

UNITED STATES OF AMERICA  
U.S. NUCLEAR REGULATORY COMMISSION

BRIEFING ON RESOLUTION OF GENERIC  
SAFETY ISSUE (GSI) - 191,  
ASSESSMENT OF DEBRIS ACCUMULATION  
ON PRESSURIZED WATER REACTOR (PWR)  
SUMP PERFORMANCE

September 29, 2010

1:00 P.M.

TRANSCRIPT OF PROCEEDINGS

Public Meeting

Before the U.S. Nuclear Regulatory Commission:

Gregory B. Jaczko, Chairman

Kristine L. Svinicki, Commissioner

George Apostolakis, Commissioner

William D. Magwood, IV, Commissioner

William C. Ostendorff, Commissioner

## APPEARANCES

### Stakeholder Panel:

Ed Halpin  
President and Chief Executive Officer,  
South Texas Project  
Nuclear Operating Company

Pete Sena  
Senior Vice President of Operations,  
FirstEnergy Nuclear Operating Company

Amir Shahkarami  
Chairman, PWR Owners Group Executive Committee,  
Senior VP Exelon and Site VP Braidwood, Exelon Nuclear

David Lochbaum  
Director, Nuclear Safety Project,  
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### NRC Staff and ACRS Staff:

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Eric Leeds  
Director, Office of Nuclear Reactor Regulation

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Michael Scott  
Chief, Safety Issue Resolution Branch,  
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Sanjoy Banerjee  
Member, Advisory Committee on Reactor Safeguards

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

1  
2 CHAIRMAN JACZKO: Well, good afternoon, everyone. The  
3 Commission meets today to discuss how to achieve closure on Generic Safety  
4 Issue-191, a long-standing safety issue regarding sump performance. This is a  
5 follow-up meeting to a meeting the Commission had in April to discuss this issue.  
6 And following that meeting the Commission asked the staff to look at a whole  
7 bunch of options and give a paper to the Commission on how we could LOOK on  
8 resolving this issue. So with their I think very good paper, the ACRS has looked  
9 at this, the input we've had from stakeholders, I think the Commission has gotten  
10 a lot of information and should be in a good place to establish a clear direction for  
11 resolving this issue.

12 As many of you know, this is something we've been dealing with for  
13 a long time. As the ACRS very colorfully described in their comments on the  
14 staff paper, the resolution of GSI-191 has proven to be a Herculean task, Hydra-  
15 like in that whenever an issue was thought to be closed, two more emerge. So  
16 hopefully, today will be the day when perhaps whoever it was that slew Medusa -  
17 - who was it? Hercules? Did Hercules slay Medusa? Or wasn't it Pericles?  
18 Perseus, Perseus but -- but you're right Perseus slew Medusa. I got my ancient  
19 Greek -- you should know.

20 [laughter]

21 CHAIRMAN JACZKO: In any case, I look forward to hearing from  
22 everybody, and we'll begin immediately unless my fellow Commissioners would  
23 like to make any comments. And I would ask that we do have a lot to cover if  
24 people can stick to their allotted times, and we will do our best on this side to do

1 that as well. Thank you. We'll begin I guess with Ed Halpin.

2 MR. HALPIN: Yes, sir, thank you, Chairman and Commissioners. I  
3 appreciate the opportunity to be here today. Just so you know from a flow and  
4 presentation standpoint, I'll be presenting and talking about really a process for  
5 going forward. Pete Sena to my left will be talking about the experience at  
6 Beaver Valley, and Amir Shahkarami will be talking about the PWR Owners  
7 Group involvement in GSI-191 and updating you on some testing. It will close  
8 out with me --

9 CHAIRMAN JACZKO: I'm sorry, can I interject here, can we figure  
10 out how to turn the music off that is playing right now? Sounds like it went quiet.  
11 Okay, sorry Ed to interrupt you.

12 MR. HALPIN: And then I will summarize some of the key points of  
13 our presentation and then make some final points. So that will be the flow.

14 Slide 2, if you will please. We always like to start with mutual  
15 agreement, and there is much of it in this topic. First bullet talks about how really  
16 between the staff and the industry, we've worked very hard, put a substantial  
17 amount of work into driving this issue closed. And we have mutual agreement  
18 with the staff on that. I also want to compliment the staff and the SECY letter. It  
19 is, I think, a comprehensive and well-written letter that helps to keep people up to  
20 speed on the last 15 years of what has happened with this issue. And certainly, I  
21 think, well-written.

22 We have made as an industry, significant progress in addressing  
23 GSI-191 out in the field. The sumps have been modified at all pressurized water  
24 reactors. In addition, we've put mitigating actions in place. So that's

1 acknowledged.

2 In the SECY letter, the staff talks about going after the more  
3 probable small LOCAs first in the short term. And as an industry, we are in  
4 agreement with that. The staff also recommends an application of some form of  
5 a risk-based approach for the large LOCAs because of the extremely low risk,  
6 and we certainly advocate that and want to talk about a little bit more and flush  
7 that out. We call it what's called a holistic approach to resolving that issue. I'll  
8 comment on it more as we go throughout.

9 I'm going to get into a little more tactical here now on Slide 3 which  
10 talks about the proposed small LOCA resolution. First bullet mentions target  
11 completion of testing by the end of 2011. We have testing that's ongoing now  
12 really under the control of the PWR Owners Group in regard to zone of influence  
13 testing. There's also some in-vessel effects testing and some strainer testing.  
14 That testing will be complete by the end of 2011. We believe once that's  
15 complete, we will take the test results, evaluate them, and work with the staff,  
16 and then commit to making whatever modifications are necessary for the small  
17 breaks, for the small LOCAs, by roughly midyear of 2012.

18 Next slide. In regard to the large LOCA resolution, what we're  
19 proposing is to really keep all the risk-informed options on the table including  
20 some form of what we call an enhanced GDC, or general design criteria, for  
21 application of Leak-Before-Break. We'd like to have an opportunity to discuss  
22 and dialogue with the staff to come up with an approach and some guidance that  
23 would be appropriate for GSI-191. And then based on that holistic approach,  
24 which is what I'm calling it, we would make commitments by midyear 2012 and

1 then go implement what had to be implemented based on that analysis.

2           The timeline basis on the next slide, which is Slide 5, why is this  
3 timeline appropriate? We are talking about a situation with extremely low risk.  
4 We have made a lot of progress out in the field on a topic. It allows us the  
5 opportunity to complete our testing, which we think is very important, and allows  
6 the opportunity to have the dialogue on a risk-based approach for the large  
7 LOCAs. Point out that the test results may affect the scope of additional  
8 modifications, so we don't want to get into a habit of having modified and then go  
9 out and test again and modify again. And it allows us to properly plan for any  
10 changes out in the field, thus minimizing dose. The last bullet talks about allows  
11 planning for aggregate impact of other regulatory issues. I've spoken with each  
12 of you in the one-on-ones on the issue of aggregate impact. I'll talk a little bit  
13 more about that in my summary remarks at the end.

14           Key slide is the next one which is, why is a holistic risk-informed  
15 approach appropriate for large LOCAs? I mean, what are we talking about with  
16 holistic? We talk about holistic in referring to using all the tools that are risk-  
17 informed that are on the table, including some form of GDC 4, Leak-Before-  
18 Break, as a part of that approach. If you look at that first bullet, I think this is the  
19 key topic. It's absolute versus reasonable certainty. That's the topic that is on  
20 the table, and where are we within the spectrum.

21           Now, I previously said that the SECY letter that was written by the  
22 staff, the response I thought was excellent. I thought it was well-written. I  
23 thought it was very professional. I also think in my own opinion that it was written  
24 through the lens of absolute assurance. In fact, if you read through it, and you

1 look at even Option 2. Option 2, which talks about a risk-informed option, has  
2 caveats around it and talks about that risk-informed option may not yield much,  
3 and there may need to be additional testing done. So in looking at it through the  
4 lens of absolute, some of the opportunities or tools that we have to use to close  
5 this can go away.

6           Look at the discussion of GDC 4, Option 3 in the SECY letter. The  
7 general designed criteria for Leak-Before-Break is one that the staff has said in  
8 the write up should not be applied because debris generation was never  
9 intended, Leak-Before-Break was never intended for this application. And yet,  
10 when you read the Leak-Before-Break under the General Design Criteria 4, it  
11 actually reads like it should be applied to this situation of debris generation.

12           Leak before break is how this piping acts. It has been  
13 deterministically proven. The rationale behind General Design Criteria 4 not  
14 being used goes on, it says that it's a global effect. I don't know much about  
15 global effects, but when I went and looked at the definition, global effect ties back  
16 to pressure, temperature, and humidity, and we're not sure what the nexus is  
17 between that and it being a global effect. And it goes on in General Design  
18 Criteria 4 and talks about how the defense-in- depth would really be weakened  
19 and thus we should not be able to apply it.

20           Well, I point out that Leak-Before-Break has been applied before,  
21 and there are some comments made in regard to different plants in the SECY  
22 letter. There's also in doing some research, a case that's called unresolved  
23 safety issue alpha two back in 1984 where there was a large LOCA scenario  
24 where there was A-symmetric loading that occurred on the vessel. The concern

1 was at that time, through that scenario, that the industry would have to go back  
2 and install pipe restraints on the large piping. The concern was dose, and it was  
3 money. That was resolved through a Leak-Before-Break approach. And so my  
4 point mentioning all that is that when we talk about options, if we look at it  
5 through the lens of absolute, then some of those options come off the table.

6 In 2007, Dr. Dale Klein said this -- he was talking about the late  
7 Commissioner McGaffigan -- he was talking about his bluntness and his honesty,  
8 and he went on to say, he quoted him and said, "It is the job of nuclear regulators  
9 to provide reasonable assurance of adequate protection, not absolute assurance  
10 of perfect protection. When they change the laws to require absolute assurance  
11 of perfect protection, there won't be a lot of nuclear reactors in this country."

12 I think this issue today that we're going to talk about, we'll talk a lot  
13 in the technical realm, but quite frankly I think it is a tone setting issue. It's an  
14 issue of leadership. I think that as the Commission you have an opportunity to  
15 figure out and weigh in on where you are on the spectrum of absolute versus  
16 reasonable certainty. And, in our proposal of a holistic risk approach, we believe  
17 that's consistent with NRC principles and should be used. We are asking that we  
18 keep this concept of GDC 4 as well as other risk-informed tools on the table so  
19 we can properly close out this issue.

20 I'm going to transition now to Pete Sena. He is going to talk about  
21 experiences at Beaver Valley. Pete?

22 MR. SENA: Thank you, Ed, and good afternoon. Again, Mr.  
23 Chairman, Commissioners, thank you for the opportunity to speak to you and  
24 provide you Beaver Valley FirstEnergy's perspective on closure of GSI-191



1 through the interactive resolution process, also known as Option 1.

2           Slide 8. So Beaver Valley, we're considered a high fiber plant, and  
3 we are currently substantially complete. Strainer change-outs has been the rest  
4 of the industry, 20-fold increase in strainer size up to 3,400 square feet per unit;  
5 insulation change-out for the piping total between the units 2,400 linear feet.  
6 Steam generator insulation change-out, we did have wool fiber on our steam  
7 generators has been changed out with RMI. For Beaver Valley Unit 1, that was  
8 done concurrent with the replacement steam generator outage in 2006. For Unit  
9 No. 2, we replaced the insulation with RMI in 2009, but also note we are  
10 replacing our steam generators in an upcoming outage in 2017. Additionally, we  
11 also perform buffer replacement at Beaver Valley Unit 2.

12           Also recognize as I speak towards Beaver Valley and the impacts,  
13 Beaver Valley is a three-loop plant. So we are just talking three steam  
14 generators per unit.

15           Next slide on Slide 9, so with Beaver Valley being substantially  
16 complete, what's the total aggregate impact? You can see from a cost and dose  
17 perspective, \$61 million spent year-to-date without final closure on in-vessel  
18 effects, dose spent to date 113 rem.

19           Let me just focus a little bit on the dose. We keep talking about  
20 impacts on dose and let me help put that in perspective. Beaver Valley Units 1  
21 and 2 are a low source term plant. Beaver Valley 2 has set the world record of  
22 online dose at 311 millirem for one year for the entire station. I expect Unit No. 1  
23 to beat that record current year-to-date dose expenditure is 250 millirem. So if  
24 we are talking annual dose online in the 250, 300 millirem, and I expend 113 rem

1 for a single project, that's an incredible difference. Take that and multiply that to  
2 a higher source term plant or to a four-loop plant and the impact will be even  
3 greater. So I just want to provide you with some actual facts on the impacts for a  
4 high fiber plant.

5           Outage perspective for Unit 2, that was critical path to replace the  
6 reflective metal installation on the Unit 2 steam generators, and it impacted us by  
7 seven days. Additionally, the dose numbers I provided do not include the dose  
8 with respect to the unit one steam generator replacement outage as was done as  
9 part of a separate project.

10           Next slide. Remaining items for closure of GSI-191, again for the  
11 Beaver Valley plant, obtained final NRC approval of the former RAI responses.  
12 We expect that shortly and do not see any hurdles. We still have remaining  
13 outage modifications to make. At Beaver Valley Unit 1 we start our refuel outage  
14 this Friday. We have installation change-out, Microtherm on the nozzles that  
15 need to be changed out, and we're looking at a 12 rem job just for that activity.  
16 When you look at the entire scope of the outage at 50 rem, 12 rem single project,  
17 20 percent of our entire dose. Finally, in-vessel effects still need to be resolved,  
18 and I'll speak to that point shortly.

19           Next slide on Slide 11. Again, for FirstEnergy, our decisions are  
20 conservative based upon a deterministic approach, and it's based upon the  
21 circumstances specific to our situation. If a risk-informed opportunity would have  
22 been available in 2009, we would have had the opportunity, perhaps, to move the  
23 installation change-out for Beaver Valley Unit 2 steam generator insulation to  
24 2017 with that being large bore piping. All right, we're looking at a savings of 22

1 rem. We have no issue with replacing the bad acting insulation. Obviously, the  
2 high fiber of the wool insulation, is a bad actor. My only point of contention is I  
3 want to do that job just once. Now, going into 2017, I'll have to replace that  
4 insulation again as I replace the steam generators. Again, if a Leak-Before-  
5 Break opportunity would have been available, hypothetically, in total Beaver  
6 Valley would have looked at a 50 rem savings just from that aspect.

7           Next slide on Slide 12. So again, the deterministic approach does  
8 leave limited operational margin. It is a bounding analysis as you know and  
9 levels of conservatism have left limited operational margin. If a risk-informed  
10 guidance was available, it could perhaps benefit operating margin. The example  
11 I provide to you is a recent PWR that did have GSI-191 closed. This outage just  
12 this past week identified Microtherm on their reactor vessel nozzles  
13 unexpectedly. So now a risk-informed option could provide them closure path.  
14 Because currently, as of today, they are no longer in compliance with the 191  
15 assumptions they had. So it's either, replace it on an emergent basis or how do  
16 you evaluate. The problem with, again, evaluations is that the strainer head  
17 losses don't easily support extrapolation to higher debris loads. It's not a linear  
18 function.

19           Next slide with respect to in-vessel effects, my principle concern  
20 now going forward is the fuel may become more limiting with the in-vessel  
21 effects. So again, I could be here again looking at additional modifications,  
22 additional installation change-outs. We're currently, you know, my fear is we  
23 could be in a do-loop. I could be here again doing additional installation change-  
24 out.

1           Again, you know, so let me -- you know, Mr. Chairman, you talked  
2 about the Hydra-like impact, so I'll quote the Chairman of the ACRS again while  
3 he states that, "what is not clear is whether the measures taken to resolve the  
4 GSI-191 issue with regard to sump screen blockage while going a long way  
5 toward alleviating problems will be sufficient to also resolve GSI-191 for potential  
6 in-vessel blockage."

7           Again, in summary, Beaver Valley high fiber plant no longer  
8 considered a high fiber plant, low fiber. We are substantially complete.  
9 Decisions are conservative based upon our circumstances at the time. Risk-  
10 informed guidance could provide operating margin and benefit in the future.  
11 Again, the in-vessel effects provide me greatest pause to date. Thank you, and  
12 with that I'll turn it to Amir.

13           MR. SHAHKARAMI: Okay. What I'd like to cover today is discuss  
14 the PWR Owners Group activity. I was here in April, and I appreciate the  
15 opportunity to come back and talk about some of the discussion we had before.

16           I'll start with zone of influence. Let me just talk about our member  
17 utility. When we look at the pipe sizes, we have some differences with what was  
18 stated in a SECY as far as size. We look at the majority of our units have an  
19 RHR line of 12 inches with exception maybe of one or two units. So that's where  
20 we draw the line to use a deterministic approach for less than 12 inches in break  
21 and then holistic risk approach as is supported by SECY, including GDC 4 and  
22 other potential mitigation strategy to be used for greater than 12 inch break.

23           We have made progress. Originally, when utilities used the zone of  
24 influence, we looked at the common RAIs. There were 12 RAIs. We have

1 worked with the staff, and that was reduced to seven RAIs. Out of seven RAIs  
2 we were able to solve five out of those, and there are two remaining.

