

# NUCLEAR REGULATORY COMMISSION

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179th Meeting

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ADVISORY COMMITTEE ON NUCLEAR WASTE

May 17, 2007

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This transcript has not been reviewed, corrected and edited and it may contain inaccuracies.

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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ADVISORY COMMITTEE ON NUCLEAR WASTE AND MATERIALS

(ACNWM)

179<sup>th</sup> MEETING

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THURSDAY,

MAY 17, 2007

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The meeting was convened in Room T-2B3 of Two White Flint North, 11545 Rockville Pike, Rockville, Maryland, at 10:30 a.m., Dr. Michael T. Ryan, Chairman, presiding.

MEMBERS PRESENT:

MICHAEL T. RYAN Chair

ALLEN G. CROFF Vice Chair

JAMES H. CLARKE Member

WILLIAM J. HINZE Member

RUTH F. WEINER Member

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NRC STAFF PRESENT:

DEREK WIDMAYER

JEAN-CLAUDE DEHMEL

TIM FREY

TINA GHOSH

CHRISTIANA LUI

BRIAN SHERON

ROB TREGONING

DON HELTON

NATHAN SIU

PHIL REED

JOHN FLACK

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Page

Opening Remarks by ACNW Chairman	4
Proposed Revision to Standard Review Plan Chapter 11.5 for New Reactor Licensing	4
Briefing on Interim Staff Guidance (ISG-04) "Preclosure Safety Analysis - Human Reliability Analysis"	49
Briefing on Long-Term Research Activities	76

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M-O-R-N-I-N-G S-E-S-S-I-O-N

10:08 a.m.

CHAIR RYAN: On the record. The meeting will come to order. This is the second day of the 179<sup>th</sup> meeting of the Advisory Committee on Nuclear Waste. During today's meeting, the Committee will consider the following: Proposed Revisions to Standard Review Plan Chapter 11.5 for New Reactor Licensing; a Briefing on Interim Staff Guidance ISG-04 "Preclosure Safety Analysis - Human Reliability Analysis;" Briefing on Long-Term Research Activities. We concluded our ACNW Paper of Volcanism yesterday. So we will not have that session and we'll finish up with any further discussion of ACNW letter reports and white papers that we did not complete yesterday.

This meeting is being conducted in accordance with the provisions of the Federal Advisory Committee Act. Derek Widmayer is the Designated Federal Official for today's session. We have received no written comments or request for time to make oral statements from members of the public regarding today's sessions. Should anyone wish to address the Committee please make your wishes known to one of the Committee staff.

It is requested that speakers use one of

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1 the microphones, identify themselves and speak with  
2 sufficient clarity and volume so they can be readily  
3 heard. It is also requested that if you have cell  
4 phones or pagers you kindly turn them off or place  
5 them on mute. Thank you very much.

6 And we'll go right to our first session  
7 which is the Proposed Revisions to the Standard Review  
8 Plan Chapter 11.5 for New Reactor Licensing and our  
9 speaker is Jean-Claude Dehmel. Jean-Claude, nice to  
10 see you again.

11 MR. DEHMEL: Thank you.

12 CHAIR RYAN: Thank you for being with us.

13 MR. DEHMEL: My pleasure. So this is  
14 essentially the last of a series of presentations on  
15 the work that we did on the revision of chapter 11.2,  
16 11.3, 11.4 and 11.5 of the SRP NUREG 0800. As you  
17 know, this was completed and made available March  
18 2007.

19 Again, as before, I'm going to go over the  
20 purpose and scope of the SRP Chapter 11.5. Some of  
21 the approaches applied in revising that chapter to the  
22 extent of the revisions and some reports of the  
23 revisions that were implemented and reflect some of  
24 the changes and some of the reviewer responsibilities  
25 and conclusion and then we'll have an opportunity to

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1 have questions.

2 So the focus of this SRP section is on  
3 instrumentation that is used for several functions,  
4 for process monitoring as well as effluent releases  
5 and process monitoring applies both to liquid and  
6 gaseous process streams and effluence involves liquid  
7 and gaseous effluence. The typical type of -- And  
8 basically there are several components to the this  
9 chapter. One involves the hardware itself meaning  
10 that the hardware that is used to extract samples from  
11 process or effluent streams and sampling systems, the  
12 instrumentation itself that is the radiation monitor  
13 be it on-line or off-line and the kind of operational  
14 programs that are mandated by that chapter and we'll  
15 go over these. So the typical type of process and  
16 effluent streams are waste, gas hold up, condensatory  
17 accretions, steam jet rejectors and so on, a whole  
18 stream of different types of airborne process streams  
19 and airborne effluence, liquid waste including liquid  
20 waste that we've processed through mobile processing  
21 systems, so those permanently installed as well as  
22 temporary mobile systems that would be installed in  
23 the rad waste building for example.

24 CHAIR RYAN: Jean-Claude, just I think  
25 maybe to refresh everybody's thinking.

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1 MR. DEHMEL: Sure.

2 CHAIR RYAN: At some point, mobile systems  
3 come into the plant, not to the original plant  
4 assigned, but typically through a Part 50.59 sort of  
5 review. Is that correct?

6 MR. DEHMEL: Yes.

7 CHAIR RYAN: Is there a difference in how  
8 it's treated in the chapter versus how it gets started  
9 or how it becomes part of the plant?

