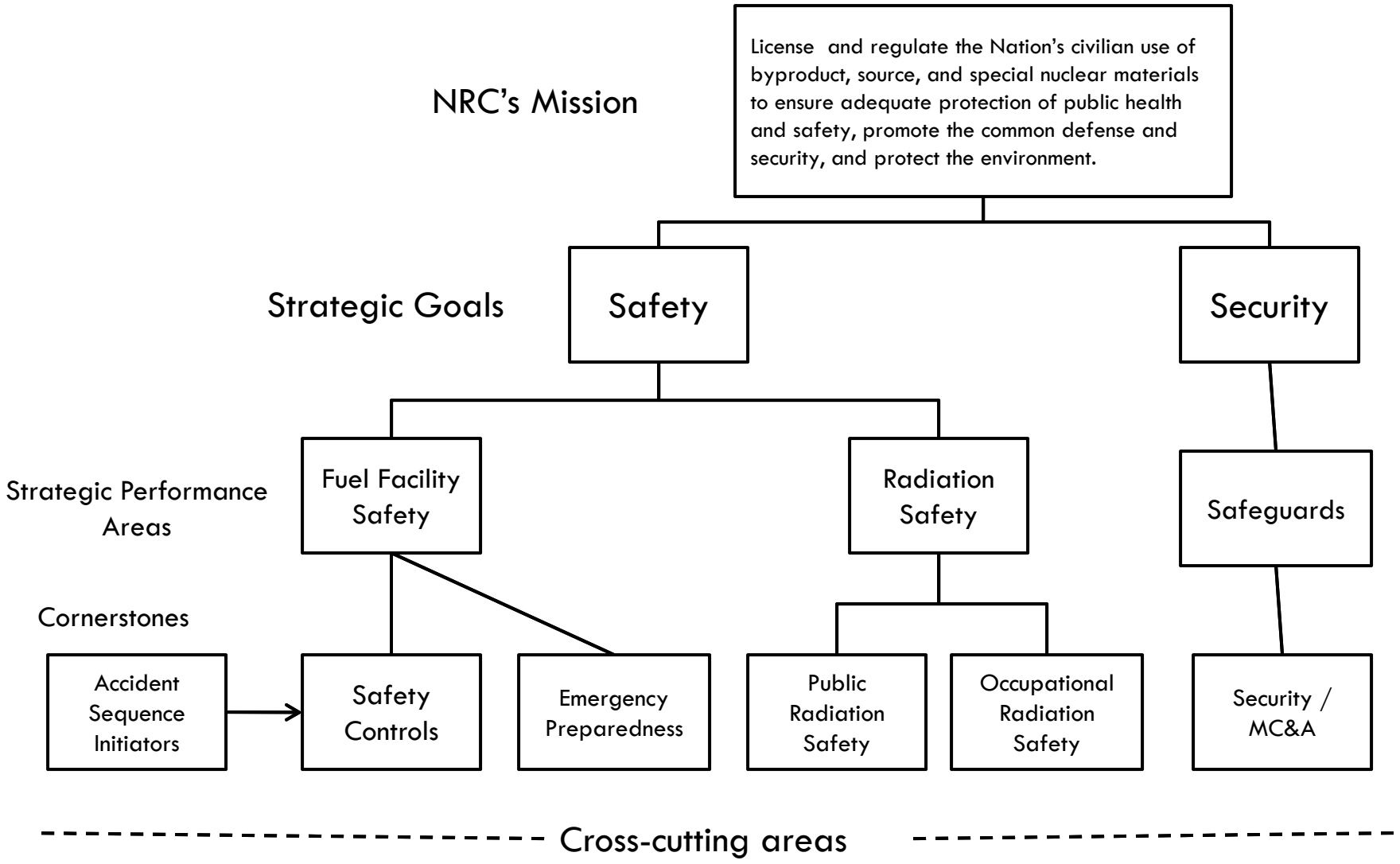
# Benefits of an Effective CAP



- More than NCV credit
- Identify and correct safety and security issues before they result in significant consequences
- Fuel facility safety is adequate with current corrective action efforts
- Opportunity to support continuous improvement of safety performance