3           The two remaining RAIs are about the scaling and what the scaling  
4 means, the jet size that we did the test, how do we take that and use it for the  
5 larger break. Question about that and also large component, how does the  
6 geometry look when it hits the target? And also, determination of zone of  
7 influence, the testing that we are proposing to do from last time I was here I said  
8 this is a viable option; we need to move ahead. We have finalized our  
9 conceptual testing with the nozzle and establishment of Isobar map. Basically  
10 what that is from a jet to the impingement, put in a longitudinal and radial  
11 instrumentation all over to determine the pressure, and where the pressure  
12 comes to a rest such that would we fully understand is 17 diameter that has been  
13 used now is conservative or not. And we expect to have all those tests done by  
14 end of next year. And that's what Ed was talking about, six months of the  
15 scoping using that criteria to see what else needs to be done including removal  
16 of installation if that's what the result is for some of the units.

17           So this is a sophisticated testing. We're going to be using a sub-  
18 cooled two-phase jet. It's not just air or water; it's actually what you will  
19 experience within the accident at the site. So we'll be looking at a scaling with  
20 respect to target size and determine destruction pressure both in a longitudinal  
21 and radial and basically the shape of how that's going to look like.

22           The next topic has to do with long-term core cooling on Page 18.  
23 And what that is is the amount of fiber that has potential to bypass the strainer  
24 and end up in the core and fuel. We were requested by staff to do a cross-test

1 on what that was. We had two vendors; they had done tests at their facility and  
2 tried to do tests from one vendor assembly in another vendor test facility.

3           We took that on. That test was done on week of September 9. We  
4 did do a baseline of a vendor within their facility, and we did see some  
5 unexpected results. We also did fuel assembly from another vendor in that  
6 facility. What we have seen is there are differences in the set-up, that is one  
7 vendor uses a pump before the tank and another vendor uses the pump after the  
8 tank. The trend is aligned. In other words, one didn't go up, one didn't go down.  
9 They are all trended together as far as the test result is concerned. So we do a  
10 full-blown root cause analysis to understand the drivers, and we continue to  
11 finalize our schedule.

12           We have committed on October 4 to sit down with the staff and go  
13 through the schedule to resolve this topic. Talking with my staff, we feel  
14 comfortable that within six months we will be able to address the in-vessel fuel  
15 issue with all the conservatism and data that we have in place and additional  
16 testing that we are going to be doing.

17           Also staff had asked us to do a single train flow. This was because  
18 the delta between two vendors was attributed to the design of the fuel. We did  
19 do this test and got favorable results, but we have been also asked to do a five-  
20 to-one ratio that we're going to be doing because of a staff request. So that's  
21 going to be part of ongoing test for the long-term core cooling.

22           On Slide 19, method of closure, again, we support the two  
23 approaches as has been discussed here: closure for breaks smaller than 12 inch  
24 and then closure of breaks greater than 12 inch using the holistic risk analysis.

1 And as for the time closure for the smaller one, I agree that there should be a  
2 shorter for a small break and then look at the larger break once we have all the  
3 risk-informed tools in our hands. What I will say the zone of influence testing that  
4 we are going to be doing is not only applicable to a small piping. The zone of  
5 influence criteria would bound all sizes. So we will do that.

6 On Page 20, just touch on some of the topic in respect to the basis  
7 for GDC 4. I'll really just put three examples of where I think the application is  
8 warranted. One is in rigor in determination of line and inspection. We do and are  
9 required to do inspection on 12-inch diameter and larger piping, and we  
10 understand the probability is low based on material properties and ductility of  
11 larger pipe.

12 There was a concern about primary water and stress corrosion  
13 cracking. We do have under EPRI, we have primary material management  
14 program that has MRP-139. MRP-139 has established inspection, mitigation.  
15 And mitigation includes anywhere from overlay that we have done as well as  
16 MSIP, that is Mechanical Stress Improvement Program, for the hot leg and cold  
17 leg. Those are schedule to come to an end in 2013. That is already established  
18 and mandatory through NEI 03-08.

19 In respect to the leak monitoring, when you look at the calculation  
20 for critical flaw size with the Leak-Before-Break, we're talking about the factor of  
21 20 versus actual flaw size. And if you look at the guidance we established under  
22 NEI 03-08 for the -- you're talking about 10 times better leak detection than is  
23 required for Leak-Before-Break. So you multiply those numbers, you're looking  
24 at 200 times sensitivity as how quick we can identify, and mitigate, and take

1 action on Leak-Before-Break.

2           The last topic on Page 21 talks about safety margin and defense-in-  
3 depth. As I indicated before, there is a significant safety margin in leak detection  
4 for the Leak-Before-Break and already have stated the size of flaw, how we  
5 determine that. There's a defense-in-depth by combining both Leak-Before-  
6 Break as well as in-service inspection that is applicable here.

7           We also looked at expert panel that is developed in 10 CFR  
8 50.46(f) as well as the PTS ruling that was done, which is a pressurized thermal  
9 shock. And they stated that double ended break of loop piping is much less  
10 probable than reactor vessel failure. And reactor vessel failure is determined to  
11 be way beyond the design basis. They also have emergency operating  
12 procedure that has been changed to provide additional defense-in-depth. We  
13 know that going forward, any modification to any component that is going to take  
14 place at any of our units, we will replace any insulation and put much better  
15 insulation in place. That would be as we move ahead with our planned  
16 modification.

17           So looking at, you know, changes in overall plant risk, both from  
18 CDF and --, they remain very small when you apply Leak-Before-Break for piping  
19 size greater than 12 inches. With that, I'll turn this back to Mr. Ed.

20           MR. HALPIN: Okay, thank you, Amir, and I'll summarize on Page  
21 22 and 23 a few key points. In agreement with the SECY response with  
22 addressing the small LOCAs in short term, we are asking for the large LOCAs to  
23 work with us in regard to a holistic approach, to look at all of the tools that are on  
24 the table and to not throw GDC 4, Leak-Before-Break away. There is probably



1 some application, a solution of the large LOCAs in regard to this issue.

2 We believe the proposed resolution timeline takes into account both  
3 risk and dose. We'd like to be able to complete the analysis and testing that we  
4 talked about zone of influence, in-vessel effects, whatever testing associated with  
5 the strainers, which should be done by the end of 2011 before we go modify.  
6 Also consider the aggregate impact of NRC rulemaking which we talked about  
7 before.

8 Page 23, just a little South Texas data because I know we were  
9 mentioned in the ACRS report and pointed out. We replaced our steam  
10 generators in 2000 and 2002. The dose to remove the installation is shown  
11 there, 116.8. This is on Page 23.

12 More recently in the last year and a half, we have removed some  
13 marinate installation from around the reactor vessel nozzles, about 30 cubic feet  
14 on each of the units. We received 9.6 rem dose. We spent about \$6.8 million so  
15 far at South Texas just on modifying the sumps. The industry, I believe, has  
16 spent close to a billion dollars in the modifications.

17 If we have to remove installation at STP, our installation per unit is  
18 about 2,800 cubic feet.

19 CHAIRMAN JACZKO: If I could just ask you to wrap up a little bit, I  
20 think we are a little bit over your time.

21 MR. HALPIN: Okay. So there is a data from STP. My point here is  
22 that for this data, when you multiply this out by the 23 remaining plants, the  
23 bottom line is we're looking at an additional 600 million, 2,000 rem. Quite frankly  
24 when we talk about the risk associated with this accident, in our point of view,

1 that's too much for this. We're asking that we keep our minds open. The issue  
2 of a deterministic approach to this problem does not deal with the unknown  
3 unknowns very well. So we ask for your consideration in what we have proposed  
4 and thank you for your time.

5 CHAIRMAN JACZKO: Now, I'll turn to David Lochbaum.

6 MR. LOCHBAUM: Thank you. Good afternoon. UCS appreciates  
7 this opportunity to share its thoughts on the closeout options for GSI-191.

8 Slide 3, please. I want to begin by commending the staff for an  
9 exceptional paper that explains the history of this issue, where things stand today,  
10 and various options for reaching the destination we all seek: close out of GSI-  
11 191. I was particularly impressed by the staff's explanation for actions not taken.  
12 For example, I'd considered recommending that the in-vessel portion be removed  
13 from GSI-191 until I read the staff's reasons for not doing so. The staff is right  
14 and even righter for sharing those views with the external stakeholders.

15 Slide 4, please. Two facts dominate our views on the close-out  
16 options. The first fact is that any chosen option entails a multiyear schedule.  
17 And second, any chosen option involves physical modifications yet to be  
18 implemented at the plants. These facts mean that reactors will be operating with  
19 an elevated risk until GSI-191 is closed out.

20 Slide 5. UCS supports the NRC staff's recommendation that  
21 Options 1.b and 2 provide the best close out path with one qualification. Until  
22 GSI-191 is closed out for a plant, UCS recommends that the risks associated  
23 with unresolved issues be formally factored into the NRC's risk-informed  
24 decision-making.

1 Slide 6. Options 1.b and 2 provide optimal close-out for many  
2 reasons. For example, this approach affords the best way to handle the Leak-  
3 Before-Break application question and its associated worker dose issue. The  
4 50.46a rulemaking process is the cleanest and most likely to be the swiftest path  
5 to defining what can break when. It provides the most solid scientific basis for  
6 defining the proper break spectrum.

7 Slide 7. In the SECY paper, the staff describes many reasons why  
8 Option 3 is not feasible. Option 3 would basically turn nuclear reactors into  
9 nuclear casinos. Instead of being protected by highly reliable emergency  
10 systems should a LOCA happen, the public would instead be protected by luck  
11 that a LOCA does not occur.

12 Slide 8. While this briefing focuses on future actions, GSI-191 has  
13 already significantly reduced risk. The modifications already implemented that  
14 increased sump screen surface areas, greatly lessens the chances that ECCS  
15 pumps will be impaired or disabled. The remaining close out steps will complete  
16 the risk reductions needed.

17 Slide 9. This is a page from NUREG/CR-6762 showing that 25  
18 reactors with the red boxes were deemed very likely to suffer ECCS pump  
19 impairment should a LOCA of any size occur. The other 12 reactors with two red  
20 boxes, or one red/one yellow box, were very likely or likely to suffer ECCS  
21 impairment should a medium or large-size LOCA occur. This GSI-191 tackled  
22 real problems at real reactors that involved real risks.

23 Slide 10. A sense of the magnitude of that risk from the unresolved  
24 issues/problems is evident in the basis for the ECCS systems and the NRC

1 standard technical specification. The cold leg recirculation phase of the ECCS  
2 response to a loss of coolant accident relies on water drawn from the  
3 containment sumps. The ECCS recirculation phase was very likely to be lost at  
4 37 reactors for a large break LOCA until GSI-191 was resolved.

5 Slide 11. More than two dozen reactors were very likely to lose one  
6 or more ECCS trains due to containment sump screen clogging, a condition that  
7 the NRC safety regulations dictate be tolerated for no longer than 72 hours by an  
8 operating reactor. Yet, we are on day 5,132 of GSI-191 with hundreds of days,  
9 not hours, yet ahead.

10 Slide 12. Bulletin 2004-02 was issued by the NRC and justified  
11 continued reactor operation based on the low probability of a LOCA occurring.  
12 Whatever that probability is, it is exactly the same value when an ECCS train is  
13 determined to be broken by a surveillance test. But the low probability of a  
14 LOCA somehow does not permit that reactor to be operating longer than 72  
15 hours with one ECCS train broken. Even if the justification is appropriate,  
16 reactors did not and will not operate with this one pre-existing safety impairment.  
17 Yet, the NRC staff considered GSI-191 exclusive of all other known safety  
18 problems.

19 Slide 13. In August of 2002, the NRC staff issued Bulletin 2002-02  
20 about the increased probability of a LOCA due to CRDM nozzle cracking. The  
21 NRC justified continued reactor operation then based on the high reliability of the  
22 ECCS systems should a LOCA occur nonetheless.

23 Slide 14. The NRC staff justified continued reactor operation during  
24 GSI-191 resolution based solely on the low likelihood that a LOCA will occur to

1 exploit the known ECCS vulnerabilities. No other known risk factors were  
2 considered. Likewise, the NRC staff justified continued reactor operation during  
3 bulletin 2002-02 resolution based solely on the high reliability of the ECCS  
4 systems should a LOCA occur. No other known risk factors were considered.

5 Slide 15. We hasten to point out that we're not saying that these  
6 NRC decisions were wrong or would have been different had all known risk  
7 factors been considered during the decision-making process. What we are  
8 saying is the risk-informed decision-making process cannot be done properly  
9 when known risk factors are excluded from that process.

10 Slide 16. From its beginning, GSI-191 did not entail the same risk  
11 at each reactor. The SECY paper makes it clear that the NRC staff understands,  
12 at least qualitatively, the risk from unresolved GSI-191 issues at individual  
13 reactors. Until GSI-191 is closed out for a reactor, it's risk must be factored into  
14 future risk-informed decisions about known safety risks from bulletins, NOED's,  
15 inspection report unresolved items, tested inspection referrals, et cetera. For  
16 example, the shoreline fault issue that is currently involving Diablo Canyon  
17 should affect NRC's -- should be included in NRC's risk-informed decision-  
18 making on that reactor.

19 Slide 17. The NRC has considerable information about current risk  
20 factors at individual reactors. Risk-informed decision-making must include all  
21 known risk factors, not just individual risk factors or a subset of factors. For  
22 example, outputs from the ROP might be used by the NRC staff to urge the  
23 Springfield licensee to prioritize GSI-191, close-out actions on Unit 1 rather than  
24 on Unit 2, given Unit 2's lower initiating event risk.

1 Slide 18. We cite the process used within the nuclear industry to  
2 guard against unintended consequences from proposed plan modifications as  
3 evidence that an all-inclusive risk assessment could be used in NRC's risk-  
4 informed decision-making process. A design change checklist protects against  
5 the proposed plant modification adversely impacting plant safety regimes such as  
6 fire protection and environmental qualification.

7 Slide 19. The NRC could similarly use a checklist that includes all  
8 known risk factors from unresolved safety issues for an individual reactor. That  
9 checklist or comparable process would guard against a decision deemed  
10 acceptable on its individual merits being unacceptable when the synergistic  
11 effects of all other known risk factors are considered. Or the decision might still  
12 be acceptable but predicated on interim compensatory measures or time  
13 limitations.

14 Slide 20. In conclusion, UCS supports the NRC staff's  
15 recommendations that Options 1.b and 2 be used to closeout GSI-191. Whether  
16 the optimum pathway is selected or not, the risk associated with unresolved GSI-  
17 191 issues must be factored into NRC's risk-informed decision-making process  
18 to ensure proper outcomes. Thank you.

19 CHAIRMAN JACZKO: Thank you for all your information. We will  
20 start with Commissioner Magwood for questions.

21 COMMISSIONER MAGWOOD: Thank you, Mr. Chairman. Let me  
22 start with Mr. Lochbaum. By the way, I haven't seen you since joining the  
23 Commission so this is the first time I have had a chance to interact with you since  
24 coming here. I know you have moved since the last time I talked to you as a

1 matter of fact.

2 MR. LOCHBAUM: A couple of times.

3 COMMISSIONER MAGWOOD: We appreciate your comments  
4 about the cumulative effects. That's something that will make certain to ask the  
5 staff about when they have an opportunity to brief the Commission. But what you  
6 didn't talk much about was the in-vessel effects. I am curious about your  
7 thoughts on that and how that should be considered as this issue plays out.

8 MR. LOCHBAUM: To be perfectly honest, I'm not that familiar with  
9 the in-vessel effects. I know what they are. I was initially thought, as I said in my  
10 presentation, they should be pulled out from the GSI-191 issue because they are  
11 related but somewhat distinct. After reading this SECY paper and what the  
12 staff's thoughts were and how that wouldn't really help GSI-191, I felt that it  
13 needed to remain -- I changed my mind. I thought I was wrong. I still think I am  
14 wrong. And I felt that should stay within GSI-191 for the reasons the staff  
15 articulated.

16 COMMISSIONER MAGWOOD: Can you elaborate a little more on  
17 that? What made the biggest impression on you when you -- because that idea  
18 of separating the two issues has been discussed.

19 MR. LOCHBAUM: Well, it seemed -- the staff -- the impression I  
20 got from the staff was there was a sufficient overlap between the issues that  
21 separating them would actually slow down both halves. And this issue certainly  
22 doesn't need anything that slows down an already slow process. So the staff's  
23 reasoning convinced me that keeping them together would actually benefit both  
24 halves of that equation in terms of expedition and effectiveness and productivity

1 and all those factors. And anything that prevents this from taking longer than it  
2 has already taken, in our view, is a good thing.

3 COMMISSIONER MAGWOOD: Thank you. I want to continue on  
4 the in-vessel effects and move onto Mr. Shahkarami. How big of an issue do you  
5 think this is? Do you see this as a game changer potentially in our consideration  
6 of GSI-191?

