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MEETING WITH THE ADVISORY COMMITTEE ON REACTOR SAFEGUARDS (ACRS)

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TRANSCRIPT OF PROCEEDINGS

Public Meeting

Before the U.S. Nuclear Regulatory Commission:

Allison M. Macfarlane, Chairman

Kristine L. Svinicki, Commissioner

George Apostolakis, Commissioner

William D. Magwood, IV, Commissioner

William C. Ostendorff, Commissioner

APPEARANCES

ACRS Members:

Dr. Sam Armijo
Chairman

Mr. John W. Stetkar
Vice Chairman

Dr. Michael T. Ryan

Dr. Stephen P. Schultz

P R O C E E D I N G S

CHAIRMAN MACFARLANE: Okay. All right, so this morning, the Commission will be briefed by the Advisory Committee on Reactor Safeguards. And I'd like to start off by thanking the committee members for their service. We very much appreciate all your insights, and I know that you are quite a revered body here at the NRC. The committee represents an impressive array of knowledge and experience, which they bring to bear in advising the Commission on the important issues before us. Today we are going to begin with Dr. Sam Armijo, the ACRS chairman, providing an overview of the activities on the committee since our last meeting with the ACRS that occurred in June of 2012. That will be followed by discussion of the revision of the regulations at 10-CFR Part 20, for conformance with the International Commission on Radiological Protection by Dr. Michael Ryan.

Next, we'll hear from Dr. Steven Schultz on the topic of filtered containment vents for Mark I and Mark II BWR containments. And finally, we will briefed by ACRS vice chairman, Mr. John Stetkar on the topic of economic consequences. So I really look forward to all your thoughts on these topics, and for a thought-provoking discussion. But first, let me turn to my fellow Commissioners to see if anybody has opening remarks. No? Okay, great. So then, I will turn directly over to you, Dr. Armijo.

DR. ARMIJO: Thank you, Madam Chairman, and good morning. Lets' see if we can get our first slides up. There we are. Next slide, and next slide. Since our last meeting with the Commission on June 7, 2012, we have issued 19 reports on the following topics. SECY-12-0064, recommendations for policy and technical direction to revise radiation protection regulations and

guidance, Dr. Ryan will provide more detail on this topic later in this meeting. Next slide.

We have reviewed a draft SECY paper on consideration of additional requirements for containment venting systems for containment venting systems for boiling water reactors with Mark I and Mark II containment designs, and Dr. Schultz will provide a detailed briefing as well.

We've reviewed the NRC staff's draft plans and status summaries for Tier 3, Japan Lessons Learned Recommendations. Next slide. Draft interim staff guidance documents in support of Tier 1 orders. In this particular report the staff responded positively to our recommendations with the exception of recommendations related to the resolution capabilities of the spent fuel pool water level instrumentation and our recommendation for the additional requirement for pool temperature measurement capability. With that -- those exceptions -- in view of those exceptions, we've responded to the August 15, 2012, EDO letter regarding our recommendations, and we continue to recommend those improved capabilities. We understand that the differences between the staff's views and ours are related to their understanding of the Commission's directions. Our understanding is different, so perhaps you may want to look at that again. Next slide.

We've reviewed SECY-12-0110, consideration of economic consequences within the U.S. Nuclear Regulatory Commission's regulatory framework, and Mr. John Stetkar will present more details later. We've reviewed Chapters 5, 8, 10, 11, 12, of the safety evaluation report with open items for the Comanche Peak Nuclear Power Plant Units 3 and 4, US-APWR reference combined license application. Next.

We've reviewed Chapter 9 of the safety evaluation report with open items for the US-APWR design certification application, and the long-term core cooling for the South Texas project advanced boiling water reactor combined license application. Next slide.

We've completed reviews of SECY-12-0081, risk-informed regulatory framework for new reactors. Draft final NUREG-1934, nuclear power plant fire modeling analysis guidelines, and Grand Gulf Nuclear Station Unit 1, extended power uprate license and request. Next slide.

Reporting on our reviews of the final safety evaluation report associated with the Florida Power and Light, St. Lucie Unit 1, license amendment request for an extend power uprate, as well as a final safety evaluation report associated with the Florida Power and Light, St. Lucie Unit 2 license amendment request for an extended power uprate. Next slide.

We have reviewed the staff's -- reviewed the safety evaluation of the WCAP-16793-NP revision two evaluation of long-term cooling, considering particulate fibers and chemical debris in the recirculating fluid and technical information needs affecting potential regulation of extended storage and transportation of spent nuclear fuel.

We've reported on the Interim Staff Guidance 8, Revision 3, burn up credit in the criticality safety analysis of PWR spent fuel and transportation and storage casks, and Draft Regulatory Guide DG-1290, proposed revision of Regulatory Guide 1.59, design basis floods for nuclear power plants. Finally, we've reviewed and reported on proposed revision one to Regulatory Guide 1.192, operation and maintenance code case acceptability ASME-OM code.

New plant activities include ongoing reviews of design certification -

- I'm sorry. Thank you. We're on the right slide. New plant activities include ongoing reviews of the design certification applications and safety evaluation reports associated with the U.S. EPR and the U.S. APWR designs. Adequacy of long-term core cooling approach for the U.S. APWR, reference combined license applications for ABWR, ESPWR, U.S. APWR, and U.S. EPR. And subsequent combined license applications for application for AP1000. Next slide.

Future license renewal activities include interim and final reviews to be performed for Grand Gulf, South Texas Project, Limerick, Davis Besse, and Callaway. Future power uprate activities will include reviews of extended power uprate applications for Crystal River 3, Brown's Ferry 1, 2 and 3, Monticello, and Peach Bottom 2 and 3. Next slide.

Other ongoing activities will include Fukushima longer-term efforts, for example the Recommendation 1, station blackout rule Tier 3 recommendations. Also, uncertainties in SOARCA analysis, Watts Bar 2 construction activities, fire modeling applications, Naval reactors, Gerald Ford Class, small modular reactors designed specific review standards, and other emerging technical issues. I want to close my presentation and turn time over to Dr. Ryan.

DR. RYAN: Thank you, Sam. Good morning Chairman and good morning Commissioners. I'm happy to talk to you today about the proposed revisions to NRC radiation protection requirements and guidance put forth in 10 CFR 20.

In SRM SECY-08-0197, the staff was directed to proceed with stakeholder interactions and data analysis to make NRC radiation protection requirements and guides more consistent with ICRP publication 103 in their 2007

recommendations. In SECY-12-0064, the staff presented the results of its analysis and requested guidance from the Commission on several issues, namely updating methodologies and terminologies and dose assessment, revising the limits for occupational total effective dose equivalent, revising the dose limit for the lens of the eye, revising the dose limit for exposure to the embryo fetus.

Staff recommendations also included a ALARA planning, protection of the environment, units of radiation exposure and dose, reporting of occupational exposure, and revisions of 10 CFR Part 50 Appendix I to make them consistent with the dose methodology in 10 CFR Part 20.

The experience to date is that there has been excellent compliance with the five Rem per year limit reported for reactor and fuel cycle facility workers. Compliance and issues -- compliance issues and challenges have been reported in some medical worker categories. Our recommendations focus on the rulemaking to revise occupational dose limits and that that rulemaking should not be undertaken. Improvements to dose calculation methods should be implemented as recommended by the staff.

Three, ALARA guidance should be improved for licensees that could benefit from additional ALARA practice. The staff should continue to work on alternative approaches for individual protection for those who are considered at or near the current limit. And dose limits for the lens of the eye and the embryo fetus should also -- efforts on that area should continue.

The reporting of occupational exposure by industry segments not currently reporting should be added to the database. The basis for the recommendations is -- for any change to the dose limits, should be based on a

clear safety benefit. And the current limits plus ALARA do provide adequate protection for the large majority of workers. My own view is that I've always considered a radiation exposure limit in addition to ALARA because ALARA is the activity that causes us to think about radiation exposure in the workplace and keep it as low as reasonably achievable. So that, to me, from a practitioner's standpoint is a very important part of radiation protection practice.

The reduction of dose limits could have unintended negative consequences, and could impede activities with real safety benefits. A little used clause is the "planned special exposure." Planned special exposures can be invoked to have occupational radiation exposure apart from the annual limit. So I wonder if by reducing the limit, we might stimulate the use of the planned special exposure category, which is a very rare thing in my practice to date. So that's something to think about. Is there going to be an unintended consequence there? So I'd be happy to provide details on that if you'd like. Well, with that, that is the essence of our letter and I think that's the essence of my comments. So thank you very much for your time and attention.

DR. SCHULTZ: We'll move to the next presentation. I'm going to present today on our review of the draft SECY paper on consideration of additional requirements for containment venting systems for BWR Mark I and Mark II designs. This is our major effort by the Fukushima subcommittee since we met in June. Next slide please.

If you recall, the subcommittee on Fukushima for the ACRS is a committee of the whole, so all of the ACRS members have participated in all of the meetings that we're about to discuss, and of course, in the letter writing process. Subcommittee meetings were held in June, discussions with the staff

through August, and met formally in September, and we had a meeting at the beginning of October and the end of October. The committee completed review as a full committee during the November meeting and then prepared the letter report in November, issued it to you so that you had that information in consideration of the staff's paper. Background, this process came forward with the staff requirements memorandum asking the staff to consider filtration of containment vents together with the Tier 1 issue of hardened vents for BWR Mark I and Mark II containments. The order, EA-12-050, was issued March 12, 2012. This was the order to examine the improvement to the venting systems, and the SECY paper on filtration events was then to be delivered to the Commission by the end of November 2012. And it was this draft SECY paper then that was reviewed by the Committee in early November and provided as input to you. Next slide please.

The order modifying the licenses with regard to reliable containment hardened vents was applicable as noted only to BWR facilities with Mark I and Mark II containment structures, and focused on the venting reliability only under design basis accident conditions. Therefore, in beginning the process of developing the SECY paper -- next slide please -- the staff prepared the following options.

The first was to continue with the implementation of that order, which was considered as the status quo. Second, to develop severe accident capable vents, that is, to upgrade and replace the option one venting design. Item three was to consider then the filtered vents, install filter venting system. And the fourth was a performance based approach to establish performance based criteria to be addressed by the licensees. Next slide please.