# Cornerstones – Hazards Analysis-Based





# Pros and Cons for Hazards Analysis-Based Cornerstones



Pros:

- This approach would result in similar regulatory frameworks across NRC program areas.
- The cornerstones are organized in the same way licensees organize the hazard analysis and controls development in the ISA.
- Key attributes for ISA-related activities are integrated into cornerstones that reflect the way licensees' ISAs were developed and are maintained.
- Cornerstones will be consistent across 10 CFR Part 40, 70, and 76 licensees (e.g., the staff would not have to delete Criticality Safety cornerstone for 10 CFR Part 40 licensees).

Cons:

- The use of the "Accident Sequence Initiators" cornerstone might have a negative impact on stakeholder communications. Some internal and external stakeholders might confuse the "Accident Sequence Initiators" cornerstone with the "Initiating Events" cornerstone in the ROP. However, these two cornerstones are not the same.

# SDP Types



- SDP types applicable to ISA-related cornerstones
  - Criticality, Chemical, and Radiation Safety (10 CFR 70.61)
  - Accident Sequence Initiators, Safety Controls
- SDP types would apply to both cornerstone approaches
- Deterministic
  - Emergency Preparedness
  - Radiation Protection (10 CFR Part 20)
  - Security
  - Material Control and Accounting

# SDP Types



- Desired characteristics of an SDP
  - Realistic/accurate
  - Practicable
  - Cost effective
  - Consistent
- Discussion of three conceptual types of SDPs
  - Qualitative Type
  - Case-by-case Type
  - PRA-based Type

# Qualitative Type



- Based on qualitative criteria, not numbers
- Perhaps based on a refined risk-index method
- Pros:
  - Simpler and less resource intensive than case-by-case and PRA-based types
  - Recognizes limitation on quantitative data and tools available and applicable to the fuel cycle industry
  - Assignment of controls to general categories more objective than justifying generic failure data to plant-specific controls
  - Standardized, hence consistent across licensees
- Cons:
  - Less informed by analysis and data, hence less precise

# Case-by-Case Type



- Evaluate risk and safety significance of each finding when it occurs
- Adjust ISA results using standardized NRC guidance and data
- Could be simplified quantitative method
- Pros:
  - Reasonably accurate
  - Standardized, hence consistent across licensees
  - Less resource intensive than PRA-based type
  - Simpler than a plant-specific PRA
- Cons:
  - Quantitative risk technology for fuel cycle is underdeveloped
  - A backup method may be required because a technical difficulty might preclude this type of evaluation being completed in a timely manner to support an ongoing oversight process

# PRA-Based Type



- Requires full PRA for all processes at all facilities
- Requires inspector notebooks for performing significance evaluation

- Pros:
  - Based on licensee PRA, thus most informed and precise basis

- Cons:
  - Requires orders of magnitude more resources
  - PRAs would not be standardized, hence significance might not be consistent
  - Quantitative risk technology for fuel cycle is underdeveloped

# Conclusion and Recommendation



- Further development of all cornerstones in the hazards analysis-based approach
- Begin pilot use of the performance deficiency concept
- Develop the qualitative type SDP
- Develop a performance assessment process based on SDP that includes an action matrix and considers cross-cutting areas
- Develop a supplemental inspection program based on licensee performance
- Further revise the Enforcement Policy to incorporate FCSDP