7 MR. SHAHKARAMI: I think it is definitely related to GSI-191, a  
8 mound of fiber that has the potential to pass through the strainer and make it  
9 through the vessel. We have done enough testing and understand some of the  
10 things that we have not put into the testing, such as for example, boiling effect.  
11 We know that boiling effect has a significant impact on bed formation in entrance  
12 of fuel. We know that the effect of boron, a buffering agent, has a role in that.

13 As I stated before, I sat down with my staff and gone through all the  
14 data and testing we have done and some of the recent trends that we have seen  
15 per staff request that a couple weeks ago we did a test, we feel pretty  
16 comfortable that in a matter of six months or so we have a good plan to conduct  
17 all the testing and show that the blockage of the fuel assembly, putting that  
18 conservatism out of the picture to the extent that its today, going to resolve the  
19 issue.

20 COMMISSIONER MAGWOOD: You talked a bit about the  
21 unexpected results from the cross testing. In your view, what do you think is the  
22 worst that that test tells us? What is the sort of the darkest interpretation of those  
23 test results?

24 MR. SHAHKARAMI: Well, there are two criteria that we use to



1 measure the performance of the test. One is the delta P, pressure at the  
2 entrance and variation, and one is how the layer of the beds are formed in  
3 entrance. There are differences in a design of vendors. One vendor has an  
4 entrance such that it creates turbulence during the entrance. So any bed  
5 formation eventually is going to go away.

6 We are very limited in a test that we have done. We have one  
7 assembling attack. What we propose in this multi-assembly, taking this  
8 conservatism out. I think, as I said, based on all the data I have looked at, this  
9 issue can be resolved. We haven't really gone through including all this data we  
10 have back into the testing. So I feel pretty comfortable that we will be able to  
11 resolve it.

12 COMMISSIONER MAGWOOD: Thank you, I'd just invite either Mr.  
13 Sena or Mr. Halpin to make any comment about the in-vessel effects since we  
14 are on that subject.

15 MR. HALPIN: Yeah, I would just say that it is important just to  
16 resolve the issue through the testing. To allow the testing to happen before we  
17 actually react to it.

18 MR. SENA: And again, my only concern is, is it a moving target?  
19 Now, we are looking at perhaps changing the allowable debris loading on the fuel  
20 by about two thirds to 150 grams down to 50 grams with reduced [inaudible]. It  
21 makes it very difficult from a planning perspective knowing what to do in the  
22 future.

23 COMMISSIONER MAGWOOD: Thank you. Mr. Halpin, first  
24 welcome back it is good to see you again. You spoke of the need for AN

1 enhanced GDC 4 approach. Can you elaborate on what you mean by  
2 enhanced?

3 MR. HALPIN: I think that is something we need to dialogue on as  
4 to what that looks like. That's why we are suggesting we get together, we talk  
5 through a holistic approach, and figure out what is it that we really think is  
6 feasible to apply.

7 The ideas that we talked about with GDC 4 in an enhanced fashion  
8 is to take the Leak-Before-Break criteria and to apply it but be selective about  
9 how it gets applied in addition to look at that process from a GDC 4 standpoint  
10 and look at the mitigating actions that have already been put in place and see  
11 what additional mitigating actions can be put in place to allow a comfort feeling in  
12 applying it on a selected basis. But that's a dialogue we need to have that we  
13 are asking it to not be thrown off the table, but it will still be considered as a part  
14 of a holistic approach.

15 COMMISSIONER MAGWOOD: As you've talked about this issue  
16 and Mr. Sena you as well. I had the impression you are using the GDC 4  
17 discussion interchangeably with risk-informed. Was I mishearing that?

18 MR. HALPIN: It's in our verbiage of holistic approach. I'm not so  
19 sure we are using it as an interchange, but it could be. Risk informed tools are  
20 talking about Reg Guide 1.174 to 50-46a, Section 6 of 0407, GDC 4 Leak-  
21 Before-Break in applying, you know, not necessarily interchangeably but as part  
22 of a holistic approach.

23 COMMISSIONER. MAGWOOD: That's fair. Thank you. Mr. Sena,  
24 you gave us some specific numbers, and I always appreciate specific numbers

1 when it comes to these things. You've noted that between your two Beaver  
2 Valley units, it cost \$61 million and 113 rem exposure to get as far as you've  
3 gotten in resolving this issue. In looking forward -- obviously you've looked at it  
4 since you've seen what the staff has recommended -- how much more exposure  
5 do you think it would entail to complete the work if you had to go forward based  
6 on where we are? Have you looked at that yet?

7 MR. SENA: My largest going forward concern again is in-vessel  
8 effects. So it's an unknown. So that I cannot quantify. From the remaining  
9 insulation change-out at Beaver Valley Unit 2, which I have this coming spring, I  
10 have about another two or three rem insulation removal, about \$4 to \$5, \$6  
11 million for both units. The 12 rem in this upcoming outage is included in the 113.  
12 So for insulation change-out, GSI-191 closure excluding in-vessel effects, total  
13 dose 115 rem.

14 COMMISSIONER MAGWOOD, IV: One-hundred and fifteen  
15 additional rem?

16 MR. SENA: No, no, total rem. The 113 I provided you, plus two  
17 additional.

18 COMMISSIONER MAGWOOD: Okay, I appreciate that. I'll sort of  
19 leave this open to anyone, but I'll direct it to Mr. Shahkarami. You've heard and  
20 read the staff's comments about the NEIS and its own exposure. Did you have  
21 any comments about those exposure estimates? Do you agree with where the  
22 staff has come out on this? Do you --

23 MR. SHAHKARAMI: Well, you know, we came here in April and  
24 put some numbers on a table from worst to best with somewhere around a

1 couple rem exposure if you have to do wholesale change-out on insulation for  
2 remaining units. And the number that I'm hearing today is not too far off that  
3 when I look at the number.

4 Now, given that you have to do site specific analysis, you may not  
5 have to remove all the insulation, but in the case of South Texas, if you use the  
6 current criteria, they have no option. I mean, because of configuration, you'd be  
7 subject to remove. So the dose that Ed referred to are realistic for this site.

8 COMMISSIONER MAGWOOD: Thank you very much. Thank you,  
9 Chairman.

10 CHAIRMAN JACZKO: Commissioner Ostendorff.

11 COMMISSIONER OSTENDORFF: Thank you, Mr. Chairman. I'm  
12 going to start out by making a comment that I appreciate the Chairman's  
13 introductory remarks about this being a long-standing issue that has taken  
14 different twists and turns with additional factors being added. As there is further  
15 information gleaned about the sub strainer issue and the in-vessel effects on the  
16 different 17 times pipe diameter calculations for this sphere of the zone of  
17 influence.

18 And while I think I personally would like to see this thing come to  
19 some appropriate closure, I do want to address what I think is the case. There is  
20 still outstanding work to be done in several different areas. And I think that Amir  
21 from your discussion, I heard that the PWR Owners Group basically your work  
22 with the zone of influence testing that is still to be completed at some point,  
23 hopefully in the next year, that there is also this post-testing of the cross-fuel  
24 AREVA/Westinghouse fuel looking at why -- they're trying to get a full grasp of

1 why there are differential pressures experienced across the fuel under different  
2 debris loading.

3 I understand the staff has their own safety evaluation of in-vessel  
4 effects that is to be coming out here in the near future. I think it may be the case  
5 that there is some outstanding vendor testing to be done or is still underway on  
6 the sump strainer performance for a few plants. Are there other issues that from  
7 a technical standpoint are still to be conducted or analyzed? Or is that a fair  
8 summary of what you're understanding? Are there things we are missing?

9 MR. SHAHKARAMI: I think you captured the issues pretty well with  
10 all of our involvement with those topics. The two concerns on the zone of  
11 influence that I have discussed is scaling as well as a determination of the  
12 configuration for zone of influence are the ones we have been working on, then  
13 the long-term core cooling for the in-vessel testing. Those are really what we  
14 have been focusing on to resolve. Unless there is some new discovery  
15 yesterday or today, I'm not aware of anything else.

16 COMMISSIONER OSTENDORFF: Does anyone else have  
17 anything you think is a to be determined issue, in addition to what has been kind  
18 of summarized there? Where I am going with this is that certainly the question is,  
19 is this issue from a technical standpoint ripe for Commission decision based on  
20 what we know now, or are there further testing results or analysis that would  
21 inform the Commission decision. That's one set of questions.

22 And then if I were, you know, industry side of the house, is there  
23 sufficient information available now for industry to go and implement whatever  
24 Commission policy decision we arrive at to bring finality to moving forward to

1 close this out without the possibly or likelihood of there being multiple steps  
2 industry would have to take if more information were gleaned going forward over  
3 the next couple of years?

4 So I'm trying -- it's kind of a two-part question. Does the  
5 Commission have sufficient information to make decisions on the policy paper  
6 from where industry sits? If there an objective by industry to have finality of  
7 decision; is there sufficient information from the industry perspective for us to  
8 move forward? I will leave it to actually all four of you to comment on.

9 MR. HALPIN: I'll start. Commissioner, in regard to do you have  
10 enough information, I think that you do depending upon the tact that's taken with  
11 regard to Option 2 and what happens with Option 3. You know, we are in  
12 agreement with the small LOCAs to go out and work through those issues. We  
13 are asking that we allow ourselves to complete some testing so we don't have to  
14 do rework and do modifications twice. That's that issue. That can be worked  
15 through. The in-vessel effect issue I think to finish the testing as well and see  
16 what the effect is.

17 For the Option 2, which is a risk-informed approach along with GDC  
18 4, we're asking to have the conversation as an industry with the staff and we  
19 think we can work together to come up with some approach that allows us to deal  
20 with the large break LOCA. It's just -- it's going to take I think tone setting on  
21 behalf of the Commission's part as to where that ends up. Is it absolute? Is it  
22 reasonable? Where do you fall out? I think with that guidance, we can have that  
23 conversation and put the right things in place to make the right decisions to  
24 resolve this issue.

1                   COMMISSIONER OSTENDORFF: Okay. Anyone else want to  
2 add anything there?

3                   MR. SHAHKARAMI: I think Ed said it. I mean, the way I look at it,  
4 we can spend a lot of energy when we do have a technology or approach to  
5 resolve the issue, and really we need to look at what value would we add to the  
6 bottom line risk in respect to CDF on every release. I think with the Leak-Before-  
7 Break approach, not hardly any so I think the value added of using more  
8 analytical method is just dragging the whole schedule along. I think we can solve  
9 the issue quicker, and I think that requires your level attention.

10                  COMMISSIONER OSTENDORFF: I'm going to switch gears a little  
11 bit. Pete, I appreciated your sharing the experiences of Beaver Valley, and I just  
12 wanted to ask a more pragmatic operational engineer question of you.

13                  You have a lot of experience dealing with submarine nuclear  
14 proportion plants where metallic flashing banding was used in significant areas,  
15 both in the reactor compartments as well as in the engine room, to protect  
16 insulation from being damaged by people walking on it during maintenance, in  
17 some cases, to provide personnel protection against there being steam burns  
18 from hot piping coming in contact with skin, et cetera. Just from your experience  
19 to date from your two units at Beaver Valley, did you consider the use of metallic  
20 banding around insulation in lieu of lagging removal, or can you comment on  
21 that?

22                  MR. SENA: Yes, we did. It was just deemed not to be an  
23 acceptable option. With the testing methodology and the input protocols, the  
24 assumption on the protocol testing, we could not show acceptable results with

1 the banding.

2 COMMISSIONER OSTENDORFF: Was that with respect to the  
3 calculations of the zone of influence or modeling issues associated with the use  
4 of banding?

5 MR. SENA: I'll have to turn it over to my technical expert, Tom..

6 COMMISSIONER OSTENDORFF: I don't want to put you on the  
7 spot here, but it's something that from a practical standpoint --

8 MALE SPEAKER: It was an option explored, but an option not  
9 deemed with a success path. From our perspective, the quickest success path is  
10 let's take the material off the table so it's no longer a point of discussion.

11 COMMISSIONER OSTENDORFF: Okay and you didn't see any  
12 significant delta then between the man rem exposure required to remove lagging  
13 and as opposed to --

14 MR. SENA: It wasn't a man rem issue; it was more of a -- it could --  
15 demonstrate --

16 COMMISSIONER OSTENDORFF: It could demonstrate  
17 acceptable --

18 MR. SENA: -- acceptable string of test results.

19 MALE SPEAKER: I think you hit it right on the head. It was an  
20 issue with regard to modeling, confidence in the modeling specific to the  
21 application at the site.

22 COMMISSIONER OSTENDORFF: Thank you. Looking back at the  
23 NEI 04-07 as well as the proposed 50.46a rulemaking that the Commission will  
24 have before it, looking at the need for PRA experts and if the Commission



1 chooses a path to look at more risk-informed approaches moving forward for this  
2 Option 2 or Option 1 and 2 in conjunction, is the industry situated from human  
3 resources side to have the PRA expertise and capacity to really use the risk-  
4 informed approach to demonstrate compliance going forward with GSI-191? And  
5 this is for anybody who may care to answer.

6 MR. SENA: It might be the same answer. Unfortunately, all of my  
7 PRA expertise is tied up in NFPA 805.

8 COMMISSIONER OSTENDORFF: Is that unique to Beaver Valley,  
9 or is there something more broadly seen across the industry?

10 ED HALPIN: Well, I would say it's about half the plants in regard to  
11 805. From the standpoint of South Texas, you know, I've got my manager in the  
12 back here who is our risk-informed manager, and you know, we're ready to after  
13 this issue.

14 MALE SPEAKER: Pardon?

15 COMMISSIONER OSTENDORFF: No, go ahead, please.

16 COMMISSIONER APOSTOLAKIS: You are not an NFPA 805  
17 transition plan.

18 ED HALPIN: That's correct.

19 COMMISSIONER OSTENDORFF: I'll be mindful of the time, and  
20 I'll close at that point, and thank you.

21 [laughter]

22 CHAIRMAN JACZKO: I think you have a little bit more time if you  
23 want. Commissioner Svinicki?

24 COMMISSIONER SVINICKI: I thank you all for being here today.

1 I've listened very carefully to your presentations. I'm not going to pose any  
2 questions today, thank you.

3 COMMISSIONER APOSTOLAKIS: Thank you, Mr. Chairman. I  
4 have a few questions. Mr. Halpin, you said several times that you would like  
5 GDC 4 to be on the table. I don't know what that means. The staff in the SECY  
6 gave us a long list of arguments why they don't like that option, so if we keep it  
7 on the table, is there hope that you will count on these arguments? I mean, I'm  
8 sure the staff has heard your side and they have reached their conclusion, so  
9 what will we achieve by keeping it on the table? It seems that the staff has made  
10 up its mind.

11 MR. HALPIN: Well, we would hope that's, perhaps, I mean, from  
12 the write-up it looks like the staff has made up its mind and admittedly from an  
13 industry prospect this is not the first time we've asked for it to be applied, but  
14 we're hoping that if we continue to have the dialogue, that we'll be able to apply  
15 some form of Leak-Before-Break to this scenario, "debris generation," I think that  
16 there are things that we can probably do from the standpoint of mitigating actions  
17 associated with GDC 4 that might be a good compromise in regard to utilization  
18 of that tool. There may be some analysis that we can do, that helps us to be  
19 better, have more selective use of Leak-Before-Break, and then you couple that  
20 up with some risk-informed options, we think that's a very appropriate approach  
21 for the large LOCAs.

22 COMMISSIONER APOSTOLAKIS: So, you think there is still  
23 hope?

24 MR. HALPIN: I think there is. I mean, I honestly, yeah, I've read

1 through that document a number of times, especially the justification for not using  
2 GDC 4, and quite frankly for me personally, my opinion looking at it, some of the  
3 justification is just not heavy enough. To me it seems like that is what should be  
4 applied for this case, but we need to have that dialogue. We're just asking for  
5 the opportunity to sit down and talk it through.

6 COMMISSIONER APOSTOLAKIS: Okay. Now, my understanding  
7 is that GSI-191 is a compliance issue -- anybody disagree -- okay, so I'm really  
8 wondering why you bring up the issues cost and rem. Are you trying to bring  
9 tears to the eyes of the Commissioners? I mean, you have to comply, don't you?  
10 Independent of cost and rem, it's a design basis, and if we want to deviate from  
11 that, it will take some action on the part of the Commission, either you know,  
12 either 50.46a and so on. What's the purpose of giving us all these cost estimates  
13 and rem?

14 MR. HALPIN: Yeah, so there are no tears here --

15 COMMISSIONER APOSTOLAKIS: No tears, okay.

16 MR. HALPIN: -- this is, we're trying to get on the table really the full  
17 discussion. I mean, the reality is from the way it's written, it is a compliance  
18 issue. In fact if you look at the write up it talks about how 50 46 was never  
19 designed to be risk-informed, but there are other policies of the NRC, the PRA  
20 being risk-informed in their decision-making, which should factor -- we believe  
21 should factor into this. It's not a black-and-white conversation.