The high level points that frame our thinking on this project were that at Fukushima, failure to operate systems as designed added to release of radioactive materials. This is a very general statement, but it certainly applied as well to the operation or non-operation related to the venting systems. Because of relatively small volumes, venting is important to the severe accident management in Mark I and Mark II BWRs. Currently the filtration is provided by physical processes within these reactors. The suppressant pool and the drywell sprays particularly. Next slide please.

As we examine then how these processes work, we look at issues like under the station blackout conditions. Even under the B.5.b considerations or the FLEX proposals. Moving forward to provide additional equipment capability, drywell sprays can lose effectiveness, and as the suppression pool floods, operators will vent from the drywell. And without drywell sprays, this could lead to an unscrubbed release of radioactive aerosol. Next slide please.

As a result, the staff has developed a position concluding that improved filtering strategy can compensate for loss of containment barriers due to venting, for example, drywell flooding. So for particular tailored scenarios, this becomes important. Also, filtered venting -- additional filter -- filtration would improve confidence to depressurize containment when addressing other severe accident challenges. And as a result, would provide substantial improvement in containment performance.

The staff also concludes on the next slide that an improved filtering strategy would provide defense-in-depth, addressing uncertainties in severe accident prevention, progression, and mitigation, and would improve effectiveness of emergency planning and evacuation. And so the staff

recommended in the draft SECY the filtering vent strategy option three, adding filtered vents. And in addition, recommending option two, the capability of severe accident vending systems. Next slide please.

With regard to ACRS considerations then, we recognize, as does the staff, that option three does not meet qualitative cost benefit based upon current NRC guidance of evaluation. Therefore, the staff uses several qualitative considerations, including defense-in-depth, to recommend option three. And we agree with this, that is, we agree with the use of qualitative considerations including defense-in-depth. This approach is appropriate given lower margin and high conditional failure probabilities for Mark I and Mark II containment systems that have been recognized for several decades. Next slide please.

The staff and industry then completed studies of severe accident progression and containment performance as a result of the work that has been performed over the several months that we have examined this issue. For certain sequences, the addition of filtration systems on the vent would reduce radioactive material releases. For other sequences, existing plant filtration systems operate efficiently, such that additional filtration would provide little or no added benefits.

On this one slide, we represent a substantial amount of work that has been done by the staff, the industry, the national laboratories and consultants, and the interaction that has occurred as a result of many meetings between the staff and other agencies, as well as with the industry and the public. Next slide please.

Our considerations then -- our considerations continue with the retention of radioactive material and containment being the primary measure for

success. And we're sure the staff agrees with this versus, but versus option three, the filtered vent, and chooses the filtered vent to improve certain scenarios. We come to the conclusion that option four would allow more latitude and scope for innovation, and in fact, may result in more effective solutions. At this point with respect to defining the performance criteria that would be used, the staff has taken limited steps to develop the performance measures for retention. But the choice of option three would lead to that development. Next slide please.

In addition, the ACRS believes it's extremely important to consider the potential for unintended consequences with the addition of any particular system, or change in any particular system in the plant, unintended consequences can result, and need to be considered. Besides effectiveness of filtering strategies and systems, other characteristics also need to be considered in moving forward with any implementation of improvement to keep the containment loads well below design levels, to rely primarily on passive components, maintain compatibility with actions to flood the drywell, and mitigate overfilling of the wet well. Next slide please.

And when relying upon the suppression pool scrubbing, make sure that the pool temperature is below saturation temperature. Preserve the integrity of the drywell head seal, very important as we learned with Fukushima. And also, with respect to the Fukushima experience, address hydrogen control. And in addition, severe accident procedure integration, which is ongoing, as well as the hydrogen control issue resolution. With all of these elements described in the last several consideration slides, we draw our following conclusions. Next slide please.

Firstly, additional measures for source term mitigation are not

justified by risk-informed cost benefit analyses relying on generic PRAs, risk metrics, estimates of averted cost and uncertainties. This is the conclusion developed by the staff, and it was determined that the cost benefit analysis results do not support filtered vents, but additional consideration would be required. And that was the additional defense-in-depth measures that should be considered to compensate for uncertainties in quantitative techniques. And we agree with that. We note that with respect to the cost benefit evaluation, if we look at option three, and option two and three were both evaluated with regard to cost benefit, the advantage seen for the option three filtered vent also includes the improvements to the venting system to make it capable for severe accidents. And more than half the benefit attributed to the filtered vent system is due to the improvements to only the vent system itself. Next slide please.

The implementation of a performance based approach, option four, is our recommendation for what should be completed to reduce severe accident radioactive releases. The option three, installation of external filtered vents, may in fact become an outcome or a partial outcome of option four.

And finally, we also recommend that the severe accident capable vents, option two, are an essential part of any controlled venting strategy based on the several considerations that we've described earlier. And with that, I conclude my presentation. I turn to John Stetkar.

MR. STETKAR: Thanks, Steve. I needed the extra time. First slide, please. This morning we're going to talk about the SECY-12-0110 consideration of economic consequences within the U.S. NRC's regulatory framework. We had a joint meeting of our regulatory policies and practices subcommittee and our reliability and PRA subcommittee to consider this matter

on October 2 of this year. The full committee met to deliberate on it in our November full committee meeting when you received our letter on November 13. Next slide please.

To refresh your memory, because I keep seeing the SECY a few months ago, I believe, the staff presented four options within -- or three options within the SECY. First option was a status -- essentially a status quo. Update existing guidance methods according to the current schedule and frequency that the staff does their routine updates. The second option was characterized as an enhanced consistency, which would increase priorities for more integrated updates to the existing guidance and methods. And then the third option was to explore potential changes to the regulatory framework in the staffs' words, to more expressly consider adverse offsite economic consequences. Next slide please.

The staff recommendation was to adopt option two, indicating that that option would enhance the currency and consistency of the existing regulatory framework through updates to guidance documents for performing cost benefit analyses in support of regulatory backfit and environmental analysis in the context of the current process. Next slide.

To provide a little bit of background for our recommendations, it's worthwhile to review the existing treatment of economic consequences within the existing framework. They are considered. They are considered in a number of places, two of which are on this slide. Those are the NEPA reviews that are performed for the evaluation of severe accident mitigation alternatives in license renewals and the evaluation of what's called severe accident mitigation design alternatives for design certifications and new plant licensing. Next slide.

Economic consequences are also evaluated as part of the regulatory analyses that are performed by the staff for proposed NRC actions, and probably most importantly and most visibly, economic consequences are considered in cost benefit analyses that are performed for backfits. However, it's important to notice that economic consequences are considered only if the staff concludes that a proposed backfit first provides a substantial increase to public health and safety. If the proposed backfit does not meet that criterion, then economic consequences are not part of the decision process. Next slide.

The staff and a number of stakeholders have identified shortcomings and inconsistencies in the methods, tools, and data that are currently used for a quantitative evaluation of economic consequences within the existing framework. That's been an important part of the dialogue between the staff and stakeholders. And the staff agrees that there are needs for improvements in that area. Next slide.

Public health risk. The focus of the regulations in the reactor oversight process of the agency is, as it should be, protection of public health and safety. For example, the current risk informed regulatory framework uses core damage frequency and large early release frequency as metrics for the evaluation of reactor safety and severe offsite health consequences. Next slide. That process has been very effective. We've seen improvements to structures, equipment, procedures, training, emergency planning, and so forth that in fact have resulted in measureable reductions in both the frequency and consequences of accident scenarios that were previously identified as potential threats to severe public health consequences. We've made real strides by that focus. Next slide.

However, the risk of economic -- adverse economic consequences has historically received less emphasis in regulatory decision-making primarily due to the deference to the emphasis on public health consequences. As we all know, the events at Fukushima Dai-ichi have heightened concerns about the societal impacts from land and water contamination, economic displacement, and so forth, despite the fact that there were no immediately measurable adverse health consequences from those accidents. Next slide.

This is actually, for those of us in the PRA business, not all that surprising. Full scope PRAs have identified the fact that land contamination and economic consequences are important constituents of a complete plant risk profile. So it's not surprising that we've seen the events at Fukushima, at least from a consequent perspective. We've also learned through those PRAs that risk is measured by both the frequency and consequences of accidents, depends very importantly on specific features of the plant design and the site environment, which has also been reinforced by the unfortunate experience at Fukushima. Next slide.

Now, over the next few months, the Commission will begin very important deliberations on a number of very closely interrelated issues, and we've listed four of those on this slide: those being, Fukushima near term task force Recommendation 1 regarding the regulatory framework. Recommendations from the risk management task force as embodied in NUREG-2150. This particular issue, that's regulatory treatment of severe accident economic consequences, and something that Steve just mentioned, guidance for the installation of filters within containment hardened venting systems. They're all interrelated to some greater or lesser extent. Next slide.

Those deliberations could result in one or more Commission policy decisions. For example, decisions could involve the prominence and degree to which quantitative risk information is used in the overall regulatory process. It's an important decision. Within the context of those decisions, there could be Commission policy regarding how broad categories of accident consequences are treated within risk informed decisions. And by broad categories of consequences, I mean for example, public health consequences as one category. Another category could be economic consequences, land contamination, and then there could be other types of consequences that could be considered as a matter of Commission policy. Next slide.

Depending on the outcome of those deliberations, there could be a number of difference options for the treatment of economic consequences within the regulatory framework. For example, there could be the possibility of a quantitative risk goal for economic consequences as a complement to the current quantitative health objectives. Another method of possibly treating economic consequences would be within the so called design enhancement category of beyond design basis accidents as proposed within the framework that's been presented in NUREG-2150. Or there could be a continuation of the treatment under the existing regulatory framework. Next slide.

Now within that context are -- we have four recommendations. The first recommendation is that we support option three in SECY-12-0110 to explore whether changes to the regulatory framework are needed to further consider the adverse economic consequences from severe accidents. We also noted that possible changes to the treatment of economic consequences should not be considered outside the context from the other ongoing initiatives that we've just

discussed. Next slide.