10 MR. DEHMEL: Well, we're starting new  
11 grounds at this point. What's happening is that with  
12 the current applications that have been reviewed and  
13 approved by the NRC recently is that the commitments  
14 have been made that mobile rad waste processing  
15 systems will be the responsibility of the COL  
16 applicant to describe. So there is a description  
17 about the overall, very generic operational  
18 characteristics of what the system may contain. There  
19 is some discussion as to where and how it may be  
20 connected to permanently install portions of this  
21 system in the plant that are described in more detail  
22 in the DCD and then there are discussions about the  
23 overall performance of characteristics and then  
24 essentially what you have in the DCDs is a box, a pre-  
25 conceptual design that says this is going to be the

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1 part of the mobile system that will address liquid  
2 waste, detergent waste, that will process solid waste  
3 and so on.

4 Then when the time comes to build the  
5 plant, the applicant at that point will have to make  
6 a determination as to which system they are going to  
7 ultimately procure and install and that's the system  
8 that's going to be reviewed as part of their  
9 inspection program or as part of an ITAAC or as part  
10 of the license condition. These things have yet to be  
11 fully defined. Then after that, the plant is  
12 operating, then any time after that they can change it  
13 based on the 50.59 process.

14 CHAIR RYAN: So the 50.59 really still  
15 kicks in after a license is issued.

16 MR. DEHMEL: Right.

17 CHAIR RYAN: Okay.

18 MR. DEHMEL: And then after that, then  
19 those changes are now subject to routine inspection,  
20 the same way we're doing it for any operating plants.

21 CHAIR RYAN: Okay. Thank you.

22 MR. DEHMEL: And then so we have liquid  
23 and solid waste systems including a mobile processing  
24 system, building vents, exhausts and plant stacks and  
25 now the tendency is to have as opposed to an older

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1 design, the existing feed of operating reactor, now  
2 the design is essentially considering a single plant  
3 stack where all of the effluence from, for example,  
4 the rad waste building, the aux building, the turbine  
5 building, will be arrived to one single emission  
6 point. That is the plant stack.

7           And then obviously there are subsystems  
8 required to collect and process effluence samples. So  
9 this is for the requiring where there are some samples  
10 you cannot measure through a piece of electronic  
11 equipment and you have to extract the sample and then  
12 subject it to some laboratory analysis for chemical  
13 extraction or, for example, for tritium, process it  
14 separately. Then the key operational programs are the  
15 off-site dose calculation measure or the ODCM, the  
16 rads or the standard radiological effluent controls  
17 and the radiological environmental monitoring, the  
18 REM.

19           The purpose of the radiation monitoring  
20 systems relies on permanently-installed and skid-  
21 mounted equipment. Again, it's kind of in many  
22 aspects analogous to the approaches we use, that is  
23 going to be used, with mobile rad waste processing  
24 systems because there's a lot more experience that  
25 with kind of skid-mounted systems because many of the

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1 plant systems right now for the fleet are essentially,  
2 many, many of them are skid-mounted equipment.

3           Essentially, looking at it from the point  
4 of where you want to extract a sample where you want  
5 to analyze the effluent, we start with sampling lines  
6 including the system or subsystems or portions of the  
7 system that would involve the conditioning of the  
8 sample and/or purging of the sampling line. Then we  
9 have the radiation monitors, either on- or off-line  
10 detectors and then there are essentially processes or  
11 equipment or valves that divert or terminate the  
12 process or effluent streams depending on how the alarm  
13 setpoint is established and what are the conditions,  
14 whether or not it's a safety system or not.

15           Then there are control panels located in  
16 the control rooms and this is in the plural form  
17 because, for example, the rad waste processing system  
18 typically has its own control room and then so the  
19 monitoring system that's used for rad waste processing  
20 when it alarms, it typically alarms at two, maybe  
21 three locations. So the main control room where the  
22 operators are and also in the rad waste control room.  
23 It obviously involved local panels for alarms and  
24 system actions.

25           Then there are design specs and

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1 instrumentation. For example, an instrumentation  
2 sensitivity dynamic response range, instrumentation  
3 failure, data display and data reduction. And then  
4 there are operational issues associated with  
5 electronic and radiological calibration and self-  
6 diagnosis and so on and then finally operational  
7 issues and maintenance such as on and off line  
8 repairs, etc., those kind of routine operational  
9 issues associated with the instrumentation involving  
10 both performing some of these operational checks,  
11 doing daily sources checks, making sure that the  
12 instrumentation responses both to an electronic  
13 impulse signal as well as to built-in radiation check  
14 sources, depending on the type of system.

15 Now focusing on the key operational  
16 programs and their requirements, the first one, the  
17 most important one, is the Offsite Dose Calculation  
18 Manual which describes the method for controlling  
19 releases and describes the method with which to  
20 estimate offsite to members of the public and those  
21 are the maximumly exposed individuals. And then this  
22 radiological environmental program, the REP, which  
23 describes the environmental samples and analysis used  
24 to assess radiological activity and radiation  
25 monitoring on risk to the areas. So basically, you

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1 have a system where the environmental report as well  
2 as the COL application or the FSAR presents an  
3 asystemic source term of ISO methodology which you  
4 calculate those things identified to a maximally  
5 exposed individual and that information is used to set  
6 the alarm set points in the system and identify the  
7 kid of dilution factor, the chi/q and so on you're  
8 going to have for the purpose assessing these doses to  
9 this mechanical process which is the Offsite Dose  
10 Calculation Manual.