22 COMMISSIONER APOSTOLAKIS: It would take some action on  
23 our part --

24 MR. HALPIN: Correct.

1                   COMMISSIONER APOSTOLAKIS: -- to allow this, so right now it's  
2 a compliance issue?

3                   MR. HALPIN: That's right.

4                   COMMISSIONER APOSTOLAKIS: Now, Mr. Shahkarami, you  
5 mention the tests that are being done to help you with a zone of influence. Now,  
6 my understanding is that, you know, determining or finding a reasonable model  
7 for that zone does require a lot of judgment, and I'm not sure to what extent tests  
8 will help you there. I mean, tests may give you insights, but won't you still need -  
9 - the zone of influence obviously is influenced by the surrounding geometry, and  
10 there is no way that you can do tests for every possible geometry in every  
11 possible, you know, ways that a jet can go, so I'm wondering why you place so  
12 much faith in tests.

13                   MR. SHAHKARAMI: There are a couple insights that we have.  
14 One -- if you look at all the tests that has been done so far, at the end of the test  
15 you basically shut the valve, and you will see indication of pressure spike, and  
16 then you try to unload that pressure spike, which in reality when you rupture, you  
17 don't have any closure. Basically you decay the pressure over time and it goes  
18 away, so there are insights similar to that, that have not been factored in, in a  
19 previous test.

20                   As I said, there has been air and water used, not the two-phase  
21 flow. We have never really done that much instrumentation that we're looking at  
22 doing here. When we put in instrumentation at many, many locations, both in  
23 longitudinal as well as the radial direction, to really understand where the  
24 success pressure going to end, so some of the things that we have seen --

1           And let me tell you this, we have a hold point in our test. If we ever  
2 come to the conclusion that this test is not going to go any farther, we'll be the  
3 first to come and say the 17 diameter is the right number and go do it, but we  
4 cannot sit here and don't try what we believe could be a success path because of  
5 some of the insight I just talked about.

6           COMMISSIONER APOSTOLAKIS: I think one of the arguments  
7 the staff is making at what they're proposing is good enough is that the issue is  
8 so complex that you really cannot model every little thing. I mean you mention  
9 instrumentation, yeah, you will have a lot of information about that particular test,  
10 but there may be so many other configurations that you know, may not allow you  
11 to --

12           MR. SHAHKARAMI: Well, let me just touch on some of the work,  
13 it's not just really to determine the geometry -- and how far. Once we establish  
14 that, we'd be looking at unjacketed new con insulation, piping target, large O D  
15 cylinder target to represent a steam generator, shell geometry, because the  
16 target can influence, you know how this target going to be hit, so there is a series  
17 of items that we have already written, that we're going to use that test to  
18 experiment. We are also going to use computation of fluid dynamic to use the  
19 analytical and practical testing data to make sure we can get that alignment, so  
20 that's all part of the project plan that I discussed with you earlier.

21           COMMISSIONER APOSTOLAKIS: Okay, well the more  
22 information the better off we are. I still have my doubts, but --

23           MR. SHAHKARAMI: I understand.

24           COMMISSIONER APOSTOLAKIS: Now, Mr. Lochbaum, you are

1 arguing that when the staff makes decisions, they should consider the totality  
2 over issues in front of the staff and how it affects risks, so we will have some sort  
3 of integrated decision-making process that will look at you know, the GSI-191  
4 and maybe fire issues and so on. That brings to my memory something else that  
5 I am sure you know about, the industry has been complaining about the  
6 aggregate impact of regulations, but Mr. Halpin on other occasions has a list of  
7 things that you could do with his plan if he was not forced to do certain other  
8 things, and maybe I'm paraphrasing here, Ed, but we are forcing him to do  
9 certain things and he has limited resources, so other things become of lower  
10 priority and they do effect core damage frequency.

11           So I'm wondering whether you would agree for someone to develop  
12 an integrated approach, which I think is going to be very difficult to do, that would  
13 include all the risks that you mentioned, but those are the risks that result as --  
14 that are the result of the fact that we are issuing regulations one after the other.  
15 Would that be impossible to do or would that be something that you think we  
16 ought to pursue to have really a grand methodology that says, you know, if you  
17 are about to issue these rules, here are all the things and the impacts you have  
18 to consider, including things that Mr. Halpin will not be able to do to his plant  
19 because he is forced to do certain other things. I'm wondering whether you have  
20 any thoughts on that.

21           MR. LOCHBAUM: I've had considerable thoughts about that  
22 general issue, because I'm very mindful the Titanic and the Eastland. The  
23 Eastland sank two years after Titanic, because they added the life boats and the  
24 davits , and everything that the Titanic disaster caused, more passengers died as

1 a result of the Eastland sinking than the Titanic, so the fixes to that disaster  
2 caused a disaster of greater magnitude. So I'm very mindful of well intended  
3 measures that actually may fix that problem, but create a different problem or  
4 make it a different problem of greater severity, so I would agree that that needs  
5 to happen.

6 I've kind of taken comfort in the fact that things like the CRGR and  
7 other full measures the NRC has, try to ask and answer those questions to avoid  
8 the well intended thought that has adverse or unintended consequences, so I  
9 think -- I would agree perhaps we need to review that to perhaps broaden those,  
10 and fill in some gaps, but I don't think that it's as missing as the collective  
11 consideration of known safety factors that I outlined in my presentation.

12 COMMISSIONER APOSTOLAKIS: Yeah, that would be a first  
13 step, I could guess. Do that and then maybe expand it to include the aggregate  
14 impact of regulations.

15 MR. LOCHBAUM: I think it's in terms of whether it's impossible or  
16 not. Even if it's impossible, I think it's worth pursuing, because even if we make  
17 a few steps towards it and don't reach the precise goal, the steps taken along  
18 that path will be worthwhile of themselves.

19 COMMISSIONER APOSTOLAKIS: Very interesting answer, thank  
20 you. Mr. Chairman.

21 CHAIRMAN JACZKO: Thank you. How many tests have we done  
22 related to zone of influence?

23 MR. SHAHKARAMI: Zone of influence?

24 CHAIRMAN JACZKO: Yeah.

1 MR. SHAHKARAMI: Well, there are tests done overseas, there are  
2 tests done here, but in 2006 is when the utility had started to do the zone of  
3 influence test, and I don't know the exact number, but what we took -- PWR  
4 Owners Group took on common RAIs as a result of that. I can't tell you exactly  
5 how many tests we ran --

6 CHAIRMAN JACZKO: Well, we've done tests --

7 MR. SHAHKARAMI: That's correct.

8 CHAIRMAN JACZKO: -- and I appreciate the comment that  
9 Commissioner Ostendorff raised, asking about the issues that are outstanding.  
10 It's not as if today we have no test data. Part of the problem right now is we have  
11 test data that doesn't support a change in whatever value diameters we're  
12 looking at for a zone of influence that many of the licensees would like in their  
13 submittals to credit, is that correct?

14 MR. SHAHKARAMI: Right now, everybody is using the 17  
15 diameter as a guidance.

16 CHAIRMAN JACZKO: Using the 17 diameter, everyone has a path  
17 forward with that --

18 MR. SHAHKARAMI: That's correct.

19 CHAIRMAN JACZKO: Okay, so the testing we're doing is not  
20 testing, because we don't know how to resolve the issues. The testing is in order  
21 to reduce that zone of influence to a lower value.

22 MR. SHAHKARAMI: That's correct. That's correct, because that  
23 could have a substantial impact on decision of removing insulation or not.

24 CHAIRMAN JACZKO: Okay, so I think that's an important point



1 that we're not talking about testing, because we don't have the information.  
2 We're talking about additional testing because people, licensees with like a  
3 smaller zone of influence, so that there would be less insulation removal.

4 MR. SHAHKARAMI: The 17 diameter tests really were not, as far  
5 as I know, were done analytically through the computer programming. I don't  
6 think -- I know in Germany there has been some tests done --

7 CHAIRMAN JACZKO: But here we've done tests. I mean there  
8 was the round of tests we did previously that had the problems with their being, I  
9 think the narrower region in the -- within the loop and as a result I mean,  
10 ultimately your pressures at the jet were not what were assumed in the  
11 calculations, is that -- so, I mean, we've done those tests and the result didn't  
12 come out in a way that supported the arguments that were being made by  
13 applicants.

14 MR. SHAHKARAMI: The delta is that, I'll give you an example.  
15 When you choke on a valve at the end of the test and see a spike of pressure,  
16 and try to bound that --

17 CHAIRMAN JACZKO: Right, right.

18 AMIR SHAHKARAMI: -- that drives you to a much larger diameter.  
19 What we're trying to say, we understand those and we want to try to go back and  
20 put the realistic configuration and behavior as we see it, such as two face flow,  
21 you know, don't choke the valve, make sure the extreme choking is not taking  
22 place, middle stream is taken at the nozzle end, so there are things that hasn't  
23 been conceived there to develop the realistic --

24 CHAIRMAN JACZKO: Whose responsibility is it to develop those

1 tests?

2 MR. SHAHKARAMI: The PWR Owners Group, on behalf of  
3 industry, has taken on -- we have the concept, design has a started --

4 CHAIRMAN JACZKO: So it's your responsibility to do the tests?

5 MR. SHAHKARAMI: That is correct.

6 CHAIRMAN JACZKO: Okay, so it is your responsibility to do the  
7 tests and you didn't do them accurately -- or you didn't do them correctly,  
8 previously?

9 MR. SHAHKARAMI: We didn't do it to the detail that we  
10 understand it, no, that's correct.

11 CHAIRMAN JACZKO: Okay, and again, I think it's just importance  
12 that we understand it. It's not that -- I mean, the issue here isn't that we have  
13 made you do tests that you didn't want to do, that didn't come out right. You did  
14 tests. You didn't get the answer you needed, so you want to do more tests to  
15 continue your findings.

16 MR. SHAHKARAMI: But as I said, they were RAI issues and the  
17 two remaining RAIs need to be resolved, and be pursuant, because of that.

18 CHAIRMAN JACZKO: And I guess I'll ask the staff when they're up  
19 here as well, whether they believe -- I mean, absent additional testing, they have  
20 a path forward, regardless of additional testing.

21 MR. SHAHKARAMI: Absolutely.

22 MR. SENA: So, if I may, so and the Beaver example, we did not  
23 apply the reduced -- testing that is currently undergoing additional questioning  
24 and perhaps additional testing, and so in the end, you know we are in

1 compliance, however but if you have additional data, additional testing that could  
2 have reduced the zone of influence, reduced the amount of insulation, that in turn  
3 could have resulted in compliance, but at a reduced impact to the station and at a  
4 reduced impact of our resources. That's the only perspective I was trying to  
5 apply.

6 CHAIRMAN JACZKO: And I appreciate that, and I just note one of  
7 the things the staff said in their paper is -- and this has to do with new testing to  
8 justify reduced RAIs. This is on Page 5, I think, of the appendix and stated  
9 elsewhere in this paper, the staff is not confident, even if it were to accept the  
10 methods for testing and evaluation, the results will support significantly reduced  
11 zone of influence, so again, I mean, you know, we can always test to try and find  
12 something different. It doesn't mean we're going to get a new answer.

13 So if what the issue is, is the position that we should wait to do  
14 something to resolve the compliance issues until we have more testing, I'm not  
15 being convinced about what I've heard that that's a necessary reason to wait,  
16 because we have no guarantee that's going to give us any new information. It  
17 seems like we're, you know, it's almost as if, you know you -- it's like passing the  
18 bar you know, or I don't know, Commissioner Ostendorff, if you --

19 CHAIRMAN JACZKO: I don't know if you took the bar.

20 COMMISSIONER OSTENDORFF: I did, State of Texas.

21 CHAIRMAN JACZKO: You did? So, I'm not an attorney, so I don't  
22 know what it's like, but I know you usually take the bar multiple times and at  
23 some point they say okay, if you don't pass it then at some point you say stop  
24 and you know, and we move on. I don't know -- and just for the record, for the

1 record --

2 [laughter]

3 CHAIRMAN JACZKO: Mr. Ostendorff took the bar one time and  
4 I'm assuming it was -- you took it one time and passed it, so --

5 COMMISSIONER OSTENDORFF: That's correct.

6 CHAIRMAN JACZKO: So, I'm just wondering at what point we stop  
7 testing and we move on.

8 MR. SHAHKARAMI: I think with us as I said earlier, Mr. Chairman,  
9 was we approached this, we received RAIs, we resolved a lot of them, two  
10 remaining and we understand the issue and we have hold point as a decision-  
11 making it may be January when we will start testing, by January 15 we say cut it  
12 because we're not going to get anywhere. That's build into the project.

13 CHAIRMAN JACZKO: Well, I mean, and I guess what I saw from  
14 Mr. Halpin is a schedule I think that says mid 2011 and then 2012 for analyzing  
15 all this information. That's a significantly long time for an issue that I don't know  
16 how many days that adds to Mr. Lochbaum's ticker, but it certainly puts us in a  
17 sphere in which we're continuing to test. You know, there was a phrase I learned  
18 a long time ago, when I worked on the Hill, and I don't know who originated this  
19 phrase, but it's called "paralysis by analysis," and I feel like to some extent we  
20 may be here.

21 I want to turn to just a slightly different issue. There's been a lot of  
22 discussion about small break versus large break. Well, from the standpoint of, as  
23 I understand this issue, from the standpoint of overall plant risk, potentially there  
24 are different phenomenon in terms of overall ECCS performance when we're

1 talking about small breaks versus large breaks LOCAs, but -- and perhaps you  
2 can help me clarify this and understand this, and I may ask the staff the same  
3 question. In this particular situation, however, it's not necessarily true that the  
4 large -- well, I mean maybe you can answer this. Is it true that the large break  
5 LOCA is the limiting phenomenon when it comes to the sump blockage?

6 MR. SHAHKARAMI: I would say in some cases maybe not. It  
7 depends on -- there are cases that your small size break could govern the  
8 situation.

9 CHAIRMAN JACZKO: So, if we're in a situation in which that's  
10 really what governs, and in some cases it might, and in fact, many of them it  
11 might -- the arguments about whether or not we risk-inform this are really  
12 irrelevant, because what drives it is what everybody seems to be in agreement  
13 on, which is the small break LOCA. Is that a kind of a correct statement?

14 MR. SHAHKARAMI: No, what we're saying is that the probability of  
15 design basis, double break -- instantaneous is much more reasonable for a small  
16 size break, whereas in a large break there is a reasonable assurance that is not  
17 going to happen, because the material property --

18 CHAIRMAN JACZKO: I mean, in terms, if you look at all of the  
19 spectrum of LOCAs and breaks, it's my understanding it's not necessarily the  
20 case that the large break LOCAs always dictate what amount of insulation you  
21 need to remove. I mean, that's fundamentally the issue we're talking about here,  
22 is the amount of insulation that we need to remove. You could in fact be limited -  
23 - you could in fact be limited by the effects of the in-vessel, the in-vessel effects,  
24 or you could even be limited by the small break LOCA, that you can with a small

1 break, depending on what the debris is, you may generate enough debris and in  
2 such a way with the small break LOCA that in fact you clog the sump at that  
3 level, and then your insulation removal is dictated by the small break LOCA, and  
4 you may because you have more small bore pipes, you may actually have to  
5 remove more insulation to fix the small break LOCA situation than you would with  
6 the large break. That's my understanding of the situation.

7 MR. SHAHKARAMI: That's correct.

8 CHAIRMAN JACZKO: So in that regard, it doesn't necessarily  
9 matter what we do with the large breaks, because we're in fact limited by the  
10 small break anyway, which is the one area in which there seems to be some  
11 agreement that people recognize will move forward on the small break. I think  
12 Mr. Halpin, that was in your slides, so I'm not sure what we're -- why we're so  
13 concerned about what happens with the large break, and again, if you can help  
14 me better understand that.

15 ED HALPIN: Well, the zone of influence, testing also affects the  
16 small break, right?

17 MR. SHAHKARAMI: Yeah, the zone of influence is for any size,  
18 any size break and the testing that we are talking about would actually be done  
19 maybe for three, four-inch nozzle and be a scale up, to the different size of  
20 potential break. I am not convinced that there may be cases that your large  
21 break, in accordance to design basis, that means instantaneous, double --  
22 wouldn't cause as huge amount of insulation to be transported to the sump.

23 CHAIRMAN JACZKO: But it may not always be the limiting  
24 situation?

1           AMIR SHAHKARAMI: In sump -- it really is a side by side  
2 configuration and type of insulation, and --

3           CHAIRMAN JACZKO: So, as I said, so in some cases we may be  
4 solving the problem just by dealing with the small break LOCA. That's what I'm  
5 trying to say, and I don't -- and that may be the case for some plants. Okay,  
6 thanks.

7           Okay, I'm over my time, so again, I appreciate everybody for -- I  
8 don't know if anybody had any other additional comments you want to make for  
9 these folks. Again, I appreciate all of you being here and your contributing to the  
10 meetings, so we'll take a very quick five minute break and then come back to the  
11 staff.