There's a risk that decisions that address issues related to the treatment of severe accidents and beyond design basis events on an isolated topic-by-topic basis could give rise to unintended regulatory inconsistencies. Next slide.

Because of that we feel that the staff guidance and methods for consideration of economic consequences from severe accidents should be subsidiary and developed in the context of any Commission policy decisions regarding the resolution of NTTF Recommendation 1 and a risk management task force recommendations in NUREG-2150; in other words set the stage for the regulatory framework and make these decisions within that context. Next slide.

Recommendation 3: in support of that recommendation we reiterated that decisions need to be made on how broad categories of severe accident consequences, that I mentioned earlier, will need to be treated within the NRC's risk informed regulatory framework.

And finally our last recommendation -- next slide -- is that regardless of whether changes are made to the regulatory framework we do support the notion that the methodology tools data for evaluating economic consequences from severe accidents should be improved, that's consistent with the staff's conclusions and it's consistent from many stakeholders. However, the priorities for those improvements and their required technical attributes depend very importantly on the prominence to which economic consequences will be treated within the regulatory framework. So just making changes to improve things needs to be informed by the level at which those decisions will affect the

regulatory process. And with that I am finished. Thank you.

CHAIRMAN MACFARLANE: Thank you. Excellent. Okay, we will now start off with questions and very fittingly we will start off with Commissioner Apostolakis.

COMMISSIONER APOSTOLAKIS: Thank you, Madam Chairman. This issue of interconnected issues you mentioned, for example, in the case of filtered vents, if the Commission were to approve an expanded use of economic consequences, would that considerably change the cost-benefit analysis the staff did? So we wouldn't need the qualitative elements?

DR. SCHULTZ: It could change it.

COMMISSIONER APOSTOLAKIS: It could change it.

DR. SCHULTZ: Yes.

COMMISSIONER APOSTOLAKIS: So indeed there are connections here.

DR. SCHULTZ: There are connections on what we talked about.

COMMISSIONER APOSTOLAKIS: What does that mean then? I mean, the staff is supposed to come back with final recommendations, Recommendation 1 and NUREG-2150 sometime next November or December. Should we postpone all decisions until then? There is no Committee position, but individual views would be very welcomed.

[laughter]

MR. STETKAR: A wise person once said we provide input to the Commission.

[laughter]

COMMISSIONER APOSTOLAKIS: It's really a difficult situation

because, you know, I don't know what the final outcome of Recommendation 1 will be. And then I have problems what to do with economic consequences before I know that. So I think what John said at the end, you know, that maybe we should be focusing on tools and methods is that the way out so we can work on tools and methods until we have an idea what the Commission would decide on this broad -- on these broad issues? Anyone.

MR. STETKAR: I'll take a stab at that. I think we all agree that we should have appropriate tools and methods for evaluating any technical issue. I think the problem in the real world with resource constraints that we all face is that if you embark on a program to develop the best possible tools and methods and data and then discover that that degree of sophistication may not be necessary, those resources might have been better allocated in other area. Now again, we don't make decisions, but certainly, everyone agrees that there needs to be improvements to the way that economic consequences are evaluated within the tools that we have available.

COMMISSIONER APOSTOLAKIS: See, the tools for doing cost-benefit analysis, for example, I mean, everybody says that we need to upgrade it is one thing. And I think it's fine. The big question there, it seems to me, where to put in the regulatory framework -- and you spoke about it, John -- the economic consequence evaluation. And to what extent? Well, since we're talking about that. I found it very interesting in your letter, in two places, you're talking about, for example, in light of the accidents at Fukushima, the NRC now -- Page 2 of the letter on economic consequences, "The NRC now faces a question regarding whether appropriate weight is afforded to offsite economic consequences in fully integrated risk informed system." And then there is -- there

are additional comments by three distinguished members that say that there is concern regarding implementation of option three. "This effort will require the commitment of substantial staff resources for several years, create a regulatory momentum of its own, and potentially raise NRC regulation of land contamination and economic consequences to be on an equal footing with protection of health and safety."

The staff has an option, the safety goal statement to put economic consequences there. They don't say how they will do that. But -- and the Committee is kind of silent on that particular option. But given that you talk about relative weights and you are talking about, well, not all of you, but three, the potential of treating economic consequences on an equal footing with protection of health and safety. Would you go for that? Again, individual comments. Would you put economic consequences, even though John Stetkar says that, you know, they are part of the complete risk picture, or would you use a weight and say that, you know, maybe health and safety is first and then economic consequences?

MR. STETKAR: Let me try my response first. And let me put a little bit of context in our letter on that notion of weight. I think that during our presentations and our discussion with the staff, we were struck by this notion that in any cost benefit analysis there was an initial pass-fail criterion that was made strictly on public health risk, and that economic consequences were always directly subsidiary to that decision. In other words, the way that the process was presented to us was you made a decision whether or not a proposed change would satisfy the criterion from a public health consequence perspective first. And then, and only then, if the answer to that question was yes did the cost of

adverse economic consequences be factored into the formula. So that was a notion of weight that already it has received within practice within the cost-benefit analysis process. A de facto very subsidiary weight. Once, once you pass that bar, then it's considered -- brings into the question the quality of the tools and the methods and things like that. So that's the notion of the weight within our letter. So regarding a quantitative weight should they receive --

COMMISSIONER APOSTOLAKIS: Well, that would be --

MR. STETKAR: -- X percent versus Y percent --

COMMISSIONER APOSTOLAKIS: That's probably judgment.

[talking simultaneously]

MR. STETKAR: That's judgment -- and in the context that I tried to paint that in some sense is part of the risk curve.

COMMISSIONER APOSTOLAKIS: Would anyone disagree with me -- oh, I'm sorry. Sam.

DR. ARMIJO: Commissioner, yeah, I disagree. We're definitely concerned, at least three of us, about this --

COMMISSIONER APOSTOLAKIS: You disagree with whom?

DR. ARMIJO: The dilution of myself and the two --

COMMISSIONER APOSTOLAKIS: Yeah. Yeah.

DR. ARMIJO: -- added members. The -- to put -- the wording in the SECY was quite disturbing. I wrote this down because I didn't want to mischaracterize it in any way; and part of the wording in that SECY document 12-0110 was to explore changes in the backfit regulations including new exceptions to the backfit analysis which would reflect a policy decision to treat economic consequences as equivalent in regulatory character to matters of adequate

protection or compliance. It went on further -- and the point that John raised -- alternatives could include modifying the backfit analysis to allow either, either a substantial increase in protection to public health and safety or a substantial reduction in off siting economic consequences. That meant they're on the same level. And to me that's --

COMMISSIONER APOSTOLAKIS: I understand, yeah.

DR. ARMIJO: -- that is something that we should not do, particularly the use of adequate protection which, I believe, is a unique and powerful regulatory authority available to the Commission to protect health and safety. And it should not be used to impose requirements to address matters of far less importance. And in my view, property can be repaired, replaced, cleaned up, and is far less important than health and safety.

COMMISSIONER APOSTOLAKIS: I -- yeah, and I tend to agree with that position and I'm a bit surprised that the rest of the Committee felt this was not worth putting in the letter. But, you know, that's your letter. I have two quick questions. Steve, you didn't mention it but I've had meetings with senior management and they're telling me that the reason they won't -- I mean, they don't have any problem with a performance based approach to filtered vents, to this particular issue; however, they feel that we have to order the installation of filtered vents now because if we go with the performance based approach this issue may drive it for many years, you know, they will submit a strategy the staff won't like, they go back to improve it, blah blah blah blah. So before you know it, you are 10, 15 years and you haven't done anything. Well can we combine the two and say, you know, we'll have a performance based approach but if within X years your proposed strategy's not approved you install the filters.

DR. SCHULTZ: That is one approach. Let me --

COMMISSIONER APOSTOLAKIS: I think it's a pretty good approach.

[laughter]

I mean, the staff has a point, so, we have to do something about it.

DR. SCHULTZ: There is a point there, and I would certainly not want the process to move in that direction where it takes a long time to implement the containment performance improvement, features that we want to see, the outcome that we want to see. Our approach of recommending option four does not say that this ought to take a long period of time. The reason I have focused carefully on the work that was done in the last really four months associated with the evaluation of severe accident performance related issues in BWR Mark I and II is we were impressed by how much was learned by the staff and by the industry in those interactions and analyses in a very short period of time. We were also wanting to have information that's not yet developed on severe accident procedure integration for these containments and also for hydrogen control, which is still ongoing because in those areas this work still continues and more information is being gathered. So the approach would be, I would hope, that a schedule would be set by the Commission.

COMMISSIONER APOSTOLAKIS: So you do it --

DR. SCHULTZ: To move forward with alacrity, you know, to address this. And I think that the industry is prepared to do it. I think the staff is prepared to do it and I think we do need to integrate these other elements into our final decision associated with this.

COMMISSIONER APOSTOLAKIS: Madam Chairman, will we have

another round of questions?

DR. SCHULTZ: You're -- what you recommended would be one alternative.

COMMISSIONER APOSTOLAKIS: Okay. I'm sorry.

CHAIRMAN MACFARLANE: No, no.

COMMISSIONER APOSTOLAKIS: Okay. Back to you.

CHAIRMAN MACFARLANE: We can come back. We're way ahead of time. So, save it, you'll probably get some more questions.

COMMISSIONER APOSTOLAKIS: Okay.

CHAIRMAN MACFARLANE: Okay? How about if we do that? So I'm going to turn to Commissioner Magwood.

COMMISSIONER MAGWOOD: Thank you, Chairman. I'm going to use part of my 10 minutes for a variety of purposes before I start asking questions. One is I wanted to personally welcome Margie to the table. This is her first time sitting with us as General Counsel, congratulations. And I look forward to watching you develop the skills of looking interested even with Commissioner Apostolakis is talking.

[laughter]

But I also -- I also wanted to reiterate my thanks and congratulations to Mr. Sieber for his long service and to note that, Madam Chairman, that it was not Carnegie Mellon University back in 1961, it was Carnegie Institute of Technology in 1961. Nevertheless, --

CHAIRMAN MACFARLANE: Thank you for that correction, yes.