11 The alarm set point is out there to  
12 essentially identify limits above which some process  
13 should be terminated or the operation be notified for  
14 the purpose of taking some action as it identifying  
15 the Offsite Dose Calculation Manual. And the REP  
16 essentially is the proof in the sense that after  
17 having done all this you go out and collect samples,  
18 look at monitoring stations and so on and confirm that  
19 indeed radioactive releases have been well within the  
20 requirement of the Offsite Dose Calculation Manual and  
21 you have not exceeded the requirements of Appendix I,  
22 design objectives, the 3 millirem and 10 millirem per  
23 year, for liquid effluent and 5 and 15 for gaseous  
24 effluent, met the requirements of 40 CFR Part 190 and  
25 the effluent concentration limits of Appendix B of

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1 Part 20 are also being met.

2           Regarding the development of the guidance,  
3 there are some key documents, NUREG-1301 for PWR,  
4 NUREG-1302 for BWR, type over there. I'm sorry, but  
5 that's NUREG-0133 which applies to both types of  
6 plants, PWR and BWR, Generic Letter 89-01 which is  
7 contained in NUREG-1301 and NUREG-1302 and this  
8 generic letter essentially allows the plant operator  
9 to licensee utilities to take the tech spec  
10 requirements that were essentially in the tech spec  
11 and place them all in the Offsite Dose Calculation  
12 Manual. So the requirements are still the same. What  
13 the generic letter did is it allowed one to put these  
14 requirements in a separate document which would not if  
15 they were changed require a license amendment as  
16 changes are normally required -- if such a change was  
17 normally made the tech specs. So this essentially is  
18 a sub-tier of tech specs that we translated and moved  
19 into the ODCM and do not require license amendment and  
20 that can be implemented by the utility as needed,  
21 document it for 50.59 process in order to diagnose the  
22 inspectors and the NRC-1979 Branch Technical Position  
23 of Radiological Assessment which is also contained in  
24 NUREG-1301 and 1302.

25           And in response to Part 50 requirements in

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1 Appendix I as well NUREG-1301 and 1302 and the generic  
2 letter, there are annual reports that have to be  
3 submitted by the utility. One is the Annual  
4 Radiological Environmental Operating Report and the  
5 other one is the Annual Radioactive Effluent Release  
6 Report. And then sprinkled through all these  
7 documents as well as in the Regs., there are these  
8 notification criteria and record keeping requirements  
9 which I have summarized here.

10 The key acceptance criteria cited in the  
11 SRB Chapter 11.5 are Part 20 requirements which we're  
12 all familiar with and then the Part 50 requirements,  
13 the most important ones are obviously Part 50.34(a) on  
14 the equipment to control releases of radioactivity,  
15 50.36(a) which is the genesis for the tech specs and  
16 the operating procedures to control and monitor  
17 releases of radioactivity and then there are also some  
18 associated items on the TMI-related requirements,  
19 design criteria 60.63 and 60.64 which has been  
20 implemented at a time by the COL applicant as well as  
21 also in the DCD, the Part 50 Appendix I ALARA dose  
22 objective for all effluence. This is kind of the  
23 subset of Appendix I. This is called Section 2D which  
24 requires that once a type of system that's being used  
25 to reduce liquid effluence or gaseous effluence it is

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1 installed that a cost/benefit analysis be done such  
2 that one can demonstrate that it is ALARA and then the  
3 other requirements identified for the purpose of the  
4 licensing of the Part 52, 52-47 and 52-97, as they  
5 relate to DCD and COL applications.

6 Key guidance in the SRP again, Reg Guide  
7 1.70 for the existing feeder operating reactor and Reg  
8 Guide 1.26 for the upcoming wave of applications, Reg  
9 Guide 1.21 on measuring, evaluating and reporting  
10 effluence, Reg Guide 1.33 on operation of QA programs,  
11 Reg Guide 1.17 on instrumentation to assess conditions  
12 during accident conditions, it means accident/post-  
13 accidents both, Reg Guide 4.1 on monitoring of  
14 radioactivity, 4.8 on around tech specs, 4.15 on  
15 quality assurance, ANSI N.13.1-1999 on sampling and  
16 monitoring from ducts and stacks, ANSI N.42.18-2004  
17 performance of instrumentation. Of these reg guides,  
18 obviously Reg Guide 1.26 is new, Reg Guide 1.21 is in  
19 the process of being revised, 1.97 has been revised,  
20 I think it's 2006, it escapes me right now, 1.33 is in  
21 need of revision, 4.1 is being revised, 4.8 is on the  
22 books to be revised, 4.15 has been revised.

23 So the structure of the chapter, Chapter  
24 11.5, essentially is still the same as before. There  
25 are secondary responsibilities. With respect again as

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1 before to Chapters 2, 3, 4, 5 of the SRP, the Health  
2 Physics group has the responsibility as having the  
3 prime review and it's supported with other technical  
4 branches. So for Chapter 11.5, some support here or  
5 secondary responsibilities include I&C and balance of  
6 plant.