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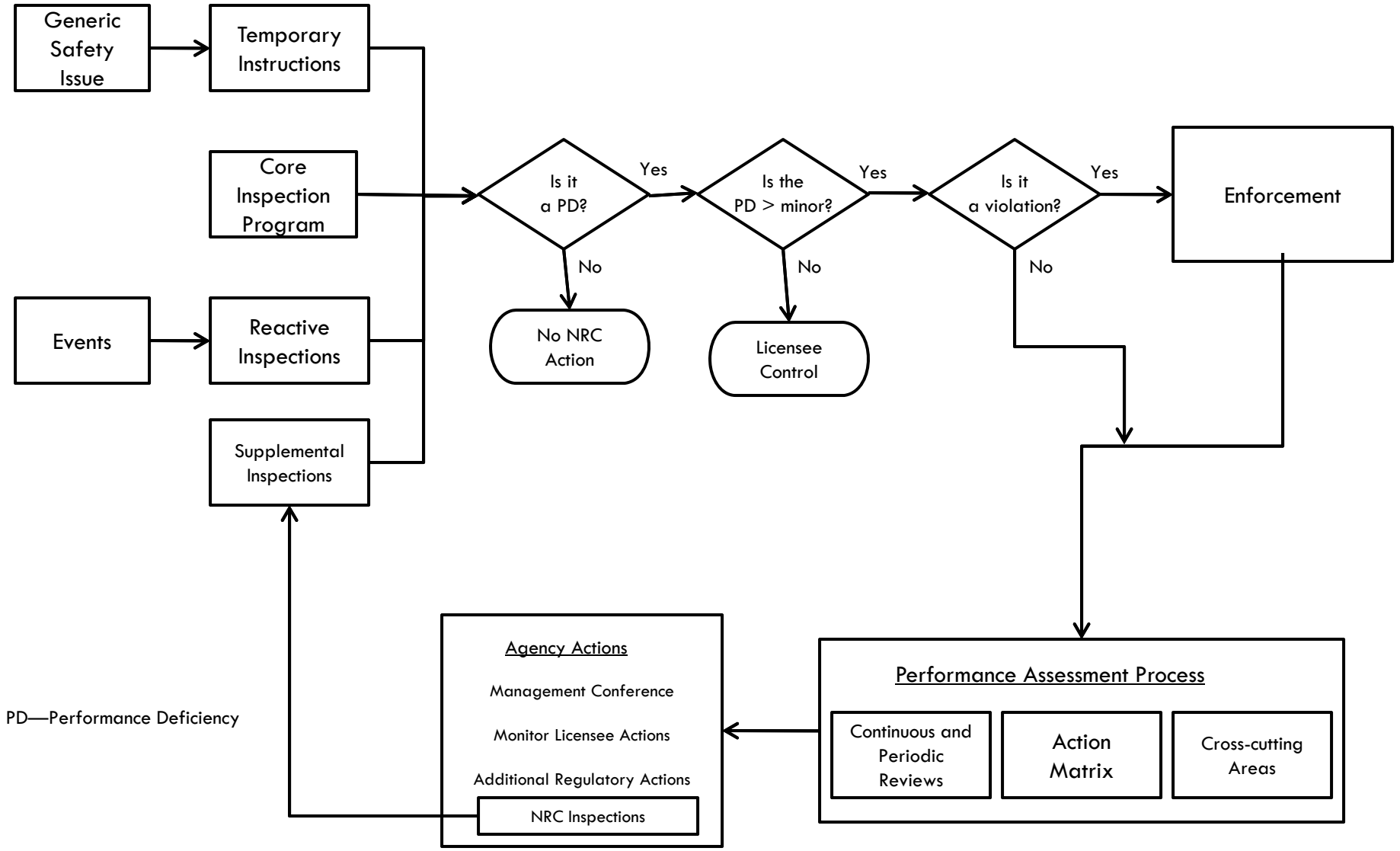
# BACKUP SLIDES