COMMISSIONER MAGWOOD: Nevertheless, the lineage is intact and as a graduate in '82 and '83, it's good to welcome you to today and to thank

you for your service. 1961 was an important year, it was also the launching of the U.S.S. Enterprise, the carrier which was inactivated on Saturday, I attended the ceremonies for that. And I was pleased when the secretary of Navy announced that the next carrier in line, CVN-80 [spelled phonetically] will be named Enterprise and I was really quite pleased with it. Just over 12,000 people who were there. As someone else has a deep connection with 1961, I just wanted to make it clear, I am not retiring, at least --

[laughter]

-- not yet. My first question, and first, let me, let me thank Commissioner Apostolakis for his line of questioning, I thought that was really quite interesting.

[laughter]

But I actually was interested in that. And I think -- I think he was able to pull off some interesting issues so that gives a lot to think about.

But one thing I wanted to follow up with, Mr. Schultz, is this issue of the qualitative factors. You've -- and also the committee's thoughts on that, but there was, on Slide 39, I wanted to see if you help me reconcile Slide 39 with the use of qualitative factors because it seems to me that Slide 39 says something a little bit different. It says additional defense-in-depth should be considered to compensate for uncertainties and qualitative, quantitative techniques, is that -- is that how you expect -- is that a reflection of the staff's approach in using qualitative factors, is this -- is this consistent or are you saying something different?

DR. SCHULTZ: No, we're not saying anything differently here. The staff considered a large number of qualitative features to draw their conclusions.

The Committee considered mostly defense-in-depth as what we considered what we call the qualitative feature that would drive our conclusion that containment performance improvement was required.

COMMISSIONER MAGWOOD: As a general matter, is the Committee, is the Committee comfortable with the use of qualitative factors and decisions like this because it -- well, one, one consequence that is that you can use qualitative factors to make almost any decision and can you give me some reflection of how the Committee discussed how to apply qualitative factors and when to use qualitative factors and looks like Sam, you want to --

DR. ARMIJO: I was impressed by the willingness of the industry people recognition that they wanted to do a better job of retaining fission products in the containment. So there was no -- and there was no defense or attempt to say, "Well, there's no -- doesn't meet the cost benefit requirement or test so we really don't need to do anything." I sense that there was a recognition just on good engineering practice that we can -- that we can and should do a better job. Exactly how we do it was the issue. I personally have no problems with defense-in-depth, use of defense-in-depth for this purpose, but it is a judgment call, you're right. It can be abused. And we certainly would prefer quantitative justification if we could do it. But when you can't, you have to use judgment and in this case I think the Committee was satisfied.

COMMISSIONER MAGWOOD: Okay. I appreciate that.

DR. SCHULTZ: I would like to add to that. The Committee was willing based upon all of -- there was a lot of quantitative work that went into supporting those qualitative components that went into the decision And so in that regard, there was a level of comfort. At the same time the concern that you

raised is very important. For example, it would be portrayed in the discussions we had that, okay, for BWR Mark I and Mark II containments we would use this approach and we would draw a conclusion that improvements are required. Would, in fact, the same approach be able to push us in a direction where we don't believe improvements are required, large PWR dry containments for example. And so there is that continuing concern and that's why we do interrelate what we're talking about here, with the elements that John discussed and that Commissioner Apostolakis raised earlier.

COMMISSIONER MAGWOOD: And I appreciate that. It seems to me that you could, because, you know, defense-in-depth is a judgment of -- in and of itself, you could make that same judgment with large dry containments. And clearly internationally people have made that judgment. So again, my concern is not so much whether this -- irrespective of whether, you know, venting, vent filtering is a good idea or not, the analysis process used to get there is something that, I think, is very important to get right. Not just for this, but really is a precedent for other decisions. So it's -- it may be something that may be worth the Commission thinking about as a more generic factor and maybe asking the ACRS's advice on that, on that aspect.

Let me switch over to talk to Mike for just a moment. I appreciate your comments, I thought the ACRS did a very good job in analyzing the Part 20 changes, it's a very complex matter, and your input is very much appreciated. One -- there was an additional comment that was added to the ACRS letter regarding cumulative doses. And this is something that I've wondered about for quite some time and I was pleased to see that there was some discussion on the Committee about this. Can you give us some reflection of where the Committee

is as a whole on cumulative dose and what issues were discussed?

DR. RYAN: Well, I think cumulative dose at the limit for a worker is 50 years at 5 rem; so it's 250 Rem would be a lifetime cumulative limit. I don't know of anybody that comes even close to that limit, most folks are well below five in a given year and most folks don't work that number of years.

I think that the cumulative dose is really where you have a lifetime metric for risk because it's the cumulative dose that presents the cumulative risk. And I think lowering the dose doesn't necessarily change the risk, I'll tell you why. Within the regulations under 20.1206 plannedspecial exposures could be used, for example, up to -- equal to the annual limit in a given year or five times the annual limit in a worker's life time. So there's this option which is, in my experience, I've never used it; I've never seen it used. So I wonder if by lowering the numerical limit will simply be driving people to invoke plannedspecial exposures to things they need to do and have to do. So I just caution that there might be a secondary effect there that needs to be thought through.

COMMISSIONER MAGWOOD: So if I understand your reflection on this, I think what I hear you saying is a practical matter, the cumulative doses don't matter because we just never see those.

DR. RYAN: And I think we never really see doses anywhere near the limit, I mean, folks typically operate, in my own experience, below 2 Rem in the radioactive waste industry; it's below 2 Rem a year now and has been for an awful long time. I went back and talked to some of my old colleagues and got cumulative data that basically shows that.

Now, you know, certain high activity jobs, steam generator work and other things in utilities might result in larger doses for a particular work

evolution, but I think most radiation protection practitioners very carefully manage cumulative dose per worker, cumulative dose for the workforce, and then individual planning. And that's where I think radiation protection practice in the United States, in particular, excels is in ALARA planning.

COMMISSIONER MAGWOOD: There's -- as we talked about this, I heard some thought about looking at the ALARA sections of Part 20 which right now avoids any quantitative approach. But the idea, perhaps, putting goals or something in ALARA, is that something that, I don't know, as a health physicist, do you find that offensive or is that a good idea?

DR. RYAN: I sure don't. In fact, you know, every place I've worked established ALARA goals and we had numerical limits, that was very specific to the context of that work activity and those workers and so on. So it was tailored, but the idea of ALARA goals is certainly not foreign to me. And I think that if it's structured in a way where a licensee can develop those goals, particularly the numerical aspects of the goals and how they achieve what they're being asked to achieve, wouldn't be distasteful. I may be completely wrong, but I think that would certainly be my view and those of many of my colleagues.

COMMISSIONER MAGWOOD: So rather than have a set goal in regulation, your advice would be to assure that goals are being set by licensees --

DR. RYAN: Have a requirement that an ALARA program should establish ALARA goals for that particular work activity and evolution. You know, it may be that doses in the 2 Rem per year range are fine, wherein some other activity doses above 500 millirem wouldn't be acceptable. So I think allowing that flexibility to tailor it to the specific licensee's activities would be effective.

COMMISSIONER MAGWOOD: Interesting. All right. Thank you. Thank you, Chairman.

CHAIRMAN MACFARLANE: Commissioner Ostendorff.

COMMISSIONER OSTENDORFF: Thank you, Chairman. Thank you all for being here. I want to start out Sam by thanking you for your leadership of ACRS. I thank the members at the table and those in the audience here. I'm struck when I read your November 13th letter highlighting the 599th meeting of the ACRS; and every time I see the rich history of the ACRS in advising this body and our predecessors I'm struck by the important legacy that you all collectively represent. And how unique we are as an agency, compared to my experience in Department of Defense, Department of Energy, dealing with similar bodies, I don't know that I'm aware of any other body that has the same gravitas in rich history and ongoing service that your body does. So I commend you and your members for that.

I want to pick up maybe where Commissioner Magwood was going with Dr. Ryan here if I can just for a minute. And this is one on the lifetime cumulative -- I want to focus on the lifetime cumulative dose. I think when I retired the Navy in 2002, I had 16 years of sea duty. And thankfully to Charlie, and his comrades at Naval Reactors, my lifetime exposure was like 980 millirem. Period. Lifetime. Serving on six submarines, many years at sea; and, again, that's not by accident.

I heard a sea story, some of you may know Vice Admiral, at the time he was a vice admiral, he retired from the Navy as an admiral, Rich Mies, he was my boss back in 1996. And he told me there's an anecdote -- he was invited to go to Russia and visit a submarine force, and go on a typhoon class

submarine -- think "Hunt for Red October", Sean Connery -- and he also visited a sailor's home that was really a nursing home for submarine sailors in the Soviet navy -- I'm using the Soviet navy term intentionally -- who had significant health effects from radiation exposure because of the tradeoff between shielding and speed on their submarine designs. And he saw people in their 40s that all had white hair. My wife has white hair, so nothing against that.

[laughter]

DR. RYAN: My wife will be happy to hear that as well.

COMMISSIONER OSTENDORFF: But the impact was looking at the radiation impact on these individuals who had higher exposures; I don't know what their -- I have no idea what their lifetime exposures may have been. But in kind of going to Commissioner Magwood's point, do we have any data on lifetime exposures and the impacts on health that would help inform this 100 Rem lifetime exposure goal? Can you comment on that briefly?

DR. RYAN: I think most exposures that for work forces that I'm familiar with in the United States would be, you know, well below that on average. Now if -- and there could have been individual workers in say, the early days of the complex sites at Oak Ridge, or Hanford, or other places. I'm not familiar; I haven't studied those databases in detail. I can tell you from my own experience in the weapons complex at Mayak that their doses are way above --

COMMISSIONER OSTENDORFF: I know. That's what --

DR. RYAN: Way above what we would see in the United States. So that's --

COMMISSIONER OSTENDORFF: Is there any data, that's a great example. Is there anything associated with the Russian experience that we can -

-

DR. RYAN: There's a new set of texts out on their radio chemical operations which I would be happy to share with you.

COMMISSIONER OSTENDORFF: That'd be interesting because I think that might help provide a data point that might be useful for the Commission.