7 As before, we've gone over this before  
8 with the other subsection of Chapter 11 of the SRP.  
9 We identified and flagged some issues associated with  
10 compliance of 20.1406, Minimization of Contamination.  
11 So some of the things that you've seen before are  
12 virtually identical here. Again, I just wanted to  
13 remind you that why we were preparing the update of  
14 the SRP we didn't have the benefit of the Reg. Guide  
15 that has been prepared for 20.1406. That's a work in  
16 progress and we know there's a rulemaking ongoing for  
17 20.1406 as well. The information that you see here on  
18 this slide as well as that's in the SRP right now are  
19 kind of placeholders with the understanding that  
20 whatever guidance emanates out of the new reg. guide  
21 and whatever is any of the requirements of the revised  
22 Rule 20.1406, we're going to have to go back in and  
23 update all those sections in the SRP in 11.2, 11.3,  
24 11.4, 11.5 to reflect the new guidance.

25 We've provided some additional

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1 supplemental guidance on meeting the 20.1301(e) and  
2 EPA environmental dose standards in 40 CFR Part 190.  
3 Again, the next bullet addresses the fact that this  
4 relates to all potential sources of radioactivity and  
5 radiation. The difference is because Appendix I  
6 requirements on the per plant basis, well, 40 CFR Part  
7 190 is for the entire site regardless of how many  
8 plants there are and only involves the liquid and  
9 gaseous effluence, but radiation and radioactivity  
10 from other sources of material onsite, for example,  
11 tanks that may contain a radioactivity, in term, rad  
12 waste storage facility or staging areas during major  
13 outages and so on.

14 And as compared to the maximally-exposed  
15 individual under Appendix I, the requirement of 40 CFR  
16 Part 190 are for a real member of the public and all  
17 of this is essentially folded into the ODCM and the  
18 REMP and the doses for radiation is dealt with a  
19 different chapter, Chapter 12, of the SRP. Again,  
20 some of the miscellaneous changes and updates are  
21 similar to the other sections that we talked about  
22 before on 11.2 through 11.4. This is really nothing  
23 new here.

24 In conclusion, we've done some minor  
25 updates. The structure of the chapter remains

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1 unchanged. We provided more detailed guidance to  
2 staff and applicant on specific updates and just to  
3 flag those, if you compare this version of the SRP  
4 with the prior one there is more elaboration  
5 discussion about the content of these operational  
6 program documents, the ODCM, the REMP and the tech  
7 specs. We also provided some further clarification  
8 and amplification on two elements, one on the  
9 calibration of the instrumentation, again the fact  
10 that the calibration response of the instrument may be  
11 different if we have a source term that involves  
12 routine operation where the radionuclide mix may be  
13 different than under abnormal conditions as well as  
14 during accident/post-accident condition. So in  
15 calibrating the instrumentation and determining the  
16 responses of the instrumentation depends on whether  
17 it's liquid or gaseous effluent, we flagged the fact  
18 that the conversion factor that may be used to  
19 convert, say, raw counts per minute to a meaning for  
20 radiological units such as microcuries per mL or  
21 microcuries per second. But the conversion factor may  
22 be different to reflect those conditions. And we also  
23 flagged the need since most of the instrumentation now  
24 comes prepackaged from the vendor where the instrument  
25 does the raw data conversion to meaningful

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1 radiological units so that the utility or the licensee  
2 would have to be aware of making sure that they agree  
3 with the software and the conversion that the vendor  
4 is using to convert again from raw radiological units  
5 which are counts per minute, counts per second, to  
6 appropriate radiological units.

7           Again, we have incorporated information  
8 from recent staff studies having to do with water  
9 contamination from the Lessons Learned Task Force and  
10 some D&D lessons learned report and with respect to  
11 the long term, again as I noted earlier is that we're  
12 going to update all SRP chapters after the issuance of  
13 the reg. guide and Part 20 and the rulemaking of Part  
14 20.1406, whatever the task force recommendations are  
15 regarding the tritium leaks and spills that were noted  
16 in the groundwater contamination Lessons Learned Task  
17 Force report. And then as we progress, that chapter  
18 will have to be obviously updated as the computer  
19 codes and reg. guides are updated to reflect whatever  
20 changes were made so that it's all internally  
21 consistent with the SRP and all the cited references  
22 including the reg. guides and the supporting computer  
23 codes.

24           That concludes my presentation and if you  
25 have any questions, I'll be glad to entertain them.

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1 CHAIR RYAN: Bill.

2 DR. HINZE: A few questions if I might  
3 please. What kind of input have you received from the  
4 user community in preparing this revision? Has this  
5 been passed by the users?

6 MR. DEHMEL: Yes, it was made available on  
7 the website as a draft and then we have gotten some  
8 comments separately from NEI and those comments were  
9 kind of tied altogether with their utilities and NEI's  
10 review of reg. guide 1.206.

11 DR. HINZE: So there was no overt attempt  
12 to get input from the user community on specific  
13 guidance here?

14 MR. DEHMEL: No, my understanding the SRPs  
15 are NRC documents and basically the Agency publishes  
16 those documents and they are implemented. The  
17 comments we have received which tie the draft reg.  
18 guide 1.206 together and also the fact that in the  
19 reg. guide we referenced the SRP so there was a  
20 vehicle or means for NEI to submit some comments.