12           [break]

13           CHAIRMAN JACZKO: We will begin the second half of the  
14 meeting, and we will have two portions of this second portion. First, we'll hear  
15 from the NRC staff, and then we will hear from Dr. Banerjee, who's here  
16 representing the ACRS. And I just want to be clear while they -- while we're all  
17 one panel here, Dr. Banerjee is representing an independent advisory  
18 committee, but for convenience we put everybody together on the same panel,  
19 but we'll begin with Mr. Borchardt.

20           MR. BORCHARDT: Okay, thank you. Good afternoon. The first  
21 panel was a very interesting discussion, I think, set the good framework, so I'm  
22 not going to take time to do that. I just want to acknowledge the efforts of both  
23 the Office of NRR and the Office of Research who have been working on this for  
24 many years. There's been a lot of very valuable stakeholder input and a lot of

1 dialogue. And I especially want to recognize Mike Scott who's going to give the  
2 bulk of the presentation this afternoon because he's been a real leader in helping  
3 us move forward. It's been very gradual, maybe more gradual than we wanted,  
4 but I think we are headed in the right direction.

5 And, as was mentioned by the Commissioners and the first panel,  
6 the plants today are safer today than when we first came upon this issue. So we  
7 can't lose sight of that fact. We're not to the end yet. We want to get there.  
8 We're desperate to get there. But it is safer today than it was years ago. So with  
9 that I'm going to turn to Eric.

10 MR. LEEDS: Good afternoon. I want to give a brief introduction to  
11 the staff's work, our conclusions, our recommendations, and then, as Bill  
12 mentioned, I'm going to turn it over to Mike to do the bulk of the staff's  
13 presentation.

14 The staff considered the points raised in the Commission's Staff  
15 Requirements Memorandum. And I want to emphasize that we took a wide-  
16 ranging look at this problem. You know, we reviewed past staff positions based  
17 on input that we had received from our external stake holders. We asked  
18 ourselves a lot of hard questions.

19 Our perspective on the issue also includes the progress made at a  
20 number of the plants that Bill just referenced to achieve closure with the strainer  
21 testing issues. You know, the majority of the plants have reached the pinnacle.  
22 They're where we want them to be.

23 But also included in our view is that the remaining plants, the high  
24 fiber plants, the plants that probably have the most safety importance, and those



1 whose strainer performance are probably most challenged. Roughly two-thirds  
2 of all the plants have shown adequate strainer testing and evaluation methods.  
3 Ten have reached that status since April of this year, when we last spoke with  
4 you. The staff's recommended approach reflects our current views on risk-  
5 informing emergency core cooling system evaluations and our extensive  
6 technical basis for those reviews.

7           We recommend that the current issue resolution process, which  
8 has been demonstrated effective in resolving the issue for almost two-thirds of  
9 the pressurized water reactors, be continued to conclusion. We believe that the  
10 recommended path forward will likely require some, but not necessarily all,  
11 insulation replacement, or banding or jacketing, at the approximately 20 or so  
12 remaining PWR units.

13           We've consulted with the Committee to Review Generic  
14 Requirements to ensure that back-fit requirements have been met. And to give  
15 the industry credit, throughout this long history for GSI-191, licensees have been  
16 cooperative in making modifications identified as needed and working with the  
17 staff to resolve these issues. And we think that going forward they're likely to  
18 continue to be cooperative. We don't see a need for escalated regulatory  
19 measures. We don't think that they're going to be likely, but as a prudent  
20 regulator, we always want to retain that option.

21           Given the recent unexpected in-vessel effects test results that have  
22 called into question the repeatability of the testing campaign, the staff plans to  
23 defer setting a timeline for some of the issue resolution until we have a high  
24 confidence path forward for the in-vessel effects.

1           And with that I want to turn it over to Mike Scott and he'll go into  
2 much more detail on the staff's recommendations and path forward. Mike?

3           MR. SCOTT: Good afternoon, Commissioners. Through the  
4 history of GSI-191, staff and licensees have worked very hard to address the  
5 issues associated with sump strainer clogging. The licensees, as you have  
6 heard, have increased the strainer sizes by one to two orders of magnitude.  
7 Some licensees have made other changes such as replacing insulation, jacketing  
8 insulation, changing sump pH buffers, installing debris interceptors, or disabling  
9 automatic initiation of containment spray. These measures have been taken in a  
10 plant-specific manner because this is a highly plant-specific issue.

11           The assumption was that the large strainers would not clog.  
12 However, because of the importance attached to making the strainers larger,  
13 testing sometimes followed the modifications, which is a less-than-ideal way to  
14 approach the problem. And the testing results called into question the  
15 assumptions that were made that the large strainers would all be insufficient to  
16 resolve the issue. That's part of why this issue has taken as long to resolve as it  
17 has. Testing of debris-laden water in the plant, of course, is not practical. So  
18 licensees engaged vendors to test a section of their strainer in a test flume at the  
19 vendor's facility.

20           NRC staff found a number of issues with this testing, resulting in  
21 delays to issue resolution. After lengthy interactions with the industry, the staff  
22 has concluded that certain issues regarding zone of influence and credit for  
23 debris settling are not likely to result in an agreement between staff and  
24 licensees in the near term, and that, of course, was discussed in the earlier

1 session that the Chairman asked about.

2           In response to SRM that was received in May 2010, the staff has  
3 taken a comprehensive look at the issue and how to address it. We will outline to  
4 you today our considerations in response to the SRM and our proposed path  
5 forward. We'll discuss the options considered, those chosen, those not chosen,  
6 and why. We'll also outline elements of disagreement among the NRC staff and  
7 the industry. And we'll discuss progress made since our last brief in April 2010,  
8 along with new challenges that have arisen, which, of course, you are aware of.  
9 We hope to communicate why we believe the path we recommend is the best  
10 choice to reach closure on GSI-191 in a manner commensurate with the risk of  
11 the issue for plants that have not resolved it. I'd also like to discuss how the staff  
12 has evaluated continuing operation while sump performance issues are resolved.

13           As Mr. Lochbaum said, this has been around for quite a while. We  
14 have continued to find operation acceptable for the plants while the issue is  
15 resolved based on several factors. As was cited by Mr. Lochbaum, one of those  
16 factors is the risk of the initiating event, but that's not the only factor. Licensees  
17 have implemented mitigating measures in response to Bulletin 2003-01. For  
18 example, some have established the capability of refilling the refueling water  
19 storage tank and continuing to pump water to inject from that source to avoid the  
20 issue of sump clogging if necessary. And licensees have made major  
21 modifications to reduce their vulnerability to the issue. For these and a number  
22 of other reasons, which are documented, the staff believes that continued  
23 operation remains acceptable until the remaining questions are resolved.

24           Slide 3. I'd like to start by providing the staff's perspective on some

1 points addressed by the industry stakeholders in the April 15 brief. Some of the  
2 stakeholders stated that GSI-191 is no longer a safety issue and that any further  
3 modifications to address it would not result in significant safety benefit. Through  
4 interactions we have had with the industry since the April 15 brief, we now  
5 understand that the safety issue statements may have been intended to refer to  
6 large-break LOCAs, which carry a lower risk because of their lower likelihood of  
7 occurrence. The staff proposed, in the April 15 briefing, risk-informing the  
8 solution to GSI-191 by allowing time for licensees to take advantage of the  
9 implementation of 10 CFR 50.46(a), should the Commission issue that new  
10 proposed risk-informed ECCS rule. This recommendation was partly in  
11 recognition of the lower risk posed by these breaks, but it would allow, also,  
12 some relaxation in the assumptions supporting the required evaluations.

13           Smaller breaks, as you've heard today, can also challenge sump  
14 performance. As little as a 1/32-inch thick uniform bed of the "right" kind of  
15 debris on an ECCS strainer has been shown through testing to cause large,  
16 possibly problematic, head losses across the strainer. For at least one plant the  
17 limiting break is a 3-inch pipe. So, the statements that were made earlier about  
18 how a plant might be limited by small breaks are accurate. It is a plant-specific  
19 issue. Some plants, even if all the large breaks were removed from  
20 consideration, would still be limited and potentially challenged if they had a large  
21 amount of debris and incurred a small break. The probability of these breaks,  
22 substantially smaller than limiting large breaks, while still small, makes them  
23 more risk-significant.

24           If the break occurs, if recirculation is required, if the sump clogs,

1 and if, beyond-design-basis, compensatory measures cannot be taken or are  
2 unsuccessful, core damage is a likely result. The conditional likelihood of sump  
3 failure is subject to significant uncertainty for a plant that has not shown  
4 adequate sump performance using method's acceptable to the staff.

5 Even if the sump strainer does not fully clog, there is potential for  
6 some finer debris to pass through the strainer and migrate to the core. Recent  
7 testing, while yielding some unexpected results, would appear to indicate that  
8 flow through nuclear fuel is subject to clogging from limited amounts of debris.

9 For these reasons the staff continues to see the sump issue as a  
10 safety issue. From remarks made to the ACRS, the staff believes that the  
11 industry agrees that small breaks should be addressed deterministically. And I  
12 believe the remarks today by the industry also made the same point.

13 Slide 4. Staff also disagrees with some aspects of the stakeholder  
14 discussion on April 15 on the impacts of addressing the sump issue. First, the  
15 implication was that using staff-accepted evaluation methods would lead to  
16 replacement of all fibrous insulation. Some plants have shown adequate strainer  
17 performance even with substantial amounts of fibrous insulation remaining in  
18 containment. There are vendor- and plant-specific variabilities in how much  
19 debris can be tolerated, and some plants might need to change out or protect  
20 through jacketing, all their fibrous insulation that is in a zone of influence for a  
21 high-energy break. But we believe some will not. The staff has accepted and  
22 encouraged a "test for success" approach in which licensees could, during  
23 iterative strainer testing, incrementally reduce the debris source term until  
24 successful performance is attained, thus avoiding unnecessary replacement or

1 unnecessary jacketing. In any event, some insulation is outside the zone of  
2 influence and would not likely need to be modified.

3           The staff has also evaluated the concern expressed about  
4 excessive radiation exposure to workers as a result of insulation change-outs or  
5 jacketing. The staff is sensitive to the dose impacts of this type of work, and we  
6 would gladly support alternative approaches that resolve our safety concerns  
7 with less radiation exposure. And the staff has, for the last several years, had  
8 numerous interactions with the Owners Group and with licensees to attempt to  
9 find outside-the-box solutions to this problem. However, at this point, we see no  
10 reasonable alternative to the path we propose, and our survey sample indicates  
11 the expected radiation exposure, while not insignificant, would not be out of line  
12 either with the safety benefit of making the changes or with exposures licensees  
13 have experienced with other large-scope maintenance inside containment, such  
14 as steam generator replacements.

15           Slide 5. I'd now like to address developments since we last briefed  
16 you. At the time of the April brief, the staff had concluded that 36 of 69 PWRs  
17 had either completed strainer testing using methods acceptable to the staff or  
18 had committed to perform testing using acceptable methods. In the staff's view,  
19 this is a key milestone for the plant, because once the methods are settled, the  
20 results (and any modifications shown by the testing to be needed) follow. The  
21 good news is that -- and I'm going to change what's in my presentation here --  
22 another 12 units have reached that status. We had 10 as of the time we  
23 prepared the remarks here, but we reached agreement on two more units this  
24 week; so, now, 48 of 69 have settled test and evaluation questions. So we

1 continue to see progress here. The licensees continue to work with us to reach  
2 closure.

3 Most of the remaining PWRs credited either zone-of-influence  
4 reductions or debris settling, neither of which the staff has accepted to date.  
5 Some of these plants are waiting on Commission direction on this subject before  
6 proceeding to resolve remaining staff questions, while others continue work with  
7 the staff to reach solution.

8 Since the last brief, the vendor whose standard test protocol allows  
9 debris settlement has demonstrated in a test satisfactory to the staff that they can  
10 show adequate strainer testing without crediting settling. So now, all the vendors  
11 have demonstrated that they can do this. Still, some of the remaining licensees  
12 with relatively high amounts of fibrous insulation are continuing to pursue  
13 protocols that credit settling because assuming the larger amounts of debris  
14 would likely challenge their ability to show adequate strainer performance without  
15 additional plant modifications.

16 The in-vessel effects issue, as has been discussed today,  
17 continues to challenge us. As you may recall, one fuel design exhibited an order-  
18 of-magnitude larger head loss per amount of debris for certain ratios of  
19 particulate to fiber debris than did the other. The PWRs Owners Group attributed  
20 the difference to one fuel design encouraging turbulent flow, as you heard, which  
21 more evenly distributed debris over the fuel assembly grids and, thus, reduced  
22 the head loss. The staff asked, given that theory, what would happen if an ECCS  
23 pump was lost. The staff pressed for a lower-flow test which showed that, at the  
24 lower flow, the behaviors in the two fuels are more similar. This testing lowered

1 the proposed debris limit for the supposedly less-susceptible fuel design by a  
2 factor of three. You heard 150 grams; this test caused that number to be  
3 lowered to 50 grams for the one vendor's fuel.

4           The Owners Group recently ran the so-called "cross test" the staff  
5 had requested and, as you heard, obtained unexpected results that did not  
6 support the Owners Group's theory that the differences in behavior were due to  
7 the manner in which debris distributed through the fuel assemblies. The Owners  
8 Group is now considering path forward in light of the test results. Until the staff  
9 has a better understanding of the reason for the unexpected cross-test result, we  
10 do not plan to issue the draft safety evaluation we have developed on in-vessel  
11 effects. We developed that -- just for your information, we developed that draft  
12 SE on the assumption that we thought likely at the time that the cross-test would  
13 show that the previous testing was well-understood. And, instead, the cross-test  
14 showed what I would view as a certainly questionable result that has caused us  
15 to go back and consider where we are with this issue.

16           Slide 6. I'd like to briefly discuss our process for responding to the  
17 SRM. We have had several interactions via correspondence and/or meetings  
18 with stakeholders to understand their viewpoints. Our basic review process was  
19 to create focus groups for evaluation of each possibly option. We also  
20 considered decisions made earlier regarding path forward in light of the  
21 Commission's direction and new information received since these positions were  
22 taken.

23           And we did some outside-the-box thinking about how we might  
24 achieve closure. Such thinking has been common during resolution of the sump



1 issue; for example, the holistic interactive review process that has helped ensure  
2 the staff does not impose unnecessary conservatism on licensee evaluations. I'd  
3 like to point out at this point that one of the stakeholders used the term "absolute  
4 assurance." The processes that we are talking about as already being in place,  
5 or that we're proposing to be put in place, are, in part, to not require absolute  
6 assurance. The holistic process is intended to avoid a push for absolute  
7 assurance. That's not where we are. It's not where we've been. And it's not  
8 where we plan to go, subject to your guidance.

9           As we went through this process, we were again faced with the  
10 dilemma there is no easy way to establish a high level of confidence in licensees'  
11 evaluations, while reaching closure in the foreseeable future and minimizing the  
12 need for licensees to make plant modifications. So, as I will discuss, we  
13 recommended an approach that is a compromise among competing objectives  
14 while being consistent with safety. We're also proposing a change in the timeline  
15 based on the continuing uncertainty regarding in-vessel effects. And this is a  
16 change from what we provided you in SECY-10-0113 because of the cross-test  
17 result.

18           As was pointed out, we have consulted with the CRGR on our  
19 proposed path forward. The CRGR concluded that the staff can and should  
20 invoke the compliance exception to 10 CFR 50.109. So, as Commissioner  
21 Apostolakis asked, yes, indeed, the staff sees this as a compliance issue.

22           Slide 7. As I mentioned, the staff considered numerous options to  
23 support issue closure. These included continuing the previously planned path  
24 forward to issue resolution as well as attempting to find a basis to take no further

1 action. We considered application of Leak-Before-Break, as requested by the  
2 industry, and we also considered more generally how to risk-inform the solution  
3 to the issue.

4 Slide 8. As part of risk-informing our evaluations we considered  
5 whether a risk-informed approach could include splitting the resolution timeline to  
6 address the most significant aspects first -- the most risk-significant aspects first.  
7 And we considered separating the in-vessel issue from the strainer performance  
8 issue.

9 Slide 9. Having considered a wide variety of options we narrowed  
10 the list down to those we considered viable. Our rationale for considering some  
11 potential approaches non-viable is discussed in the enclosures to SECY-10-  
12 0113. The result of the comprehensive evaluation was a list of three options, two  
13 of which have sub-options. The first option is to continue the staff's current  
14 approach to issue resolution. This involves extensive plant-specific interactions  
15 to resolve most remaining issues, along with the potential to resolve a few issues  
16 with wide applicability on a generic basis. Since the April brief, we have  
17 interacted extensively with the involved vendor and licensees regarding their  
18 ongoing attempt to credit debris settlement.