DR. RYAN: The way I would approach the question of the 100 Rem is I would have a tendency to look at the current work force across a broad spectrum of industry types, whether it's fuel fabrication, reactor operations, or medical, or whatever it might be. And try to look at the current data, say for the last decade, because that's really where ALARA practice is going to be best reflected for what is happening now as in the last decade or so. So, I would try and extract that information and see where it lies. I think if you go much past that in history, you're getting into different kinds of practices that were viewed differently, and now we've evolved, and you know, any place I've been or places that I think are of high quality, have a very active and aggressive ALARA program, and that's where the action is in terms of radiation safety. It's not in a dose limit. It's not necessarily in protective clothing, although that's helpful on occasion, but it's on the principle and practice of how do we maintain everything as low as reasonably achievable with regard to radiation exposure.

COMMISSIONER OSTENDORFF: Okay, thank you.

DR. RYAN: So, I guess I'll take an action item and --

COMMISSIONER OSTENDORFF: I'd appreciate it. It'd be helpful for me to better understand that. I wanted to go back to the line of questioning Commissioner Apostolakis started in his round, and this gets into the

coherency/consistency between the Commission's decisions on one paper, and another paper, and another paper, and I think the ACRS has very helpfully and thoughtfully highlighted those to us, and so we're grateful for that.

I want to maybe just to -- because I don't have -- well, let me start out with a very simple question, because I think that's -- John, if I can approach you on this. So let's just say, and I look at Steve's presentation – let's take the filtered vent recommendation, and then let's take the economic consequence. Just limit this question to those two papers. I'm not going to get into the other Near Term Task Force or Risk Management Task Force at this stage. So, if, you know, the staff recommends filters to install filters, the ACRS option four looks at a more performance based approach, if the Commission chose, John, to go with option three or option four, but did not change the economic consequence methodology, let's say stayed with option one or option two under economic consequences. You know where I'm going with this. Will we be inconsistent as a regulator? Would we be failing to provide predictable stability – predictability and stability of our regulations if we said yes to filters or some other alternative venting strategies, but did not take a different approach on economic consequences from what we're currently doing because we have to be able to answer that question ourselves?

MR. STETKAR: You do.

COMMISSIONER OSTENDORFF: Before we vote on any of these, I think.

MR. STETKAR: It's a difficult question for us to answer, certainly.

COMMISSIONER OSTENDORFF: And I'm not asking for a Committee view I'm asking strictly an individual view.

MR. STETKAR: I think -- I wouldn't paint it as quite black and white as you have. I think there's a gray middle ground that could achieve sort of both objectives. I'm not quite sure what that is. I mean I have my own personal ideas about how it could be done, but I don't think it's appropriate to bring those forth right now. I think it's certainly something, as you've raised, that you need to be considerate of -- and that's one of the reasons why in my discussion I said that some of the decisions regarding that fundamental framework, the degree to which you want to place economic considerations with regard to public health and safety. They don't have to be equal. They don't have to necessarily be directly A is always more important than B. I think that there are tools that we have that could provide you very good information on a plant specific basis information about the potential benefits from installing a filter at plant X versus plant Y. Now, those benefits, quite honestly, are not going to be achieved in public health.

COMMISSIONER OSTENDORFF: Okay.

MR. STETKAR: You will not see a measurable benefit in the public health. I have done enough risk assessments, level three risk assessments that I can pretty much say that you won't see those benefits in public health. You may very well see benefits for a particular site, the particular design, and a particular population demographic in terms of economic consequences.

COMMISSIONER OSTENDORFF: Okay. I'm going to put Sam on the spot here, because in your economic consequence additional comments that you've already discussed, and I found it very helpful, and I took note of the "create a regulatory momentum of its own" phrase, which got my attention. Do you want to comment on this question about the consistency or predictability of

our regulatory framework if we decided on option three or four on filters but did not change our economic consequences methodology?

DR. ARMIJO: I personally don't see an inconsistency, because I really look at the reasoning for the filters, or the option four approach is really a defense-in-depth measure, and at the bottom of it is health and safety, whether there is a release, the immediate releases would be health and safety of workers, you know, when you vent, you get a lot of noble gasses that the filters won't touch. So, you've got to think in terms of those things. I just think that economic consequences are a purely money issue, and purely money issues should not be on the same level as health and safety, and there are other mechanisms, Price Anderson legislation. Whether those numbers are correct or not, or adequate, that's a matter for the Congress, liability insurance on the part of licensees. So, I really don't see too much of an inconsistency, but you know, I haven't thought about it enough to really make a final conclusion on that, but the answer at this point, I'd say no. I don't see a problem.

COMMISSIONER OSTENDORFF: Thank you, thank you, Chairman.

CHAIRMAN MACFARLANE: Okay, thank you. Let me add my thanks to you all, to all your hard work.

COMMISSIONER APOSTOLAKIS: Commission Svinicki? It's you?

Oh, no, it's me? [laughs] I've got some backseat drivers here.

[laughter]

He just wants to go again.

[laughter]

Anyway, let me again start and say I really want to thank you all for your hard work. It's such an impressive list of work that you've done. Really, it's sort of overwhelming. So, I really appreciate all of your hard work, and I appreciate your dedication to this, and to giving the Commission the advice that you do. So, very much appreciate it.

I have a number of questions. Let's see if I can get through all of mine. Probably not, so I'll get to go again too. Let me start off with Dr. Ryan and the issue of radiation protection. I'm going to start off by noting that in your letter you argue that in the absence of a clear and well demonstrated benefit, we disagree with lowering the dose limits. At the same time, some of your reasoning for lowering those dose limits, you demand a well demonstrated reasoning to lower the dose limits, but your reasoning for not lowering those dose limits is not well demonstrated in my view. Compliance with lower dose limits could have unintended consequences. Further, the lower dose limits could inhibit the response of workers. So I would like to see more of a balance here, that if you're going to demand that level of backup of evidence, you should provide it yourselves.

DR. RYAN: Okay, well, that's fair enough, and I'd be happy to at least address that in part.

CHAIRMAN MACFARLANE: Let me just say that I think there's a larger issue here for all of your reports. I would like to see more of the evidence. I know that you, as I said, you've done all this work, and I know you've done a lot of -- put a lot of time and effort into this, and I don't feel that it's reflected in these letters. I would like to see some references and citations to the work that you've done. That would certainly help me to understand your reasoning more. I'm

looking for something, you know, not as long as a National Academy report. I know that's not what you're doing here, but I would like to see something that goes in between there, that does you know, explain some of your reasoning into your recommendations, but maybe you want to respond that. And then I'll continue.

DR. RYAN: Fair enough. On the specifics of lowering a dose limit, I don't think that would change the character of a work force for a particular reactor plant, for example. Under the provisions of the plant's special exposure requirement or allowance in 10 CFR, workers may have up to the annual limit in any given year, and up to five times the annual limit in a lifetime, in addition to and separate from their routine annual exposure. So, the regulations themselves allow for incremental exposure over and above the annual limit, under the specific circumstances of the plant's special exposure. In my experience, that's rarely used. In fact, I can't tell you a time when it's been used in my experience, but I imagine if the numerical limit does come down it'll be used more often.

So I don't know what we've accomplished in terms of worker exposure if we still maintain this allowance versus a lower numerical limit for an annual dose. That's just one thought, and I think that's some of the consequences or potential consequences that ought to be evaluated before any numerical limit is changed.

That's one example, and I agree with you. It would probably have been helpful if that was more carefully delineated in the letter and I'll surely take your advice on doing that in the future, for future reference.

CHAIRMAN MACFARLANE: Well, I think it's a request to the ACRS in general --

DR. RYAN: Oh, absolutely. No, I appreciate that.

CHAIRMAN MACFARLANE: -- to add more backup, and something for you guys to consider anyway. You know, continuing with this, I do want to note that I don't feel that you actually have a real majority in your views here, because half of you dissented, and I do want to note that. And given that the preponderance of the scientific community, international scientific community has coalesced around a dose limit different from our current limits, I'm really still struggling to understand why we should maintain the current limits in Part 20. You know, you have the ICRP, the BEIR studies, National Academy, UNSCEAR, NCRP. It seems pretty good to me, but not good to you.

DR. RYAN: I guess my view is that the international and the National recommending bodies are looking at a body of evidence that doesn't necessarily take into account the actual practice. So the actual practice in radiation exposure if the limit is five, and the typical exposures are well below that, we've accomplished the same thing. However, maintaining the flexibility that under certain circumstances that a higher individual does might be appropriate for human work activity.

CHAIRMAN MACFARLANE: You know, it does seem like it's not an issue of what's going on at reactors, it more of an issue in medical settings in the U.S., and I think that's an area of concern.

DR. RYAN: Absolutely, so you know, if you get outside of the reactor and look at some of the medical questions, there are important issues there. However, I don't know that we'd be changing the doses that people receive. They'd simply be having plannedspecial exposures instead of dose under a limit. That would have to be addressed if you want to change the dose

limits.

CHAIRMAN MACFARLANE: [affirmative]

DR. RYAN: Now, I'm not recommending that. In fact, I would recommend not to do that, because there are lots of reasons when planned special exposures are appropriate and important to have available. So, I think it's a broader question than what's the numerical limit. I think the context of all the different categories of workers in radiation exposures they received and the satisfaction with which we think that's been evaluated and implemented is a much bigger question that should be addressed before we embark on a change to the annual limit.

CHAIRMAN MACFARLANE: Did you want to add something?

DR. POWERS: As sort of the leading author of the added comments, let me just sort of make a few things. I don't think that we really dissented that. We, you know, we're not necessarily endorsing the notion of going to a two Rem limit. I think we do agree that there seems to be a great deal of agreement in the science that the risk is higher, and that should be addressed.

CHAIRMAN MACFARLANE: [affirmative]

DR. POWERS: It's high, and again, we're talking about a population of people where the cumulative doses are up in the 10 Rem and above range, and so you know, questions about how applicable these results are to very low exposures I don't think are really germane to this particular problem. We are talking in a problem where there's agreement among all the scientific organizations that have addressed this. The risk is higher than we thought it was, and what the added comments really said was we ought to think about that. You know, are there ways to handle it? You know, Mike looks at this special

exposure thing as a defect. To me that's an argument that you could live with lower limits. You have these special exposures, but they would be controlled. They would be tracked. You'd understand them better, and --

CHAIRMAN MACFARLANE: Right, I agree.