21 But basically the comments were three  
22 types that I can relate to you. One is the idea that  
23 the industry recognized that some of the computer  
24 codes under the reg. guides need to be updated. This  
25 was very clear. No one disagreed there. The other

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1 one was, the other category of comments, was that NRC  
2 is asking a lot of information and this information  
3 will not be available at a COL application stage and  
4 therefore there has to be a mechanism by which the  
5 delta, and that's addressed in reg. guide 1.206, is  
6 that as opposed to prior licensing procedure now you  
7 have a DCD in place that may or may not have been  
8 approved but essentially there is a document that  
9 essentially validates a type of reactor system that  
10 the NRC is in the process of reviewing or is being  
11 approved and then there is possibly an early site  
12 permit which banks a site as being suitable to accept  
13 one or more reactors and that once the applicant takes  
14 the information from early site permit and takes a DCD  
15 and packages it together in COL application is that  
16 utilities say that the actual construction and the  
17 final detail design is now going to occur some years  
18 down the line, anywhere from five to six years or ten  
19 years, that some of the items that are described both  
20 in the reg. guide 1.206 and also described as being  
21 needed in the SRP will not be available and therefore  
22 there should be a mechanism in the licensing process.

23 The way the SRP right now is written in  
24 11.2, 11.3, 11.4 and 11.5 regardless whether or not  
25 we're dealing with liquid or gaseous effluence of

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1 waste or solid waste or radiation in system to liquid  
2 and gaseous effluence, there is no escape clause  
3 there. The information is required and it's mandatory  
4 for the staff to be able to look at it and evaluate it  
5 in order to reach the evaluation findings that are  
6 stated at the end of each section of the SRP. So this  
7 is something that is being addressed through the upper  
8 tier of the other branch of the NRC that's dealing  
9 with infrastructure and so on as in the licensing  
10 process how this is going to be dealt with.

11 So the issue -- Just to make a long story  
12 short on that element was that we are requesting  
13 information both in the reg. guide and the SRP that  
14 the applicants, future applicants or near-term  
15 applicants, we won't have that by the time we supply  
16 the application to you.

17 DR. HINZE: I guess that kind of gets to  
18 my second question I wrote down here. How robust is  
19 this standard review plan and certainly we all know  
20 about the advances that are made in hardware and  
21 operational procedures and so forth. Is this written  
22 with sufficient flexibility and I think that was what  
23 you were really getting at, Jean-Claude, that there  
24 needs to be some flexibility in this to incorporate  
25 future instrumentation or do you look at the

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1 instrumentation and modify this as it becomes  
2 available?

3 MR. DEHMEL: The flexibility -- This point  
4 you're raising also applies to mobile waste processing  
5 system.

6 DR. HINZE: Sure.

7 MR. DEHMEL: And the approach, we've had  
8 several meeting with the utilities and potential  
9 applicant on this subject alone and the idea was that,  
10 for example, they are telling us that the level of  
11 details required it cannot be provided. For example,  
12 these operational documents, they cannot be prepared,  
13 that rad waste processing system that are being  
14 designed or that will be designed in the near term,  
15 they don't have enough design specifications to  
16 include information now. So the idea of postponing  
17 these kind of major operational program or providing  
18 the technical details on different types of rad waste  
19 processing systems, that's where the utilities and the  
20 applicant is looking for flexibility.

21 We have the flexibility. In the context  
22 the way we described it in these meetings is that with  
23 respect to, for example, in complying with Part 20 or  
24 complying with Appendix I, we have to demonstrate to  
25 you that we can meet those requirements now. But

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1 we're not essentially forcing the applicant that once  
2 described the hypothetical system that this is exactly  
3 the same type of system that's going to have to be  
4 installed.

5           And our approach in discussing this across  
6 the table was that to provide enough information in  
7 these COL application packages such that if you put  
8 the health physicist, a systems engineer and a  
9 radiochemist together in a room they'll say that we  
10 agreed that if you have that kind of system with these  
11 major elements, major features, in this kind of ionic  
12 change goes on or this kind of instrumentation that  
13 you can meet those objectives of Part 20 and Appendix  
14 I and that the applicant would only need to caveat the  
15 application by stating that it is recognized that by  
16 the way the time the plant is actually built the  
17 applicant at this point will look at whatever systems  
18 are available commercially and make a decision and  
19 thereby make a commitment that whatever they  
20 ultimately end up installing and reinspecting as part  
21 of the licensing process that it be of equal or better  
22 performance and so this issue is still in the realm of  
23 discussion with the applicants, but that's essentially  
24 the approach that the staff is using at this point.

25           DR. HINZE: Finally, you talked about

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1 incorporating the tritium task force recommendations.  
2 How will that be done and does that mean that you will  
3 issue the review plan again? I'm ignorant about this.  
4 Or can you just have an addendum? Do you have to go  
5 through a lot of procedure to add those? What's the  
6 process?

7 MR. DEHMEL: We're going to look at the  
8 recommendation, I believe. I mean Tim can talk about  
9 this a little bit more, but there are several task  
10 forces that are essentially looking at the  
11 recommendations and the recommendations will be  
12 issued. Then management will have to make a decision  
13 as to how these things will be implemented and then  
14 depending on these recommendations we're going to go  
15 back in the SRP and see what the recommendation is,  
16 what the impact is on the SRP and we're going to  
17 supplement. We're just going to revise the SRP.

18 DR. HINZE: I see.

19 MR. DEHMEL: Tim.

20 MR. FREY: Yes. Tim Frey, Branch Chief  
21 for Health Physics. I think as Jean-Claude mentioned  
22 earlier in the briefing one of the key outputs that  
23 the staff is doing and it's really NRR that has the  
24 lead as revising a couple of reg. guides, Reg. Guide  
25 1.21 and Reg. Guide 4.1 to address the Lessons Learned

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1 Task Force and as those get revised that guidance will  
2 be reflected in the SRP.