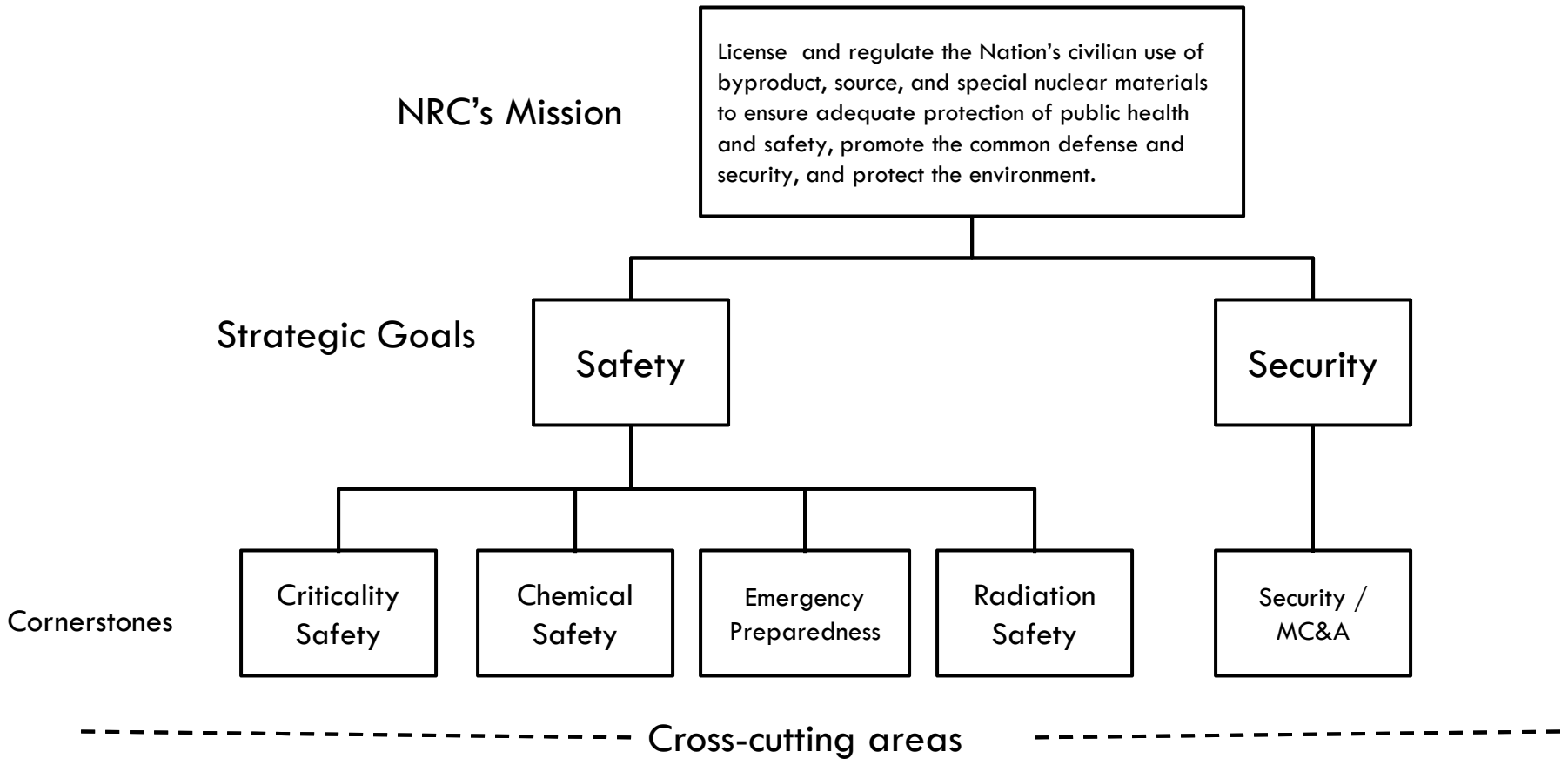
# Conceptual Diagram for Option 2





# Cornerstones – Operations-Based





# Pros and Cons for Operations-Based Cornerstones



Pros:

- The cornerstones are organized along safety program lines similar to the safety areas in 10 CFR Part 70 and how licensees implement safety at their facilities.
- The cornerstones are easy to communicate with external stakeholders because they use the structure of day-to-day operations.

Cons:

- Key attributes for ISA-related inspections are similar across cornerstones, thus separating what might be common inspection into separate areas. A single failure would impact several cornerstones and thus could move the licensee across an action matrix for a problem in one area of performance.
- This cornerstone construct would result in two different regulatory frameworks for oversight in the agency (FCOP and ROP).
- Cornerstones will not be the same across 10 CFR Part 40, 70, and 76 licensees (e.g., the Criticality Safety cornerstone is not applicable to 10 CFR Part 40 licensees).