DR. POWERS: And so, you know, there are ways to go different ways here, but again, I don't want to label it as a dissent, but I think we do think that we really ought to take into account that the preponderance of scientific opinion at the moment is that the risks have gone up, and those higher risks are applicable to the population we're talking about. We're not often in cumulative dose here for people receiving very low exposures. We're talking about occupational workers --

CHAIRMAN MACFARLANE: Right.

DR. POWERS: -- with significant dose.

CHAIRMAN MACFARLANE: Well, I agree, and I think your doses are incredibly -- very impressive, and so if you try, you can achieve it. You know, that's what you're telling me.

COMMISSIONER OSTENDORFF: If I can comment on it, I think very unique set of circumstances with the Naval nuclear propulsion program. Quite frankly, the doses that are really the higher ones in the regulated entities, are not at nuclear power plants by and large. It's more the radiopharmaceutical, medical --

CHAIRMAN MACFARLANE: Yes. And I think that is an area of concern. I don't know how many of you have gone to get an X-Ray or CAT scan. Has any technician been able to tell you what your dose will be? No? They never tell me.

DR. RYAN: I couldn't agree with you more, that that's an opportunity for improvement.

CHAIRMAN MACFARLANE: So, they don't know their dose either.

DR. RYAN: Well, I think we certainly know the doses. I'm not trying to imply that, you know, anybody regulated under an NRC or an Agreement State license doesn't understand and know their doses. I'm simply questioning whether a change from five Rem per year to two Rem per year is an effective way to do anything different. You know again, I don't take a dose limit alone, I absolutely couple an ALARA requirement with a dose limit, because if you do one well you may not be getting the best outcome. If you look at both together, you could probably optimize your activity, and maintain that dose as well as reasonably achievable.

CHAIRMAN MACFARLANE: I always try to keep in mind that the best is the enemy of the good, but let me turn to Commissioner Svinicki.

COMMISSIONER SVINICKI: Well, I will add my thanks to all my colleagues for the work that you all do, and for a lot of you who are willing to subject yourself to being multi-term members of the ACRS. I'm always pleased when I see that one of our very capable members is interested in continuing on the ACRS. So I encourage that, and I think that the longevity that some of you have on these issues has also been a substantial subsidiary, you know, benefit from a multi-term members. Dr. Shack is squirming in his chair, and other people are who have --

[laughter]

-- long service, he has kind of blazed a trail, I think, but in any event thank you all for the work that you do. I was invited, very honored, asked to give

the Edward Teller Lecture this week in South Carolina, and so I was realizing that I didn't know as much about Dr. Teller as I should. I've heard a lot of histories of the Manhattan Project, but Dr. Edward Teller, of course, I learned that he did not like this term, but he was the father of the hydrogen bomb. But one of the things that I learned about him is that he can be characterized as -- now ACRS has changed names over time, and when it was codified into law, in amendments to the AEA, Atomic Energy Act, it took its name of Advisory Committee on Reactor Safeguards -- but prior to that, there were a couple of bodies that were really your predecessors but had slightly different names, but Dr. Teller was, if the history can be relied upon, could be considered to be the first Chairman of the ACRS. So, you have had people, luminaries of the atomic and nuclear sciences that have served on this committee, in my view, that continues to this day with all of you. I was going to say with the gentlemen serving now, but with Dr. Rempe as well. So, we have one woman on the ACRS. So progress, right? That only took 60 years or so --

[laughter]

-- to get a woman on the ACRS, but in any event, I'm sorry I'm using all my time taking a little trip down into the history here.

I did want to share an observation, Dr. Ryan. I agree with you on how -- my observation of how seriously ALARA is taken at a number of nuclear facilities. I have a practice every time I visit a nuclear power plant. They're always eager to give me recent operating history, so they'll talk about their most recent outage, and they talk about how many days, and what work they undertook, and I always ask the question immediately. I say, "How did you do on your dose goal for your outage?" They have a dose goal well below the

regulatory limits, and it has been my experience in almost five years on this Commission, there was never a time that either the site vice president or the plant manager didn't know that off the top of his head. They never had to look it up. They knew exactly what their goal was, and exactly how much under it in every instance. Sometimes they're a little closer to it -- to the goal than they would have liked, but it's well below the requirements.

And so I just share that in terms of the very -- what I've observed to be a very disciplined approach to ALARA. It's almost as if they're not all that cognizant of the regulatory limits, because their goals for themselves are so far below that that they're not even -- if they ventured anywhere near to the regulatory limit, I think they would view it as a complete breakdown of their ALARA program. So, I just wanted to share that observation as well.

The other thing, and my colleagues have asked some really wonderful questions. We had good topics today. We had kind of harmonization with international goals on radiation protection under a topic of ICRP, we had economic consequences. We had filtered vents, and something that I, you know, I wonder a little bit, is it just me, but I've acknowledged here I'm kind of a student of history, and I do feel that a lot of complex policy is in front of the Commission right now. A lot of it where it's under the heading of post-Fukushima activities, but it's not limited to that, as our discussion about ICRP and updating dose limits, attest to that. But what I think I'm observing though is that is unique and kind of AEC or NRC history is that we have a lot of this policy being evaluated and opined upon by NRC staff or ACRS members when you review the NRC staff's products. And I feel that there's a bit of a blurring that's going on. NRC staff members don't qualify for their jobs by demonstrating a competency as

policymakers, and with all due respect to the members of the ACRS, you are not, you are chosen for your technical preeminence, nationally and internationally on various topics. And so I know that it is likely that every NRC staff member and ACRS member, they are likely to have a view on these policy matters. Whether or not you think we do it well, the job of weighing these factors and making these decisions, the members on this side of the table are again, whether you think we do it well or not, we're chosen for our ability to weigh these -- for our experience in weighing important policy matters. And so the buck is going to stop on this side of the table, and my view of the history is not -- I think there was more of a division than previously between the NRC staff's technical analysis, and then when things fell into the policy domain, my reading of papers historically was that there was more of an attempt to draw a bright line there.

And I think that the use of the qualitative factors in order for NRC staff to tip between the various options, to me is somewhat precedence setting, and I could be wrong, and there may be many papers where staff said, "I will now use policy judgments in order to decide between the recommendations," but I can't think of any off the top of my head. I've talked to a lot of people with more experience at NRC than me.

So I think we've ventured into something new, but I think that really falls squarely on the shoulders of the members of the Commission, and again, we are political appointees for a reason, because we are expected to use our discernment, to weigh those various factors.

Is this anything that's come up as you, again, you have the staff present to you, so if there's policy judgments embedded in what they've done, then you're going to have to sort your way through that, but how have you

addressed that as a Committee trying to keep the fact that you are not policy advisors? You are a technical committee.

DR. ARMIJO: Yeah, we understand that, and it comes up in our discussions. You know, this is really not our game and it's not what we're here for, but this is what we've got to review, and we will just provide our views. It's simple as that. We certainly do not seek to make a policy, provide policy advice. If it comes to us in the course of documents that we have to review, we just do the best we can.

COMMISSIONER SVINICKI: John, did you want to make a comment?

MR. STETKAR: Some of my -- and I hope my comments are a letter on the economic consequences weren't misinterpreted as recommending a certain policy. I think that in my experience, we do see a large number of individual pieces of information presented to us by the staff, and that's been especially intense over the last year and a half, the post-Fukushima era, and I think that some of our comments regarding the need for an integrated perspective arise out of that. We're not trying to recommend a particular policy direction, but if you're making a technical decision or a pseudo-policy decision, if you want to put it that way, with regard to a specific issue in isolation, and you see another related issue perhaps two or three months later within its own little box, that's the sense that we're trying to raise, that there are interrelationships there that might not necessarily be appreciated by the staff, because they're working individually on those issues.

COMMISSIONER SVINICKI: Well, and I'll --

DR. STETKAR: And if you see them, you know, staggered in time

that way also, you're faced with those decisions, and you're well aware of the integration, obviously.

COMMISSIONER SVINICKI: And I don't. I framed this as if it's very clear to see, and truly, you know, what we're deciding is if you will, technical policy. So, it is, you know, it's a judgment, and the policies are heavily influenced by technical factors, and I think both the ACRS and the staff are working to again, kind of lay out what the implications and considerations are as we go about our policymaking role, which is also not simple, and it's a very, very difficult thing and a lot of different factors to be assessed.

But I have one other issue that -- it's not something that you would have a report on, but as you reflect on the totality of what you're reviewing in terms of post-Fukushima activities of the NRC, what percentage of it would you say is actually arising from information learned from the events in Fukushima, and what amount of it is essentially kind of a regulatory reconsideration or do over of just issues that since Fukushima happened, we're now just going to reconsider? One Near Term Task Force recommendation obviously should come to mind immediately, which is overhauling the regulatory framework. I mean that seems to me is that that is such a global overarching recommendation that it's very difficult to say that has its origins in some specific accident sequence that occurred at Fukushima -- and what -- do you think that we are basically taking an opportunity for a kind of a regulatory do over on a number of items that doesn't really have -- in your view, does most of it have its origins and things were actually learned from the events in Fukushima?

DR. ARMIJO: Is that addressed to me? Well, I think some of it is definitely unconnected to Fukushima, you know, whether our regulatory system

or framework is a patchwork, which I don't agree with, or not, has nothing to do with Fukushima. Venting is a big issue at Fukushima, and that's directly related to concerns about the spent fuel pool. They were concerns. There was no real actual danger, but we are doing some things that will improve ability to monitor the spent fuel pools, the water level, and hopefully temperature measurement. So, that's directly connected. So, there's --

COMMISSIONER SVINICKI: But things like, I mean multi-unit events, okay? We have multiple units at sites here, and so do they in Japan -- it's very hard for me to say that that's a learning from Fukushima that we ought to look at, you know, multi-unit accidents, because that's what I mean by that, is like, what about Fukushima is new, that is -- some of this seems just a fundamental consideration of how we regulate.