3 DR. HINZE: Thank you.

4 CHAIR RYAN: Allen.

5 VICE CHAIR CROFF: I'd better lean  
6 forward. In your slide 10 in a couple of places  
7 there, you have phrases and quotes, "real member" and  
8 "total dose." When I see that, it sort of leads me to  
9 think that I'm mean that your intension is to say some  
10 document says "real member" but maybe we don't really  
11 mean that. What should I read into that? What are  
12 you trying to tell me with those?

13 MR. DEHMEL: The distinction between the  
14 recommendation of 40 CFR Part 190 and Appendix I is  
15 that the appendix slide calculations are the ones that  
16 are done every month or before a batch release occurs,  
17 liquid or gaseous effluent. Those calculations  
18 reflect maximally-exposed individuals as it is defined  
19 in Reg. Guide 1.109. That means something with  
20 respect to the kind of individual assumptions made as  
21 to the location of that individual, the kind of  
22 exposure pathway that individual may be exposed to and  
23 so on and again, that's based on a per plan basis as  
24 opposed to 40 CFR Part 190 which is a person outside  
25 the fence. So in this case it could be the nearest

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1 house with a real resident in it.

2 The total dose meaning that when Appendix  
3 I, the way the requirements are set up, it only deals  
4 with gaseous and liquid effluence while the  
5 requirements of the EPA normally addresses liquid and  
6 gaseous effluence, but also external radiation. So,  
7 for example, if you have a turbine building from a BWR  
8 where, for example, it's Nitrogen-16 as a significant  
9 contribution to potential outside doses due to the sky  
10 shine, then in calculating the total dose as it is  
11 defined in NUREG-1301 and NUREG-1302 you would  
12 consider liquid and gaseous effluence, the  
13 contribution of those effluent releases to that real  
14 member, whoever that is as it defined just outside the  
15 fence, and that real member is defined by these PRA  
16 called these yearly land use census and the  
17 contribution of direct dose, direct shine from  
18 external radiation, takes into account, for example,  
19 the BWR from turbine building skyshine in a rad waste  
20 storage building, a rad waste warehouse that may be  
21 used, a storage warehouse that may be situated,  
22 temporary staging area where radioactive waste and  
23 material and equipment is stored during a major outage  
24 condition and so on. So the total dose is different  
25 in the context of complying with 40 CFR Part 190 than

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1 it is with Appendix I requirements.

2 VICE CHAIR CROFF: I understand now what  
3 you're saying about total dose. I'm still not sure  
4 about the real member. As I understood it, depending  
5 on, well what does Chapter 11.5 say about the real  
6 member? As I heard it, there were two real members.  
7 One was a maximally-exposed and the other was a real  
8 person outside the fence. Does that mean there are  
9 two different calculations to show how two different  
10 regulations are met?

11 MR. DEHMEL: It could be. But in most  
12 cases to simplify the issue is that the utility  
13 combines the two. So you have maximally-exposed  
14 individual, but that person and location happens to be  
15 also the same person that's used for the purpose of  
16 doing those calculations for 40 CFR 190.

17 VICE CHAIR CROFF: Okay. Thanks.

18 CHAIR RYAN: Jean-Claude, that kind of  
19 brings me to something we just discussed at our  
20 planning and procedures meeting. We're thinking about  
21 the string here. I think we understand the standard  
22 review chapters and we dealt with the GALE code as an  
23 issue that backs up a couple of those and as I'm sure  
24 as you're probing now with Allen, there are other  
25 codes and calculations that go back. I was just

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1 trying to quickly identify what is the data in Reg.  
2 Guide 1.109 now. Late '70s?

3 MR. DEHMEL: Yes. All the T reg. guides  
4 are essentially 1976 and 1977.

5 CHAIR RYAN: And I'm going to guess most  
6 of those are not risk informed.

7 MR. DEHMEL: Right.

8 CHAIR RYAN: I'm going to guess that most  
9 of those kind of rest on bounding assumptions and  
10 bounding calculations and overestimates of dose by a  
11 modern kind of risk informed thinking and the  
12 structure of how the chapter is revised and how it  
13 relates to the documents I think you've laid out very  
14 well in all these briefings. But we're beginning to  
15 think about pulling the string a little bit and saying  
16 what's the substance backing up this structure in  
17 terms of what are the reg. guides. What's the  
18 underpinning of the reg. guides? We touched on the  
19 GALE code, just the idea that it's a calculational  
20 tool that's probably not as well vetted as a more  
21 modern tool that we would use today for some  
22 application just because it's older and folks who  
23 wrote it are gone and retired and it's in Fortran and  
24 all the things we talked about.

25 So I think what we're thinking about and

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1 I throw this idea out to you and to Tim is we'd like  
2 to study a little bit and get ourselves ready to think  
3 about what in the reg. guide arena or in the  
4 fundamental documents arena are out there that an  
5 applicant would use and can we offer the Commission  
6 any insights that there ought to be a little bit more  
7 of a systematic assessment of those that -- Let me  
8 just pick out some categories for just the sake of the  
9 discussion of need immediate attention, are okay but  
10 a couple of work-arounds might be needed or they're  
11 fine the way they are just as a rough cut. I think if  
12 that was offered to applicant, that might ultimately  
13 even though it's some work up front now, might  
14 ultimately serve the review process in a good way. Do  
15 you have any reactions or thoughts to that idea?