19 Some progress has been made on this front, although numerous  
20 challenges remain and the staff cannot predict the ultimate success of the effort.  
21 That is largely due to the complexity of attempting to credit a certain amount of  
22 debris settlement that occurs in a test and show that it would also occur in the  
23 plant; not to say it can't be done, but it is a very complex effort. The PWR  
24 Owners Group also intends to submit a new approach, as you've heard, to zone-

1 of-influence reduction credit; again, we cannot predict the likelihood of success of  
2 this effort, whose timeline to an NRC staff decision runs at least through 2011.  
3 Their plan says 2011. It includes submittal of a topical report and staff review  
4 and they are planning to come in with an analytical approach that we have not  
5 reviewed before. History of this issue suggests that 2011 as a resolution point  
6 for that effort may be optimistic.

7           Sub-options to this option involve whether the NRC would establish  
8 a firm schedule for resolution to occur.

9           Just, parenthetically here, Option 1A is to continue the current  
10 process. I don't know that our SECY paper spoke to that explicitly as far as the  
11 staff's view on that. We are perfectly okay with continuing down the present  
12 path. We offered the Option 1B and Option 2 as an effort to provide options,  
13 other paths forward, that would risk-inform that issue, and that's also acceptable  
14 to us.

15           Option 2 was also brought before you in April. It involves a new  
16 effort to risk-inform the solution set for GSI-191. I say "new effort" because there  
17 is an existing risk-informed regulatory framework for GSI-191 that allows this, but  
18 licensees have not implemented it because it would require exemptions and it  
19 would not clearly provide relaxations in debris generation and debris transport  
20 analyses. If the Commission approves proposed 50.46(a), Option 2 would  
21 involve developing guidance for implementing the new rule for GSI-191.

22           Option 3 is applying leak-before-break credit to GSI-191 strainer  
23 evaluations. This option would allow licensees to completely exclude LBB piping  
24 from consideration as break locations. The result would be that larger breaks

1 would not need to be evaluated for debris generation. Though NEI and some  
2 other stakeholders prefer this approach, the NRC staff has a number of concerns  
3 with it.

4 Slide 10. Staff has evaluated the acceptability of applying LBB  
5 credit to sump debris generation evaluations in the past. One reason the staff  
6 rejected such application was that the proposed expansion in scope of LBB  
7 would be inconsistent with Commission intent as stated in the Statement of  
8 Considerations for GDC 4. However, this specific issue has not been taken  
9 before the Commission until now, and the industry has obviously not agreed with  
10 the staff's past decisions on the matter, so the staff looks forward to a  
11 Commission decision that could provide finality to it, one way or another.

12 If credited, LBB could affect evaluations of worst-case break  
13 locations from the perspective of impact on the sump strainer. The break  
14 selection process involves, as you know, evaluating debris generated from  
15 breaks in different pipe locations to find the worst from the perspective of the  
16 amount and type of debris generated from the break that would potentially reach  
17 the strainer. Were LBB allowed to be applied to break selection evaluations,  
18 breaks from all LBB-qualified piping could be excluded when determining debris  
19 generations amounts. In other words, the assumption would be made that LBB-  
20 qualified piping could never experience a pipe break and could therefore be  
21 neglected from further consideration. As, of course, was discussed by the  
22 stakeholders earlier today, the industry is proposing potential for mitigators that  
23 have not yet been specified to us and, also, would not be required by regulation if  
24 LBB were implemented for this purpose.

1           The impact of this exclusion would be plant-specific. For some  
2 plants, the limiting break is in LBB-qualified piping. Such breaks would be  
3 excluded from evaluation, which would then make a break in non-LBB piping the  
4 limiting break for sump performance. For other plants, the limiting break is  
5 already in non-LBB piping, as was discussed earlier. It is likely that some or all  
6 plants with substantial amounts of fibrous insulation would benefit in terms of  
7 cost and occupational radiation exposure by reducing the need to replace or  
8 jacket insulation. The staff does not believe a “high fiber” plant would likely be  
9 able to completely avoid insulation modifications under any circumstance,  
10 because, again, a non-LBB break could be a problem if the LBB breaks went  
11 away, and in-vessel effects could still be a problem even if the strainer  
12 performance issues were resolved.

13           Though LBB credit could simplify the resolution of GSI-191, the  
14 staff strongly recommends against this approach. Our fundamental concern is  
15 that it constitutes a significant reduction in defense and depth. A break in LBB  
16 piping, however unlikely, could lead to core damage since there would be no test  
17 acceptable to the staff of the ability of the sump recirculation system to function  
18 correctly for a break in LBB piping. Further, loss of recirculation function would  
19 potentially cause loss of both core cooling and containment cooling, thus  
20 impacting systems that would minimize or avoid core damage and, also,  
21 impacting systems that would mitigate the impact of core damage should it occur.

22           Staff has a number of other concerns as well. The Commission’s  
23 original intent in granting LBB credit was to obtain a safety benefit, specifically  
24 improved ability to perform primary plant piping inspections. Staff sees no

1 reactor safety benefit in applying LBB credit to sump evaluations, although we  
2 realize that there would be benefits of other types, as was discussed by the  
3 stakeholders. To the contrary, the application would potentially allow licensees  
4 to retain large amounts of materials in containment that have been shown to  
5 challenge sump performance. In addition, the staff is concerned that expansion  
6 of the scope of LBB credit in this manner could create a precedent for its  
7 expansion to other areas of concern, again, without a safety benefit, but with  
8 potential for further reduction in defense and depth.

9 Another issue is the impact of primary water stress corrosion  
10 cracking. The NRC and licensees are still addressing this issue. Leaving aside  
11 our other concerns about expanding LBB credit in this manner, the staff does not  
12 believe it is appropriate to expand application of GDC-4 in the presence of an  
13 unresolved PWSCC issue. Should the Commission approve LBB for sump  
14 evaluations, the staff believes additional evaluations of the impact of primary  
15 water stress corrosion cracking would need to be performed beforehand. So, in  
16 any event, the staff does not see LBB as a near-term solution to GSI-191 as the  
17 industry has stated.

18 Slide 11. Staff recognizes the industry's concerns regarding  
19 avoiding unnecessary occupational radiation exposure, so we considered how  
20 best to do that while maintaining safety in defense in depth. We propose to  
21 continue with the current plant-specific issue resolution process, which has  
22 shown to be effective in resolving complex issues involved in the sump problem.  
23 But that process alone cannot resolve the issue of large reductions in assumed  
24 debris generation and transport attempted by many of the licensees who have

1 not yet reached issue resolution with the staff.

2           The staff has been, throughout the GSI-191 process, open to ideas  
3 that might help resolve the issue, as long as an adequate level of safety is  
4 maintained. I already mentioned that a risk-informed approach is available to  
5 licensees. With the final rule for 10 CFR 50.46(a) scheduled to go to the  
6 Commission late this year, we propose to make use of that rule, if approved, to  
7 help resolve 191. Implementation of that rule would remove the need for  
8 exemptions, which has been an impediment to risk-informed solutions in the  
9 past.

10           The staff would work with the industry to develop implementing  
11 guidance for the rule. As a matter of fact, we have suggested to the industry that  
12 they start considering that now just in case this reaches fruition. The staff would  
13 work with the industry to develop -- would allow additional resolution time for  
14 GSI-191 for break sizes that would fall within the rule's scope. We have already  
15 begun to consider how the rule might impact debris generation and transport  
16 evaluations. Because of the complexity of the phenomenon and the lack of  
17 realistic models for them, we cannot predict how much benefit would ultimately  
18 be gained for GSI-191. As was said, licensees have had a concern that there  
19 may be limited benefit. But we would allow some additional time to see how it  
20 plays out with a different resolution schedule for the larger breaks potentially  
21 affected by the proposed rule.

22           Another example application of 50.46(a) might be the use of a non-  
23 safety back flush system to support demonstration that larger breaks could be  
24 mitigated even if the strainer clogs. In keeping with the risk-informed framework,

1 a licensee would need to show, likely through a test but perhaps one with less  
2 rigorous assumptions than would be needed for a design basis test, that the non-  
3 safety system would actually be effective in keeping ECCS flow adequate. The  
4 impacts on in-vessel effects would need to be addressed since a clean strainer  
5 would pass more debris until a debris bed built up.

6 Slide 12. We believe that continuation of the existing issue  
7 resolution process, along with risk-informed treatment of larger breaks, is the  
8 best path forward for a number of reasons. It allows time for additional attempts  
9 to refine evaluation methodology, maintain sufficient defense-in-depth,  
10 incorporates available risk insights, and continues a demonstrably effective issue  
11 resolution process that contains checks and balances to reduce likelihood of staff  
12 requiring excess conservatism. The implementation schedule would be risk-  
13 informed and would take into account the amount of planning and effort required  
14 for licensee implementation. We would also not push for near-term resolution  
15 until the in-vessel effects situation becomes clearer.

16 Slide 13. I'd like to conclude by emphasizing a few points. While  
17 the staff, licensees, and other stakeholders are frustrated with how long it has  
18 taken to resolve GSI-191, the struggle has not been caused by lack of focus or  
19 effort. Licensees have expended large amounts of resources to address the  
20 issue, and they are continuing to do so. Within the issue resolution framework  
21 established by the Commission and the staff, all licensees have been  
22 cooperative. But as I have said, there are points of disagreement among the  
23 staff and some stakeholders regarding the significance and potential impacts of  
24 this issue. We believe that the staff is in the right place on this issue. We still



1 see it as a safety issue, particularly for “high-fiber” plants that have not made an  
2 adequate demonstration of sump performance. We are therefore pushing for its  
3 resolution in a defensible manner.

4           We are attempting, while focusing on safety, to risk-inform the  
5 solution. We believe that “high-fiber” plants will likely need additional  
6 modifications regardless of the path forward the Commission chooses, so the  
7 difference would be one of degree. We have been and continue to be flexible in  
8 the recognition of the low likelihood of the initiating event, the complexity of the  
9 compliance demonstration, and the potential impacts of the modifications on  
10 licensees. We have not been prescriptive regarding modifications. We have  
11 supported allowing licensees sufficient time to do ALARA planning for needed  
12 mods. And we have been sensitive to the potential for excess of conservatism in  
13 sump evaluations and have put a process in place to attempt to reduce that  
14 potential.

15           Applying LBB to sump evaluations would be an unacceptable  
16 reduction, from our perspective, in defense in depth. In the event of a break in  
17 such piping, the break by itself could potentially lead to both core damage and  
18 degraded accident mitigation systems with no equipment failures. So we do not  
19 recommend that approach.

20           We also believe that the in-vessel issue can and should be resolved  
21 as part of 191. We see the issues as inextricably linked, in that a plant could be  
22 successful in making a strainer large enough to avoid clogging, but the result of  
23 that might be to pass enough debris to the core to cause clogging there. The  
24 continuing challenges in bringing this aspect of the issue to closure have caused

1 us to revise our proposed path forward in as far as we proposed to take no action  
2 regarding issue closure schedule until a high-confidence path forward on in-  
3 vessel effects is visible to us. We will keep the Commission, of course, informed  
4 of our progress in resolving the issue.

5 With that, I conclude, subject to your questions. Thank you.

6 CHAIRMAN JACZKO: Dr. Banerjee.

7 DR. BANERJEE: Thank you. Is this on? Good afternoon, and  
8 thank you for this opportunity to give the ACRS views at this meeting.

9 As you know, ACRS has been involved with this issue from its early  
10 days, and we've written many letters and things about this. We, in our last letter  
11 before this letter which relates to the policy paper, I think we expressed that we  
12 were largely in agreement with the facts that the staff was saying. This was our  
13 2008 letter. This was the integrated review process, the holistic process they  
14 were going through. And, we saw at that point, because we were not that aware  
15 of downstream effects, that there was a clear path to resolution. And in fact, as  
16 Mike Scott pointed out, many of the plants have been able to go through this  
17 process. And, except for a few high fiber plants left, I think it is a clear path  
18 forward. And they were in the process then of issuing these letters to make sure  
19 that some sort of schedule was followed. So, we are largely in agreement with  
20 that process.

21 So, let me have the first slide. Now I'm going to sort of give you the  
22 recommendations and conclusions of our letter. So, the first thing that we  
23 concluded after reviewing the staff paper was that they had looked at, essentially,  
24 all the reasonable options and reviewed them very thoroughly, so we were very

1 happy with that. Option 1, which was essentially to continue the current holistic  
2 process, we found acceptable, and Option 2, which would develop some  
3 additional risk-informed guidance and, perhaps, also, there were two sub-options  
4 within this. The second sub-option would depend on whether 50.46(a) went  
5 through or not or what form it came through. That would also be an acceptable  
6 option, but we wanted to see a reasonable schedule set.

7           Now, what the staff recommended was option 1B and 2. And,  
8 implicitly, that set a schedule, but we would have liked to see it more explicitly set  
9 in order to bring it to closure, and that's what we said in the recommendation.

10           The next recommendation was related to Option 3, which I will --  
11 this is on Slide 3. I'll expand on that as we go on. This would exclude leak-  
12 before-break qualified piping from consideration as debris generators. This is  
13 sort of an issue which has come up before and the staff has dealt with it in the  
14 past, and it keeps coming up, sort of like a zombie; you think you've killed it, but it  
15 comes to life again after a while. So, we think it should not be considered further.

16           Anyway, the next conclusion and recommendation is that our  
17 examination of, let's say the evidence that was made available to us regarding  
18 the doses that would be incurred in large-scale removal of insulation were on the  
19 low end of the estimates that NEI had presented in your briefing a few months  
20 ago. We came to the conclusion that, at least based on the evidence we've  
21 heard, it was more like what you heard from the industry stakeholders, about 110  
22 to 115 for two plants, so it was at the low end anyway. Maybe some of the plants  
23 would go a little higher.

24           Slide 5 -- here are our attempts at being literary. We found that the

1 in-vessel and the sump screen performance issues are inextricably intertwined,  
2 and we don't see that there was really much logic in trying to separate them, and  
3 we'll expand on this a little bit more.

4           Okay, so now let's turn to Slide 6 which is the radiation dose. In the  
5 letter, NEI suggests a dose estimate of 100 to 600 person-rem per unit with an  
6 average of 200. Our current information we got is that for the two units, this is in  
7 line with what the stakeholders said; it was about 110 person-rem for Beaver  
8 Valley. The estimates that were presented to us by STP were about 81 person-  
9 rem per unit for the large breaks. That was the subcommittee meeting.

10           This is our attempt at art. In addition to literary pretensions, we  
11 have some artistic ones. You can see that if you got debris clogging a sump, it  
12 would tend to knock out not only the green system, which is the long-term  
13 recirculation system, but also the containment spray system. So, basically, there  
14 is an issue there that with that you can knock out both systems. Of course, the  
15 idea of drawing from the refueling water storage tank is a great idea because it  
16 bypasses that. That's a way of doing things, which could be interesting.

17           Anyway, moving on to the next slide which is 8, we recommend that  
18 Option 3 not really be considered too much, or not at all maybe. It's inconsistent  
19 with defense in depth, we feel, and this is also the position the ACRS took some  
20 time ago, even with regard to 50.46(a). I quote a letter, which we wrote -- I think  
21 it was in 2004 on this -- and we say "risk-informed 10 CFR 50.46 should maintain  
22 defense in depth by including requirements intended to provide reasonable  
23 assurance of a coolable geometry for breaks up to the double-ended guillotine  
24 break of the largest pipe in the reactor coolant system." That was our first

1 recommendation. So, in view of that, it seems not consistent with what we have  
2 seen before.

3           With regard to in-vessel effects, the first time I saw this was a few  
4 years ago, and I went to see the AREVA test, and I saw these fibers stuck into  
5 these spaces, which sort of -- the question arose, "What does this do then to core  
6 coolant?" It was just the beginning of this, so this is one of the heads of the  
7 Hydra, which had sort of grown since that time. So, we think, of course, that the  
8 core and the screens are basically almost like two screens in series, so what  
9 passes through the sump screens, eventually, if it doesn't get caught elsewhere,  
10 gets caught in the core, so you can't really separate them. And, in a sense, the  
11 problem is severe because, if you make the screens larger and you get the  
12 pressure dropped down, some more stuff can then go and get into the core.

13           So, that's always been a concern that we've had for a long time,  
14 and it seems that now we can't even predict, really -- not yet, anyway -- the  
15 behavior that we're going to see. This is sort of an open issue. Nonetheless, we  
16 feel that reducing fibrous debris in the plant -- removing insulation or whatever --  
17 will reduce the amount that will get into the core. So, it's bound to be a beneficial  
18 effect. What we don't know is precisely how much; that's sort of the problem  
19 there right now. And, it's going to be a little bit longer before we know that.

20           With that, I'll end. Thank you.

21           CHAIRMAN JACZKO: Thank you for those presentations. We'll,  
22 again, start with Commissioner Magwood.

23           COMMISSIONER MAGWOOD: Thank you Mr. Chairman. I want  
24 to start with Dr. Banerjee. I recognize that there is more than one panel here, I'll,

1 just for convenience, start with you and move on from there.