DR. ARMIJO: Well, I wanted to add the hazard reevaluations. It's very important that we have recognition, that the hazards that we thought were adequate, you know, we better look at them again to see if they, you know, some of these -- and we're talking about mind boggling hazards and not just routine, and so I think that's all very valuable. So, I would say a great bulk of what we're doing is lessons learned from Fukushima, but there's some stuff that is truly do over in my opinion, unrelated.

COMMISSIONER SVINICKI: Okay, thank you. John.

MR. STETKAR: Thanks. Yeah, I echo Sam's quite a bit, and I also add the fact that Fukushima, in a sense, has brought to attention, immediate attention, very dramatic immediate attention, many issues that have been I think addressed to a greater or lesser extent by the industry and by the staff, for a large number of years. You mentioned multi-unit events. There have been

projects developed to develop multi-unit risk models for some, a small number of sites in the U.S. They haven't received very much prominence because they're expensive and there has been no regulatory focus in that area. There has been a lot of work done on seismic risk assessment, and I think we're all familiar with that, but it has not received very much attention.

So that I think one of the outfalls from Fukushima, disregarding the regulatory framework issue is are there things that have been addressed to a greater or lesser extent throughout the technical community, both the staff and the industry for a long number of years, that perhaps should receive greater attention. This is a wakeup call. It's the same as Three Mile Island. Three Mile Island woke us up to the extent that perhaps we didn't have the right type of operating procedures. Perhaps we didn't have the right type of operator training for certain types of accidents. Perhaps we hadn't focused our attention on the right types of accidents. You know the design basis, it wasn't a design basis accident at Three Mile Island. Fukushima has served as another wakeup call in that area.

COMMISSIONER SVINICKI: Okay, thank you.

DR. SCHULTZ: I would like to add to that from the perspective of the Fukushima sub-committee. A large part of what we are examining, the very largest part, are technical issues, and they are technical issues, as both Sam and John have indicated, have been around, and have been examined over the last several decades for the reactors, but there is an enhanced need and interest to move forward, to apply lessons learned, very dramatic ones for example, with regard to hydrogen control and in all aspects of operation, but specifically in severe accident response, and procedures, and integration of procedures, and

moving through to provide more appropriate and better support to public health and safety.

COMMISSIONER SVINICKI: Thank you, thank you.

CHAIRMAN MACFARLANE: Commissioner Apostolakis?

COMMISSIONER APOSTOLAKIS: Thank you. Two quick questions. Steve, you say on Slide 37, important to consider potential for unintended consequences, but if you go to the letter on Page 4 of the letter, the issue of unintended negative consequences is raised in the paragraph that says that really talks about a performance based approach. I'm wondering if we order to install filters, is there a potential for unintended consequences, negative consequences? Is it a characteristic only of option four or option three as well?

DR. SCHULTZ: No, it's a characteristic that must be examined for both.

COMMISSIONER APOSTOLAKIS: For both.

DR. SCHULTZ: The fundamental unintended consequence for option three would be improper use of the filtered vents, so that for some reason either improper use or for mechanical failure the vent opens at the wrong time, and a release happens when it doesn't need to happen, and that's why we focused on option four to examine how do we contain the material.

COMMISSIONER APOSTOLAKIS: But that issue is raised in the context of option four. So, one would assume that option three doesn't have that, but you say, no, in option three also.

DR. SCHULTZ: No, it was intended to be a broad statement in the beginning, and we specifically felt we needed to address it for option four as well.

COMMISSIONER APOSTOLAKIS: Now, Sam, you said something

earlier in passing, that economic consequences are a purely money issue, is it really true. Is it really true that it's purely a money issue?

DR. ARMIJO: Yeah, and let's --

COMMISSIONER APOSTOLAKIS: Just another thought. I don't think we should over play the issue of the fact that people were not killed in Fukushima. I mean the wind was blowing in the right direction. If it was blowing in a different direction, I don't know how many deaths we would have. But again coming back to your statement, is it really purely money, money? The money issues is --

DR. ARMIJO: No, no, it isn't . That was an overstatement. Mostly a money issue, but you know, when we measure there are human consequences, you know, people having to leave their homes, having to be displaced for long periods of time. Yeah, those are real issues, and so that's kind of a little bit overlapping into health and safety, but it's on the economic consequence ledger.

COMMISSIONER APOSTOLAKIS: I mean it's a sizeable impact, isn't it?

DR. ARMIJO: Yeah, there's human impact. There's no question about it.

COMMISSIONER APOSTOLAKIS: Okay, thank you.

CHAIRMAN MACFARLANE: Commissioner Magwood.

COMMISSIONER MAGWOOD: Thank you, Chairman. You know the history probably doesn't reflect it, Commissioner Svinicki, but I received probably what was one of the last new ideas from Dr. Teller. He actually applied for an EERE grant at DOE some years ago, just within the same year -- right

before he died. We didn't accept it, but it was an interesting idea. It was actually for a sub-surface small reactor. So, maybe he was prescient. So, we'll see. Maybe ultimately he'll be proven correct on that.

I think I want to talk a little bit more about filters. One thing about the filters in the discussion we've had so far that really hasn't been made entirely clear to me is whether we can characterize what percentage of sequences, or what portion of the likely sequences, would the filters actually provide real benefit? Is that something the Committee has talked about in any way? Can you characterize that? Are we talking about a very large number of sequences, are we talking about a very narrow range of sequences.

Dr. SCHULTZ: There have been a couple of evaluations done, one by the industry and by the staff. The staff has examined that in the documentation that is provided in the SECY as attachment. So, they've identified the particular sequences. I described the one that is most prevalent in that sequence where the release is associated with the inability of the drywell sprays to function properly, and the releases to the vent. That sequence was evaluated by the industry to be a representation of about maybe 10 percent of the risk associated with the containment and its release in that factor.

Other features that one needs to take into consider is how much will the vent provide as a benefit for the other sequences of release that achieve or receive cleanup from the systems, the cleanup systems that are in the reactor where inherent cleanup is taking place. The general feeling, although it's disputed, but the general feeling is that the cleanup systems will reduce the level of activity by a factor of let's say 1,000, and in that case the filtered vent would provide very little additional cleanup, and that is in fact representative of

somewhere between 50 and 90 percent of the range, depending on what evaluation you take on the other side of filtered vents.

There is of course as we've already expressed, there is noble gasses that will not be affected by the vent, and will be released if the vent is opened. So that were you get into the unintended consequences.

COMMISSIONER MAGWOOD: Yeah, and I appreciate the way you referenced the staff paper, but you've added a characterization which I hadn't heard, which was I guess you'd say was about 10 percent.

DR. SCHULTZ: That was a feature that was developed by the industry as they were looking for other ways in which the plant systems could be augmented, or the procedures could be augmented to achieve, as we were discussing in option four, achieve the intended consequence of containment, and containment performance improvement.

COMMISSIONER MAGWOOD: I appreciate that. One other quick question. I think I'm going to ask John to comment on this. As I've discovered since being here, the discussion of codes is a very emotional issue, and one question I have is when we're thinking about this issue of land contamination, when we're using MAX to basically give us the best estimates, and I think -- is that the right thing to be doing? Is it well equipped for that? I'll let you take some of the heat here.

MR. STETKAR: I can pass along the heat because I don't know anything about MAX. It's my understanding that it's not consistent with other current state of the art codes for atmosphere dispersion analysis. It'll handle I believe, and I may need some help from Dr. Rempe, who is much more familiar, aren't you? Or perhaps Dr. Powers, regarding what it can and can't do. I know it

won't handle varying meteorological conditions over the duration of the event in terms of different wind patterns and things like that. I believe it's got a multi-puff release model today. I'm not sure --

DR. POWERS: MAX is a Gaussian Plume model, which allows for statistically sampling a year's worth of weather and in that it tries to give you an integrated average of what kind of consequences you would get. It is more tuned for predicting health consequences than it is economic modeling. That's simply a reflection of where the focus of the agency is. It does predict economic consequences, but that has not received the kind of attention that it would -- that modeling has not received the kind of attention it would if that were one of the Commission's safety goals.

And, of course, economic modeling is a very challenging thing to keep up to date, because where there's weather changes over 50 100 year times scheduled, economic activity around a nuclear power plant changes on certainly a decade scale, maybe even a little faster than that. So it would represent a challenge for the modelers to keep up with that and, you know, they just have not because it's not a major thing for them to do. They do calculating -- every time they run a calculation you get the output on economic consequence modeling.

Are there better economic consequence models available that could be incorporated to MAX? Absolutely. Absolutely. And if -- where do you put your resources on these sorts of things? It would be a significant resource commitment to upgrade the Max type of modeling.

Consistently the approximation made of the Gaussian Plume has been found to be entirely adequate for regulatory needs. Is it adequate for a specific event at a specific plant or a specific experiment? No. It is an attempt to

statistically average over the weather that you have at a plant over the course of a year. It's used for risk assessment. It's not used for comparing two experiments.

In fact, when we look at the deposition of radioactivity following the Fukushima accident and look at that, MAX does pretty darn well, pretty darn well. I can, on the other hand, show you additional -- other kinds of experiments where MAX, and indeed very sophisticated multi-puff tracking models do very poorly. I can show you that for all the modeling plumes wandering around rugged terrain and with varying weather is a big challenge, technical challenge. MAX continues to get lots of assessment, lots of attention, lots of comparisons, and again, it has been the presumption that it is adequate for regulatory needs for the purposes of assessing health consequences.

COMMISSIONER MAGWOOD: Excellent. Thank you very much.

DR. POWERS: Economic modeling, you get an approximation.

COMMISSIONER MAGWOOD: Thank you. That was a pretty comprehensive lifeline.

MR. STETKAR: Yeah. You like the answer?

[laughter]

That's, by the way, one of -- the last bullet on my last slide in terms of the degree to which the tools, and I was thinking primarily MAX, the amount of resources that are allocated to improving facets of MAX that have been identified in a wide variety of areas, ought to be tailored to how the code will be used, as Dr. Powers mentioned. If the primary purpose for the use of the code is to develop a general assessment of average health consequences for a typical site, it might be okay for that purpose. If it's meant to develop a detailed evaluation of

health consequences for a specific accident at a site that has very challenging terrain and weather patterns with a population demographic that might be distributed uniquely, it might need quite a bit of update to handle that problem.