16 MR. DEHMEL: Yes, I concur with you.  
17 Since we've been at this, these reg. guides are kind  
18 of like living documents. We look at them almost  
19 every day and you could look at potential revisions of  
20 these documents in three tiers. The first one is  
21 that, for example, if we're concerned about the reg.  
22 guides being outdated with respect to the basis of  
23 radiation dosimetry, ICRP-2 19.59 vintage versus the  
24 current Part 20 or the upcoming recommendations from  
25 the ICRP, one way to deal with that would be to simply

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1 go in there, in the reg. guides, and obviously this is  
2 the simplest revision and the most cost effective  
3 revision with respect to expenditure and time of  
4 effort would be to go in there and say, "I'm going to  
5 go in there and change all the dose conversion factors  
6 and modify the routine of the code so that when I have  
7 the new dose conversion factor I can calculate dose  
8 according to either ICRP 26 and 30. So that would be  
9 one approach.

10 CHAIR RYAN: Right.

11 MR. DEHMEL: The simplest approach. The  
12 other tier of review and modification would include  
13 the first one plus the revision of the factors that  
14 directly impact dose such as bio-accumulation,  
15 consumption rate and so on, occupancy rate and so on,  
16 shielding factor credits that are provided into the  
17 code. So that would be essentially the next level of  
18 review. So that would be at this point we were  
19 talking about mounting some mini-research project to  
20 figure out what are, for example, bio-accumulation  
21 factor for the BIV transfer factor from soil to plants  
22 and so on and update that.

23 The third revision would be essentially a  
24 complete revision where we're saying "This is set of  
25 reg. guides is fine for the existing feed of operating

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1 reactors. But what we are going to do now for the new  
2 reactors is revise this thing from top to bottom.

3 CHAIR RYAN: So that might even be a  
4 different platform, use of inputs.

5 MR. DEHMEL: Exactly.

6 CHAIR RYAN: And it's a refresh review.

7 MR. DEHMEL: That's right. Fresh review,  
8 starting from scratch with no hindrance, with no tie  
9 to the existing methodology. We could look at this  
10 with such things like no ties to what has currently  
11 been done. What that would involve is major level of  
12 effort. You're talking about years of research to  
13 support information.

14 I realize that since then there is a lot  
15 of information available that was not available when  
16 the reg. guide 1.109 generated. For example, if you  
17 look there's a database, ISCORS. It's a large  
18 database now available on Factor that may be used for  
19 environmental dose calculations. So there's a wealth  
20 of information. ICRP has done some work. IAEA.

21 CHAIR RYAN: Even Larson and so forth.

22 MR. DEHMEL: Exactly.

23 CHAIR RYAN: That's all been brought  
24 forward in the new commissioning arena. So there's no  
25 reason that that same information shouldn't be brought

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1 forward to the reactor arena.

2 MR. DEHMEL: Exactly. Right. And then  
3 we've heard talking to industry and other groups that  
4 should dose calculation for Appendix I be done  
5 probabilistically, the same way that it's done for  
6 compliance with the decommissioning criteria and 40  
7 CFR Part 20.1401 and the question then is should we  
8 apply that methodology. There are some people out  
9 there who really think that we should do probabilistic  
10 dose calculation to demonstrate compliance with  
11 Appendix I. The question is should that be something  
12 to consider or should it be based on the all  
13 deterministic method? Does it warrant to be  
14 probabilistic the same we're doing for demonstrating  
15 compliance of 25 millirem per year for  
16 decommissioning? So what I'm suggesting is a third  
17 level of revision, everything is up for grabs,  
18 everything is up for review. We're starting a clean  
19 slate and we're free to go.

20 The other thing that we've heard is that  
21 why even bother with Appendix I. Just delete it from  
22 Appendix I. Slip it into the ALARA requirement of  
23 Part 20. So you just open your vision on this one and  
24 everything is possible so to speak as to what may be  
25 considered. What ultimately the Agency and the

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1 Commission decides to adopt that's a different story.  
2 But you could toss a lot of option on the table and  
3 look at all of these and figure out which way they go.

4 CHAIR RYAN: And I think our tack is to  
5 think about the reg. guides and the codes and the  
6 underpinnings of the structure and the requirements,  
7 maybe more towards that sort of first look of are  
8 there any showstoppers, things that are just so out-  
9 of-date they might not even be useful at this point or  
10 they're wrong or there's a hardwired parameter that  
11 really shouldn't be hardwired and isn't what's in the  
12 hardwired number or those kinds of things and I have  
13 no sense at the outset here of how much effort we've  
14 put in here to even get to level of detail. But I  
15 think you want to at least examine the question and  
16 see if there's any real criteria issues.

17 I mean just on the dose symmetry alone we  
18 have everything from ICRP-2 which was developed and  
19 published in 1959 as you all know all the way up to  
20 now ICRP-68 which is the newest on the street and that  
21 spans 50 years of dosimetry. I've heard Ralph  
22 Anderson talk about the fact that they're happy that  
23 the *Health Physics Journal* published ICRP-2 in that  
24 DVD compendium because that's the only place you get  
25 it. It's not available anymore and they have to teach

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1 it to their folks to use it.

2 MR. DEHMEL: We have the same problem.  
3 We're hiring people and --

4 CHAIR RYAN: They've never been taught  
5 ICRP.

6 MR. DEHMEL: Yes. That's right. It's not  
7 being taught in the health physics curriculum.

8 CHAIR RYAN: And it's not just a simple  
9 matter of different factors. It is a completely  
10 different way of calculating critical dose.