2           In the staff presentation, there was an interesting phrase which I  
3 should have marked, so give me a moment to recover it here, that I found -- that I  
4 think reflects your thinking as well, regarding leaks before break. And I believe  
5 next time I will bring tabs to mark these things. There's too much paper here.  
6 Oh, let's see. The phrase, I believe, was, -- it has disappeared on me -- in any  
7 event as I recall, the phrase said something to the degree that leak-before-break  
8 damage is not just the primary systems but also the recovery systems at the  
9 same time; therefore, the staff doesn't recommend using it. And you've reflected  
10 that sort of thinking as well. And, as you said, it's a zombie that never seems to  
11 completely vanish from the scene, but, as you've heard in the previous panel, our  
12 industry colleagues have come before the Commission once again and  
13 presented this as a potential solution.

14           What are we not saying to each other? What, in your view, as an  
15 independent observer of all of this, do you think is not being made clear to one  
16 side or the other? Can you -- would you like to take an attempt to characterize  
17 how we've managed not to bring that particular aspect of this issue to closure?

18           DR. BANERJEE: I'll try to reflect the ACRS view rather than my  
19 view on this, which, I think, is -- I'll try to be accurate. What the concern is, is that  
20 if you completely eliminate the large-break LOCA and you have no mitigation,  
21 then you've got quite a serious problem. So, what we have always  
22 recommended, that even under 50.46(a), that, you know, you can bring definitely  
23 different systems and maybe not safety-grade systems. So, those could be used  
24 to mitigate a large-break LOCA. And that's really the view that we have, that

1 those systems then should be shown to be able to mitigate the large-break  
2 LOCA. You shouldn't completely not consider it. Whereas this leak-before-break  
3 thing would allow you just to eliminate it from consideration. I think that's where  
4 we disagree. You still want to be able to mitigate it in some way.

5           COMMISSIONER MAGWOOD: Thank you. I want to sort of give  
6 this -- pass the same question to you, Bill, and Eric, if you'll just care to opine as  
7 to how -- why we're still talking about leak-before-break. The staff has been very  
8 clear, and you've heard that there's still some hope in the industry that you'll  
9 come around to another view on this. Is there something that we're not  
10 understanding about this issue as to why this keeps coming up?

11           MR. LEEDS: Yeah, I'll take a crack at it, Commissioner. In the  
12 absence of defined data, in the absence of some sort of assurance about what  
13 could possibly happen, the staff always goes to some basic safety principles that  
14 we hang onto, and that's diversity, redundancy, and defense in depth. And,  
15 unless we have that assurance that we have data, if we can't go have a model  
16 that's been verified, if we don't have that background, we're always going to go  
17 back to our core principles -- and that's defense in depth, we're going to hang  
18 onto it.

19           COMMISSIONER MAGWOOD: Leak-before-break has been used  
20 in other instances, and in previous briefings, you've talked about that. I believe in  
21 the previous briefing on the subject, we talked about whether there's an  
22 inconsistency between the previous application, Leak-Before-Break, and using it  
23 in this particular instance. But, in your view, besides the philosophical aspects of  
24 it, is this something that you believe can be captured more in, I guess I would just

1 put it --in a more calculated approach with a PRA basis? I mean, how -- I have  
2 never seen a discussion about Leak-Before-Break in a PRA context. I mean, is  
3 this something you can talk about in that context?

4 MR. LEEDS: Interesting question. Bill, you want to --

5 MR. RULAND: Leak-Before-Break, and we do have our Leak-  
6 Before-Break specialists here with us today, is a deterministic evaluation that  
7 licensees perform. We chose to recommend the 50.46(a) route rather than Leak-  
8 Before-Break because of what we believe is the regulatory consistency and the  
9 rather extensive review that was performed by a number of ACRS committees,  
10 several commissions, and literally since 2003, a number of staff have been  
11 participating in a 50.46(a) rulemaking development. So, it's at least our view that  
12 the way to risk-inform the ECCS acceptance criteria is precisely the way that  
13 we've arrived at from 2003 going forward.

14 It's --well, Leak-Before-Break has some appeal to it. When the  
15 Commission issued the statements of consideration, it acknowledged that there  
16 was an inconsistency with the way it was treating it, so it's our view, at this  
17 juncture, for us to really return to regulatory coherence, to use, if the Commission  
18 approves, to use the regulatory assessment that, really, over this long period,  
19 has been arrived at. It so happens, because it's taken us awhile, that the timing  
20 is now right -- well, it would actually be right if a 50.46(a) decision had already  
21 been made. But, it's much better than it has been, and so, that's why we  
22 recommended it. I'm not sure I answered your question.

23 COMMISSIONER MAGWOOD: No, you know, that was very  
24 helpful. Let me sort of take off from that point. The staff recommendation



1 includes both a deterministic approach upfront on the small breaks, and then  
2 later, a more risk-informed approach for larger pipes down the road. What -- you  
3 haven't quite talked about the possibility of shifting the entire discussion to the  
4 risk-informed approach, and essentially waiting until 50.46(a) is available,  
5 assuming we go down that path, what extra risk do you think comes into play  
6 where we would make that kind of approach and simply wait until that was  
7 available to the licensees, whether they use it or not, make it available, and then  
8 go forward?

9 MR. RULAND: Let me give a part-answer to that, and then maybe  
10 the risk folks can supply some additional information. The current staff  
11 recommendation is based on the notion that below the transition break size,  
12 50.46(a) would not provide any relief for licensees, so it wouldn't matter,  
13 regardless of what the decision -- at least, based on the proposed rule --  
14 regardless of what the decision was for the Commission, the small breaks would  
15 still need to be addressed. And that's why we've made the recommendation not  
16 to be a risk-informed approach for the small breaks. But the large breaks could  
17 wait until this Commission decision is made on 50.46(a), so that's why we took  
18 the two different approaches.

19 What the industry is proposing is to use what they're calling a  
20 holistic approach, which includes Leak-Before-Break, and it's a different cutoff for  
21 Leak-Before-Break; it's not the transition break size. And the transition break  
22 size, as it's currently envisioned, was developed by an expert elicitation process  
23 that also included uncertainty in that process. And that's why those sizes for the  
24 leak-before-break -- excuse me -- for the transition break size were picked, so

1 the staff gravitated toward -- there's an awful lot of technical work by a lot of fine  
2 experts to come up with that number, and we really weren't in a position to  
3 challenge that.

4 COMMISSIONER MAGWOOD: Thank you. That's very helpful.  
5 I'd like to follow up with you on that later on that actually.

6 Eric, I just wanted to give you a chance to respond to David  
7 Lochbaum's concerns about the concept that the staff's not integrating all the  
8 risk- factors associated with GSI-191. It looks like Bill wants to jump on this. Bill,  
9 please.

10 MR. BORCHARDT: Yeah, just because we -- it's a very interesting  
11 idea. We haven't really explored it very much in depth. So I think it's something  
12 we'll take a look at. I think it's difficult; the answer doesn't come to me  
13 immediately as being something that would be practical to do for 104 units  
14 because every unit would be a unique evaluation, and I think there's some  
15 benefit in the construct of the ROP that there's transparency and predictability,  
16 and it's relatively easy to understand for the most part. This would make it much  
17 more difficult, I think, to explain the differences. We'll certainly take a look at it,  
18 but we haven't done anything substantive to date.

19 COMMISSIONER MAGWOOD: Thank you. Mr. Chairman, it might  
20 be worthwhile on the SRM to just include a note to ask the staff to just give some  
21 further thought to this and give us some feedback. I know my time is up, but I  
22 just wanted to indicate that I might be offering a COM sometime in the near  
23 future to change the name of this issue from GSI-191 to MSI-101 which stands  
24 for Mike Scott Sump Issue 01.

1 [laughter]

2 CHAIRMAN JACZKO: The great irony here, though, is that Mike  
3 Scott is leaving the GSI-191, so it would be -- would have to have a new name.  
4 Then I guess it would change again.

5 COMMISSIONER MAGWOOD: Well, Mr. Chairman, my entire  
6 purpose is to make sure that Mike's contributions to this issue over a very lengthy  
7 period of time, that it should never go unrecognized, it should never be forgotten,  
8 so that, you know, 40 years from now, when this issue is still being debated --

9 [laughter]

10 -- people will know that Mike Scott was the person that was in the  
11 middle of it when it was going on.

12 CHAIRMAN JACZKO: I would say that, as a fellow follicly  
13 challenged individual, I can say he probably had a full head of hair when he  
14 started.

15 [laughter]

16 MR. SCOTT: I can't think of anything to say. I really -- my heart is  
17 broken to leave all of this.

18 [laughter]

19 MR. RULAND: Commissioner, we won't let him forget, believe me.

20 [laughter]

21 COMMISSIONER MAGWOOD: Mike, thank you very much for  
22 your contributions here. It's been very impressive. You were among the first  
23 staff people I've had a chance to spend a lot of time with, and you set a very high  
24 bar for the others. So, thanks again for your contribution.

1 MR. SCOTT: Thank you, I appreciate the kind words. Thanks.

2 CHAIRMAN JACZKO: Commissioner Ostendorff.

3 COMMISSIONER OSTENDORFF: Thanks Mr. Chairman. I want  
4 to start out by thanking Mike, adding to Commissioner Magwood, thank you for  
5 your service on this issue and for the work of you and your team on the SECY  
6 paper and all of the background work. And I also wanted to thank Sanjoy for the  
7 ACRS contributions and your letter and your review of this issue in a timely  
8 manner.

9 I want to start out, Mike, back with you, if I could, and I wanted to  
10 follow up on a comment in the exchange earlier on between -- that Commissioner  
11 Apostolakis had. And I just wanted to better understand the regulatory space  
12 and the history as to where we are with respect to the compliance issue. And I  
13 wanted to recognize in these plants the existing fleet has a licensing basis and  
14 that there have been changes made to the sump strainers and so forth, and  
15 recognizing that the in-vessel affects is to be resolved at some future point based  
16 on what I've heard so far. I wanted to get a -- just maybe a little bit more in-depth  
17 explanation as to the background for us being in compliance space from earlier  
18 comments made and to see, does that represent a universal view among the  
19 staff.

20 MR. SCOTT: The rule in question here is 10 CFR 50.46(b)5, which  
21 is the long-term core cooling ECCS rule. And when Generic Letter 0402 was  
22 issued, the evaluation was done at that time of what the backfit implications per  
23 50.109 were, and the staff concluded that, in fact, this was a compliance issue, a  
24 compliance issue with an important safety-related rule, and it was pursued on

1 that basis.

2           When we took a look at this again in response to the recent SRM  
3 on the subject, we went back to the CRGR to sort of re-baseline with them where  
4 we were on this issue, and we carried it in as a compliance issue, and we also  
5 thought it was an adequate protection issue, too, because of the importance of  
6 the rule. And the CRGR recommendation was that the staff should focus on the  
7 compliance aspect of it because it was clearly a compliance issue, and we have  
8 therefore gone on that basis. So, it is compliance because there is this rule that  
9 the licensees, of course, need to show adequate core cooling. We believe it is,  
10 as I said, it is a safety issue as well. Was that what you were looking for? Did I  
11 answer your question? Doesn't look like it.

12           COMMISSIONER OSTENDORFF: Well, I'm just trying to -- is it  
13 required, as part of the principle of defense-in-depth, is that -- we're trying to go  
14 to the -- there's a justification for continued operation that the staff recommended  
15 a few years back. And so, I'm not saying it's a black-and-white issue, but at one  
16 point in time, there was at least a discussion that, well, we're okay for this period  
17 of time going forward until resolution of certain issues. And so, I'm trying to  
18 understand the difference between justification for continued operation pending  
19 resolution of certain issues, and that we are definitely in compliance in a  
20 compliance space issue for this topic.

21           MR. SCOTT: Well, let me try it from another perspective. This is  
22 one of those issues that fits in, you might say, in the middle somewhere. It is of  
23 sufficient importance that we need to resolve it. It is a safety issue for the  
24 reasons we described. On the other hand, because of the low-frequency

1 initiating event, the changes that have been made since 2004 to reduce the  
2 vulnerability of the plants to the issue, the presence of the beyond-design basis  
3 compensatory measures, the staff has taken the view throughout this process  
4 that we need -- and I have seen this with the industry -- that we need to focus on  
5 getting the problem fixed. Now, at the time in 2004, and later, the problem was  
6 not as significant -- or we didn't know as significant as it turned out to be because  
7 of the existence of chemical effects that wasn't widely known at that time, the in-  
8 vessel affects issue.

9           So, the situation has constantly changed, but our view has not  
10 changed because, basically, we have made the problem better, and the  
11 licensees have reduced the significance of the problem, but there's more work to  
12 go. It fits in the space of we are concerned about it, it is a safety issue, and we  
13 need to resolve it, but we don't think it poses a shut-the-plants-down-now type  
14 issue.

15           MR. BORCHARDT: Commissioner, if I can try this, maybe a  
16 separate example, but it kind of illustrates the regulatory construct that we  
17 operate under. Technical specifications lay out a number of operational  
18 requirements about system operability. We do not require a plant to shut down  
19 the instant that it fails to meet one of those requirements. There's a limiting  
20 condition for operation. There's some time period for them to fix that. Similarly,  
21 on a more grand scale perhaps, this issue identified a failure to comply with a  
22 regulatory requirement, yet we did not require the plants to shut down. Because  
23 of the low probability of the event and other actions that were being taken, we  
24 thought it was justified to allow the plant to continue to operate, and we still

1 believe it's justified.

2 COMMISSIONER OSTENDORFF: Thank you. But, let me go to  
3 another question then. Mike, I'm staying with you. With respect to your Slide 3,  
4 you talked about the tolerance of nuclear fuels and debris appears to be limited,  
5 and you used, I think, your example, a three-inch or a small pipe break in having  
6 problematic head loss based on a 1/32 of an inch-thin bed layer, I believe, on the  
7 fuel. Was that correct? Is that the example you're looking at?

8 MR. SCOTT: In the case of that three-inch reference, that was a  
9 three-inch break for a given -- for a particular plant could cause the strainer, or  
10 the ECCS strainer, to clog, and it wasn't referring directly to in-vessel effects.

11 COMMISSIONER OSTENDORFF: Okay, I'm trying to get a feel  
12 for, again, the small pipe arena here for what is a range of values of clogging of  
13 the coolant channels and the core that would be associated with the debris that is  
14 accepted to be the level beyond which you do not have adequate core decay  
15 heat removal.

16 MR. SCOTT: Well, the testing that has been done has been  
17 designed to show that in the presence of what would be expected to pass  
18 through the strainer and get downstream, the core would be adequately cooled.  
19 As Dr. Shahkarami mentioned, the test that's been done is one fuel assembly in  
20 a test rig. There is no credit taken for potential bypass flows because it has not  
21 been demonstrated that that bypass passage would not itself be clogged. So,  
22 that's been the focus, has been to show that in that one assembly that develops  
23 a certain amount of clogging in the grids, that it's okay; an adequate flow still  
24 occurs through the core.

1           And what the testing found is that, above a certain amount of  
2 incident debris, that enough debris builds up on the grids of the fuel assembly --  
3 and it may be the bottom grid, it may be higher up, it may be a combination --  
4 then the flow drops too low, and there's not adequate thermal driving head to  
5 keep the core cool, again, neglecting these other possible flow paths that the  
6 industry would like to take credit for but have not sought credit for. That's the  
7 way the testing was directed, so clearly if you look at the situation of testing one  
8 assembly at a time, it potentially is a problem here, and depending on the design  
9 of the assembly it may not take too much of this material, and one number that  
10 was considered was 15 grams of fiber per assembly which isn't a whole lot.

11           COMMISSIONER OSTENDORFF: Okay, let me ask one last  
12 question then. You know, I'll direct it to Mike, but others please feel free to chime  
13 in, Sanjoy as well. With respect to the Option 2, including use of the existing NEI  
14 04-07 paper and/or 50.46(a) risk-informed principles, if that is adopted by the  
15 Commission, and appreciated Mike that you gave a couple examples of where  
16 the 50.46(a) might provide an alternative approach. Do you see that 50.46(a), as  
17 it is in draft form, recognizing that it's not approved, do you foresee any problems  
18 in applications of that proposed rule to the GSI-191 issues?

19           MR. SCOTT: The challenge will be that -- what the licensees would  
20 really like to have happen here is have the implementation of that rule result in  
21 reductions in the amount of debris generated and transported, or assumed to  
22 generate and transport, and we have already started looking at how that would  
23 play out using the draft rule as a template for where we are today, where we  
24 might be if the Commission issues that rule. And this is a complex problem, and



1 again, we don't have the modeling to help us out.

2           So the question is, can we reach a middle ground, as it were, on  
3 what would be the amount of debris under relaxed assumptions that would be  
4 assumed to be generated and transported? Do we approach the ZOI testing  
5 from a different perspective? Is the standard of evidence perhaps less? We  
6 haven't sorted all that out yet, that's what we're trying to think about and get the  
7 industry to think about now. And, I think that's what they're worried about, is that  
8 at the end of the day they may not get much of a reduction in the rigor of how we  
9 would look at debris generation transport assumptions. And, it will be  
10 challenging, and I think we said that in the SECY paper.