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

CHAIRMAN MACFARLANE: Commissioner Ostendorff.

COMMISSIONER OSTENDORFF: Thank you Chairman. Steve, I want to go back to you on filtered vents for a minute. Under the ACRS position for option four allowing alternative strategies, can you comment briefly on your thoughts or the Committee's thoughts on what kind of testing might be required in order to provide assurance that the projected decontamination factor might be reached under an alternative strategy other than filters?

DR. SCHULTZ: I might call upon Dana again. The Committee did consider this. We didn't move to consider what kind of testing might be required, because we feel that based upon the work, at least, that we were informed of in the evaluation of severe accident, both by the staff, by the National Labs, by industry, were based upon the best information that is currently available. We weren't identifying any particular additional information that's required. Filtered ventilation system developers came both to the staff and also presented to us and they provided data that they thought would be appropriate to demonstrate what their systems would be able to provide. And we didn't feel that in terms of advanced either facility experiments or that even experiments would, in fact, be further required to make decisions about where we might go with either equipment performance development implementation of changes with regard to response procedures and so forth would be needed.

So we weren't really looking or examining it in any extensive plan or any plan really whatsoever associated with those things that would be needed to move in the right direction with regard to improving containment performance.

There's certainly programs that have been done. We did have a recommendation as added comment to be sure that we were continuing the process of evaluating our techniques and tools that are really not only adequate, but well recognized as the premier tools to do these kinds of evaluations, the MELCOR, as well as the methodologies developed here that those tools ought to be informed by the work that is currently ongoing, as well as anything we might gain from the work of evaluation that's being done to compare our predictions with Fukushima Daiichi results.

Joy, do you have an additional comment you'd like to make?

DR. REMPE: Briefly. With respect to the filtered vents, if you're going to rely on defense-in-depth, the analysis was adequate, but if you're going to try and go with option four and you're going to say what's comparable to what was done with the analysis of the improvement associated with filtered vents, then the information that we reviewed in that enclosure does indicate that you do need to spend a bit more time in benchmarking that code against the more recent data, which it indicated in the attachment that we received it had not been done yet, because it was beyond the scope of the program. Furthermore, it appeared that -- and again, I'm -- the staff has made a valiant effort with the time and schedule and allocations they received, but they are working very hard to try to accomplish their goals. But there were -- more emphasis, I believe, as indicated in the added comments, needs to be placed on that analysis.

COMMISSIONER OSTENDORFF: Okay, thank you.

DR. SCHULTZ: And I would add to Joy's comment that there was significant progress in learning and understanding ongoing between the professionals on the staff and within industry that was occurring because of the interactions associated with this project this summer in a very short period of time. So part of option four, our recommended with option four is to move that forward and given the progress that was made in three or four months, and the progress that needs to be made in, I would say, another three or four months, associated with procedure development and hydrogen control and so forth, perhaps a little longer than that. That's the timeframe I think we're talking about to move forward with a better understanding of what can be done to improve the performance of the containments. These particular containments.

COMMISSIONER OSTENDORFF: Thank you. Thank you, Chairman.

CHAIRMAN MACFARLANE: Okay. Just a word, Sam, on economic consequences and it's just only a matter of money. You know, they think there were significant mental health impacts that would fall under the term health impacts. There have been extremely significant political impacts, which I think are important to consider.

Anyway. Back to filtered vents. So, I wonder if you guys can be a little more specific, maybe quantify, seeing how we like to do that, the amount of time required to take on option four. You know, you've specifically now mentioned a number of instances where you would require more information and there's additional information you would need to do more to really -- than the staff has done hopefully. So how much time would it take to do that? Because we suffer under -- as an agency under the -- a few issues, such as the fire protection

issue and the sump issue that have gone on for decades, some of them, and I would not like to see this issue fall into that category. So do you have a quantifiable estimate of the amount of time?

DR. SCHULTZ: I will start with "it depends."

[laughter]

And I don't mean to be facetious. It depends on the direction given. The direction given to reach the point at where we are associated with the SECY paper, was, you know, clearly directed that the SECY paper would develop the recommendations that are being brought forward now by the end of November and the recommendations with quantitative evaluations based upon the work that has been done in a very short period of time are on your doorstep.

So, as I mentioned, I feel that -- and we haven't discussed this as a committee directly, but I feel based upon the discussions we have had, but more importantly, the discussions we've had with the staff and with the industry, that no one is expected -- there's a fear that that could happen, but given proper direction I don't think it will happen. I think the intensity that has been applied to this issue already can be continued. I do think it needs to be coupled with some initiatives that are ongoing and that would contribute greatly to better understanding of what needs to be done. And that is, again, hydrogen control and severe accident procedure development and integration or review and integration. In particular, now we're talking about for these containment types, and I will tell you that this is, as we understand, already ongoing. It's already ongoing by the industry, as well as a lot of thought development by the staff, at least. We haven't gotten a report from the staff on this.

So, let's just say then that an appropriate timeframe for meeting this

better understanding that we would like to have developed for implementation of option four might be a year.

CHAIRMAN MACFARLANE: And if within a year you still have a bunch of open questions, would you kick it further down the road or say make a decision?

DR. SCHULTZ: You can always have open questions. At some point a decision needs to be made, and I do believe that not only the staff, but of course, I'll just let it be as Commissioner Svinicki indicated that the staff would recommend and the Commission would decide. But I do believe, and the Committee does believe, that a better recommendation could be developed in that timeframe than what is presented now.

CHAIRMAN MACFARLANE: Okay. Thank you.

COMMISSIONER SVINICKI: Dr. Ryan, the ACRS as a whole has been very involved in looking at GSI-191, but I in concert with other members of the Commission have worked hard to have the NRC staff look at and react to some of the dose estimates that could be incurred for the total job of removing the fibrous insulation to some levels that are being contemplated by the NRC staff. The response that we got from the NRC staff in our request for them to look at that were fairly summary. They just kind of canvassed for industry estimates, which I think can range as high as 300 to 500 Rem for the total dose incurred to implement some of these options, and the staff said they just didn't have a basis to think that that was unreasonable, they just didn't have any basis to opine on it one way or another.

Do you think that if we did a compel regulatory action as we're contemplating and require extensive removal at some plants that would have

these higher doses, do you think that there would be finally some licensee invoking the procedure -- the provision of our regulations that you've mentioned multiple times today on the special cases? Do you think it would necessitate that?

DR. RYAN: That's hard to say. I think it would really boil down to how many workers would be involved, you know, what the size of the workforce is.

COMMISSIONER SVINICKI: So you can just spread that dose around --

DR. RYAN: How many plants, you know a particular group would go to? Would it be one company with 50 people or 50 companies with 1,000 people? It's hard to say. So the collective dose is one fact, but then how that would be distributed in a workforce it would just be hard to say. So I'd need a little bit more kind of insight as to what the work plans are and the number of folks involved in an individual work plans to come up with an answer to your question.

COMMISSIONER SVINICKI: Okay, thank you. John, did you want to add something?

MR. STETKAR: Yeah, I would add something that you need to look very carefully at the skill sets that are required. I mean, the skill set that's required to remove insulation isn't necessarily a very technically focused skill set as compared to someone performing a particular operation or maintenance activity that requires a very, very specialized skill set where there would be a more likelihood of invoking special considerations. So I think I would tend to agree with Mike in my experience that those types of activities -- the cumulative

dose across the whole workforce would certainly be elevated; however, making special considerations for individual workers most likely would not.

DR. RYAN: Just as a guess I would say that planned special exposures would probably not be something invoked in that particular work activity. It's usually where a specialized function and specialized skill set that even comes into question.

COMMISSIONER SVINICKI: Okay, thank you. And the last question I had was more mundane. I had to beg the indulgence of my good colleagues on this side of the table to give me an extension on voting on the ICRP matter for some months, because the staff's paper became very out of sequence with the ACRS's consideration of the paper and I appreciate that my colleagues supported me in that so that I could have the ACRS views in hand when I voted, which was something that was just personally important to me. Are you satisfied with the amount of coordination between your Committee, your subcommittees, and the NRC staff? Is there a good opportunity to get in alignment in terms of schedules so that the Commission does not have a paper in hand well in advance of the Committee's consideration?

DR. ARMIJO: In this particular case, we had to schedule two subcommittee meetings, and we'd only planned for one because the nature of the documents we were reviewing. The issue didn't close after one subcommittee meeting. We had to require another one, then who knows what other things interfered, but basically it was going the normal progression, which normally works. Fukushima's been very difficult, because times are compressed. Schedules are tight. And, but -- by and large we're -- I'm satisfied as Chairman that we're getting things done in reasonable order. This particular one took much

more work than everybody anticipated.

COMMISSIONER SVINICKI: And I was simply using that as an example. I wasn't trying to be critical of either the staff or the ACRS and I know that with the increased pace of activities you've added additional meetings, and I know your subcommittees are more active than ever, so I appreciate your balancing all of that workload. As you project into '13 and '14, do you think that you can sustain at this pace or is it getting to be some membership, you know, meeting thresholds for the amount of time they can put into this?

DR. ARMIJO: Just looking right now, the workload in front of us actually would be somewhat lighter, but you know, there can be peaks in a particular issue where we're going to have to do some juggling, but right now it's a little bit lighter. Some things are slowing down. The reviews of some of the -- on the table may just be deferred indefinitely in the particular plants.

COMMISSIONER SVINICKI: Okay.

MR. STETKAR: We've already seen plant license renewals and power upgrades being pushed out because of the waste confidence issue, for example. That frees up a little bit of our time -- in time for the staff to shuffle things. So that's one area where we've already seen a measurable drop off. There have been some extensions in the new plant licensing also. I think there's a partial fallout from that.

COMMISSIONER SVINICKI: Okay, well thank you for juggling all that. Thank you.

CHAIRMAN MACFARLANE: Okay. All right. Well, I think we have come to the end of our allotted time. I really appreciate all your comments and I appreciate the questions and the lively back and forth. It was a very fruitful

meeting and it is now adjourned.

[whereupon, the proceedings were concluded]