11           COMMISSIONER OSTENDORFF: Sanjoy, do you have anything  
12 you want to add to that?

13           DR. BANERJEE: I think Mike makes a right point about debris  
14 generation and transport. Trying to get that down is like trying to swim uphill; it's  
15 pretty tough, I think, in view of the evidence. The advantages you might get  
16 though are, you can use non safety grade equipment to mitigate the accident, a  
17 large break LOCA. And, that, I don't know how much we have thought through  
18 that, but clearly there are advantages there.

19           COMMISSIONER OSTENDORFF: Okay. Yes, Bill, yes.

20           MR. RULAND: In addition, as one example that Mike had already  
21 mentioned was back flush capability that licensees could take credit for non-  
22 safety equipment that wouldn't have to be single failure proof for back flush  
23 capability and what was also mentioned was refilling the water storage tank, that  
24 is something licensees could take advantage of to reduce the amount of time, the

1 amount of injection that we have. Of course, licensees would have to examine  
2 that, what is that additional -- you know, what's the effect of the additional water  
3 in containment. But, those are examples where the kind of ZOI questions about  
4 what is a relaxed set of assumptions, at least at this juncture, doesn't seem as  
5 problematic.

6 COMMISSIONER OSTENDORFF: Okay, thank you all.

7 CHAIRMAN JACZKO: Commissioner Svinicki?

8 COMMISSIONER SVINICKI: I'd like to join in thanking you for the  
9 presentations, and both Mr. Roland, and Mr. Scott, I know you also represent a  
10 lot of folks in NRR and Research that have worked hard on this issue, so I thank  
11 both of you and all of the other contributors are colleagues on this as well.

12 Dr. Banerjee, I appreciate as well, the ACRS taking a look at this,  
13 and today you tried to represent both the artistic and literary aspirations of the  
14 ACRS, but I think Mr. Roland has you beat by a country mile. I don't turn of  
15 phrase you were looking for, but actually Bill in answer to one of your questions,  
16 he used this, and this is going to be speech title, I promise, for me. Bill said we're  
17 going to have a return to regulatory coherence, and he said - - now, I'm not going  
18 to ask you when it is exactly we entered incoherence because I'm afraid of your  
19 answer --

20 [laughter]

21 MR. RULAND: Thank you.

22 COMMISSIONER SVINICKI: But then, Dr. Banerjee surprised me  
23 because just now, to Commissioner Ostendorff's last question he said, "We're  
24 trying to swim uphill," and that sounds difficult indeed to try and swim uphill, so

1 thank you, really seriously on both panels the Q and A was really informative.

2 I just have one question and maybe none of you will have any  
3 familiarity with this, but I was wondering if international ways that other regulators  
4 or operators in other countries have addressed this particular issue would be  
5 helpful or have we looked at anything. And I am told that in one country there is  
6 reliance or credit is taken for operators alternating flow so that you could  
7 essentially kind of back flush the clogged strainers, and so again, this is history  
8 perhaps people have already covered, but is there anyone who could talk about  
9 is there anything interesting internationally in addressing this issue?

10 MR. SCOTT: I'd be happy to address that. As it happens, the  
11 country that I know of that does it just the way you said now is Germany.  
12 German PWRs are somewhat different from ours. For example, they don't have  
13 a sump buffer. They have chosen to go the back flush route and demonstrate  
14 that it works.

15 Now, the downside to the back flush, of course, is that when you  
16 back flush you clean off the strainer, and then that allows more materials to go  
17 downstream to the core until you reestablish the debris bed, and then when you  
18 blow it down again then you have the same problem. So, what they found was --  
19 and we met with them just this past May and had a technical exchange with the  
20 German regulators over there -- what they did is they made the holes much  
21 smaller, they had their licensees remove the strainers that had already been put  
22 in and put in new strainers with like an order of magnitude smaller holes to  
23 minimize -- it turns out that even if you keep the flow area pretty constant, if you  
24 make it a lot more small holes than a fewer larger holes, it makes a difference to

1 the fine debris that could get down to the core.

2           So they ended up re-modifying having made the mods, they made  
3 them again to attempt to address the downstream issue while also allowing the  
4 back flush to keep the strainer clean. And that kind of approach would potentially  
5 be successful here if the heavy lifting is done to evaluate and show that it works.  
6 So we have had technical exchanges with the Germans, the Belgians, the  
7 Spanish, the Japanese, Taiwan, a number of places to learn what they're doing,  
8 and often they look to us because of our greater resources than some of them  
9 have. I would say that it's accurate that it's not done the same in any one  
10 country, and also it would be accurate to say that the strainer designs and the  
11 insulation designs are not the same.

12           Another example is that the Germans use mineral wool a lot, and  
13 that's almost not used in the United States. So there's some apple and oranges  
14 aspects to it, but we do talk with our counterparts to try to get ideas from them  
15 and give them good ideas where we have them to try to get to the end of this  
16 because it's, of course, been challenging everywhere.

17           COMMISSIONER SVINICKI: Thank you. Did anyone else want to  
18 --

19           MR. BORCHARDT: There's a very strong international component  
20 of this. If my memory is correct, this all started with the Barsevick event which  
21 was in Sweden, at a boiling water reactor, that's the very genesis of all this, and  
22 there's been an extensive amount of international cooperation and exchange. I  
23 think the in-vessel issue really originated - - the recognition that it was an issue  
24 overseas we took that on-board and built upon the work that's being done. And,

1 there's a number of countries that had discussions in recent weeks, nations are  
2 looking very closely at how we resolve this as strong indicator for how they'll  
3 move in the future.

4 COMMISSIONER SVINICKI: Thank you, that's very helpful. Thank  
5 you, Mr. Chairman.

6 COMMISSIONER APOSTOLAKIS: Sanjoy, you said that you  
7 would like to see, or the ACRS would like to see a more explicit schedule. Now,  
8 as I recall, the staff writes for the smaller than TBS breaks they would give two  
9 cycles and then an extra cycle for beyond TBS. How much more specific do you  
10 want it to be?

11 DR. BANERJEE: No, that's fine. That's Option 1.b. With 2, the  
12 schedule is not explicit. If you go and adopt 2 without 1.b --

13 COMMISSIONER APOSTOLAKIS: Ah, I see.

14 DR. BANERJEE: Because you can do sort of a mix and match.  
15 Though, if you talk to the staff, they will say they see it coupled in some sense so  
16 that you automatically set in option, I mean, a schedule. But with 2, it seems  
17 pretty open to us.

18 COMMISSIONER APOSTOLAKIS: But if you take two in isolation  
19 of the others, then you would need some --

20 DR. BANERJEE: And you could potentially take two in isolation.

21 COMMISSIONER APOSTOLAKIS: Although the staff does  
22 recommend 1.b and 2, right?

23 DR. BANERJEE: That is correct.

24 COMMISSIONER APOSTOLAKIS: Okay. Thank you.

1 DR. BANERJEE: That's what we meant.

2 COMMISSIONER APOSTOLAKIS: I am still perplexed, I must say,  
3 about this GDC 4. You -- my impression is you really don't like it --

4 [laughter]

5 -- and yet Mr. Halpin here says that he still hopes it will be on the  
6 table. I mean, Mike, do you think there is hope?

7 MR. SCOTT: I think that the staff has stated strong views on the  
8 subject in the SECY paper and here today. I would be skeptical that we're going  
9 to modify our position on that. If new information is presented, of course, we'll  
10 listen to it, and if the Commission directs us in that regard, obviously, we will go  
11 in that direction. I think it's a tough pull to be able to change our minds on this.  
12 We feel strongly about it.

13 COMMISSIONER APOSTOLAKIS: So you're not as optimistic as  
14 Mr. Halpin.

15 MR. SCOTT: No.

16 COMMISSIONER APOSTOLAKIS: No. Regarding the SRM item  
17 that Commissioner Magwood recommended, I was debating with myself whether  
18 that would be a good idea, but I would support it. But I think it's going to be one  
19 of the most difficult ones to phrase because we're talking -- we may be talking  
20 about risks that might be averted if somebody had taken certain action. And I --  
21 we have never dealt with anything like that. Usually, we deal with risks that we  
22 quantify and the way the plant is, so that would be an interesting one. I mean, it  
23 may take a long time to actually satisfactorily phrase it, but I want to finish by  
24 congratulating the staff for the quality of the documents you sent up. I really

1 enjoyed -- well, enjoyed isn't the right word --

2 [laughter]

3 -- reading them, I liked the historical perspective you gave and  
4 arguments you gave , it was a pleasure reading them. So I congratulate you for  
5 that.

6 MR. SCOTT: That was a huge team effort. There are probably 20  
7 people or more in the room right now who because --

8 COMMISSIONER APOSTOLAKIS: That's why I praise you,  
9 Michael, like other people did --

10 [laughter]

11 -- and with that, Mr. Chairman, back to you.

12 CHAIRMAN JACZKO: Well, thank you. I just have a couple of  
13 questions mostly having to do with the downstream effects and the timing for  
14 resolution. If I understand the staff position, the staff would essentially -- well,  
15 maybe I'll preface it to say how I understand it.

16 I guess -- as I understand the issue, there's basically three factors.  
17 There's what small break LOCAs could contribute. There's what large break  
18 LOCAs can contribute, and then there's what -- then there's -- I'll say it this way --  
19 there's three factors that can determine whether or not we have a problem: small  
20 break LOCAs, large break LOCAs, and then in-vessel effects. And in each  
21 situation, the biggest issue is debris generation and debris getting into the sump  
22 or getting into the core.

23 And each one of those could be the limiting factor. The core could  
24 determine how much debris you can allow and therefore how much insulation

1 you need to remove. The small break LOCA could determine how much debris  
2 you can allow and then how much insulation you need to move, or the large  
3 break. It seems, as I understand the staff position, the staff is comfortable with  
4 the small break LOCA actions going forward on an earlier schedule than the  
5 large break LOCAs, so it's not clear to me why the staff is not comfortable with  
6 the small break LOCAs going forward absent resolution of the in-vessel effects.  
7 Does that make sense? I may be confused myself and then so I can't ask a  
8 coherent question.

9 MR. SCOTT: No, I understand your question. We can do that. We  
10 can, of course, do that. The issue is that if you pursue the small breaks and you  
11 arrive at, okay, I need to remove or replace "x" amount of insulation, just from  
12 small break strainer testing, and then the in-vessel issue is subsequently  
13 resolved and you find out that you couldn't even live with that much insulation,  
14 then you're going to be round two of modifications. Now, that's doable. It's not  
15 that it can't be done.

16 CHAIRMAN JACZKO: Isn't that what the staff's proposing, though,  
17 with the large break as well, that the large break would be in Outage No. 3, so  
18 why is Outage No. 3 not okay to do the in-vessel effects then as well?

19 MR. SCOTT: It could be done that way.

20 CHAIRMAN JACZKO: Okay.

21 MR. SCOTT: There's no reason why it couldn't. The thought was  
22 that we had this unexpected development occur within the last two weeks, and  
23 the Owners Group is confident that within a few weeks they're going to have a  
24 clear path forward. Maybe, maybe not. Again, there has been history of GSI-



1 191 that suggests that optimistic expectations are not always met, but maybe  
2 they can provide a clear path forward that then would allow us to say -- because  
3 we have a draft safety evaluation, and we're close, but this has to be resolved,  
4 this unexpected test result, and it could take a while. So our thought was, let's  
5 just wait a few weeks and see if there's going to be better visibility on that, and  
6 there may or there may not be.

7 CHAIRMAN JACZKO: Okay.

8 MR. SCOTT: But it's all -- it could be done as you said, one at a  
9 time, and the effect would tend to be cumulative. And it's possible that by the  
10 time all that's sorted out, licensees wouldn't have actually done the first set of  
11 mods anyhow, so it might all come back together at the end as one, you know,  
12 set of modifications to be made. I can't predict for sure, but that was the thought.

13 CHAIRMAN JACZKO: So fundamentally, though, the staff doesn't  
14 believe that the small break LOCA fixes could exacerbate the in-vessel effects?

15 MR. SCOTT: Not likely.

16 CHAIRMAN JACZKO: Not likely.

17 MR. SCOTT: Again, it's GSI-191, I'm reluctant to go too far out on  
18 a limb about things that have not yet been observed yet, but again, partly  
19 because we don't understand what happened with this in-vessel test. But it's  
20 likely -- to put it another way, it's likely that a modification that would address the  
21 small break issue would go a ways towards or potentially all the way towards  
22 addressing the downstream effects issue, too.

23 CHAIRMAN JACZKO: And I appreciate that, and that was largely  
24 my understanding, which is why I think I was a little bit surprised to hear, but it

1 sounds like what you're talking about is, let's wait a couple of weeks to see what  
2 comes out. It's not necessarily we have to wait two or three years until all the in-  
3 vessel effects --

4 MR. SCOTT: Correct. We want to catch our breaths from the  
5 latest unexpected result.

6 CHAIRMAN JACZKO: Well, I appreciate that and certainly if the  
7 staff has more information, as you get that in the next three weeks, it's probably  
8 good to send that up to the Commissioners because we're deliberating on the  
9 paper.

10 MR. SCOTT: We'll keep you informed.

11 CHAIRMAN JACZKO: It's very interesting, because this issue  
12 seems very much where we were a couple years ago with the strainer  
13 enhancements. I think that, at the time, there was also a similar concern with  
14 ACRS that by installing larger strainers you had the potential to allow more debris  
15 into the core, and I think at the time the staff's view was fundamentally, let's  
16 install larger strainers because it's going to at least address the strainer issues  
17 and we'll eventually deal with the in-vessel effects. It sounds like to some extent  
18 we're not necessarily in a different situation than we were when we went ahead  
19 with the larger strainers.

20 MR. SCOTT: I would say that two years ago we didn't -- or three  
21 years ago anyhow, we didn't think that in-vessel, and you could probably find a  
22 quote from me somewhere that I didn't think that in-vessel effects would be the  
23 long pole in the tent.

24 CHAIRMAN JACZKO: Yeah.

1 MR. SCOTT: Yet it turned out to be.

2 CHAIRMAN JACZKO: Yeah, yeah.

3 MR. SCOTT: So there were expectations that were not met, and  
4 this issue, you know, it's the Hydra that Dr. Banerjee talked about, and it's been  
5 this way. It's been very challenging because we work off assumptions based on  
6 some information, test results, sometimes modeling work, and we work up  
7 assumptions about how it's going to play out, and then it just doesn't, often as  
8 not.

9 CHAIRMAN JACZKO: Well, again, I want to echo the comments of  
10 everyone else on the thorough work that the staff has done on this issue, and I  
11 appreciate your -- and ACRS as well, and I appreciate ACRS putting together a  
12 meeting I think in a very short time for them, reviewing the staff papers so that we  
13 would have the benefit of their views for this meeting. So I certainly thank you for  
14 that as well. I think it's been very helpful for us to have, as well as the  
15 stakeholders that were here. It sounds like -- obviously, the Commission has the  
16 paper in front of us. Largely, I think the issues related to GSI-191 can be dealt  
17 with in that paper. It sounds like we have one issue for the SRM.

18 I would suggest perhaps maybe a unique way of doing this that  
19 perhaps Commissioner Apostolakis and Commissioner Magwood, if you wanted  
20 to get together and try and draft some language and let that be the basis of the  
21 SRM, and then we'll go forward and see if that would work. Otherwise, SECY, I  
22 think, would largely -- I'm perhaps at a loss of what the language should be, so I  
23 would certainly suggest maybe we pursue it that way rather than having SECY  
24 try to take a stab at it unless, Annette you want to.

1 MS. VIETTI-COOK: I can read what David Lochbaum said.

2 CHAIRMAN JACZKO: Well, again, and unless there's objection, I  
3 propose that we do it that way and --

4 COMMISSIONER APOSTOLAKIS: Can I say something?

5 CHAIRMAN JACZKO: Sure, of course.

6 COMMISSIONER APOSTOLAKIS: This particular proposal  
7 regarding the integrated decision-making process is not really unique to GSI-191,  
8 and it might take some time to formulate an SRM. So an alternative path would  
9 be to do it separately.

10 CHAIRMAN JACZKO: As a perhaps a COM?.

11 COMMISSIONER APOSTOLAKIS: As a COM maybe.

12 CHAIRMAN JACZKO: Commissioner Magwood is that something  
13 you'd be okay with?

14 COMMISSIONER MAGWOOD: Yeah, I'm open to that.

15 COMMISSIONER APOSTOLAKIS: Because I think it's going to  
16 delay this particular resolution, not that it matters after 30 years, but you know --

17 [laughter]

18 CHAIRMAN JACZKO: I want to be done with GSI-191. I can't --

19 COMMISSIONER APOSTOLAKIS: So maybe we can do that, and  
20 maybe Commissioner Magwood and I can have a COM and address that  
21 separately.

22 CHAIRMAN JACZKO: I mean, I defer to you.

23 COMMISSIONER MAGWOOD: I think that's a good idea. We'll  
24 pursue it in that fashion.

1                   CHAIRMAN JACZKO: Well, again, I want to thank everybody for a  
2 very enjoyable meeting. Thanks.

3

4                   [Whereupon, the proceedings were concluded]