11 MR. DEHMEL: Correct.

12 CHAIR RYAN: We won't go into the details,  
13 but it's a different method. And I know that there's  
14 a provision that if any licensee says "Hey, we want to  
15 use the modern dosimetry in a Part 20 evaluation and  
16 exposure" no problem. Please do. It's an easy  
17 request and so forth, but --

18 MR. DEHMEL: It's an easy request, but  
19 remember that the staff is not prepared to do those  
20 evaluations because all the tools that we have with  
21 respect to the guidance is that it's all defined in  
22 those reg. guides, all defined in the SRP. So if  
23 somebody were to submit an application based on SRP-26  
24 or SRP-68, we would have to scramble and actually  
25 develop a tool that would be suitable to do this

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1 analysis and we don't have it.

2 It's something that any of us could  
3 develop a spreadsheet to do this calculation, but the  
4 question is is this the way it should be done. I  
5 mean, that kind of supplemental tool would have to be  
6 developed with some recognition that this is the way  
7 to approach it. Here's what is going to be developed  
8 up and how is the structure, how it is going to be  
9 structured, and so on, some recognition. So it's not  
10 like every health physicist -- one health physicist  
11 reviews an application X, Y, Z and another one from A,  
12 B, C to developing their own spreadsheets. That's a  
13 disaster.

14 CHAIR RYAN: Yes, that's terrible.

15 MR. DEHMEL: This is kind of licensing by  
16 anarchy. You can't do that. So we would have to  
17 scramble and come up with a tool, a methodology, that  
18 would be consistent.

19 CHAIR RYAN: And more importantly, it's  
20 better for the licensee to see a transparent tool so  
21 they could understand what the expectation is.

22 MR. DEHMEL: Correct.

23 CHAIR RYAN: I guess what I'm thinking is  
24 that we're going to begin to probe this a little bit  
25 more formally in more detail so that we can at least -

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1 - You know, way back, I don't know, a year and a half  
2 or so ago, I remember Dr. Paperiello gave a  
3 presentation on the age of reg. guides and it was very  
4 interesting that a lot of them are 30 years plus old.

5 MR. DEHMEL: Right.

6 CHAIR RYAN: And like I said, there may be  
7 some. That's fine. They don't need to change. But  
8 I think it would behoove us as a committee to maybe  
9 help with your help, of course, identify maybe some  
10 critical issues that need to be brought forward so  
11 that other parts of the organization or research or  
12 contractors or whoever can be identified to help maybe  
13 with some of these kinds of questions and get the  
14 tools up-to-date because I'm personally -- It makes me  
15 a little bit nervous as a former applicant to find out  
16 that some of the things I'm using to apply for an  
17 activity may be basically out-of-date.

18 That doesn't mean they're wrong or bad or  
19 can't be used. It's just maybe there's the refreshing  
20 process needs to be a little bit more formal and again  
21 more transparent so everybody understands, yes, we're  
22 using an old code that we've refreshed it in these  
23 ways. We've examined it, determined it was workable  
24 and these are the working constraints and then  
25 everybody is on the same page. That's sort of start

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1 over and let's get a real modern whiz-bang special  
2 graphics computer code which would take time and  
3 effort. Does this kind of make sense to you?

4 MR. DEHMEL: Yes. The technical staff, my  
5 level, we've been striving, pushing for this for  
6 awhile.

7 CHAIR RYAN: Yes.

8 MR. FREY: It makes a lot of sense and we  
9 have been working with the Office of Research for the  
10 last several months to establish a working which  
11 really started when we came with the update to Reg.  
12 Guide 112 in the GALE code and we recognized that code  
13 needed a review and update and the reg. guides and  
14 NUREGs that support it need a review and update. So  
15 we have been working with the Office of Research to do  
16 just what you're suggesting to establish a working  
17 group and review all these reg. guides and codes that  
18 do provide the underpinning for the SRP and figure out  
19 which ones need to be updated.

20 CHAIR RYAN: Great. I don't want to take  
21 up all the time. Ruth, do you have any questions?

22 DR. WEINER: As long as you have that  
23 slide up, thank you, Jean-Claude, what is meant  
24 exactly by "integration of all exposures and pathways  
25 in total dose"? What do you do, add them altogether?

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1 How do you integrate them?

2 MR. DEHMEL: I think maybe I should have  
3 said a "summation of all exposures."

4 DR. WEINER: Okay.

5 MR. DEHMEL: Sorry. I think the idea was  
6 to make sure that again as I stated earlier on our  
7 Appendix I, compliance to Appendix I only addresses  
8 itself to liquid and gaseous effluent releases and not  
9 external radiation. So the integration of summation  
10 of all exposure meaning the summation of all different  
11 sources of radiation, of source of radiation exposure,  
12 that include liquid and gaseous effluence and external  
13 from facilities and buildings and temporary rad waste  
14 storage areas and so on such that once the doses from  
15 each of those respective pathways and different types  
16 of effluence are summed or integrated that one can  
17 demonstrate compliance with the EPA's environmental  
18 standard of 40 CFR 190.

19 DR. WEINER: Yes, the thing that disturbs  
20 me and maybe it's not a question here is that if you  
21 integrate the inhalation dose with the ingestion dose,  
22 the people who receive the ingestion dose is a  
23 different group. I mean it isn't necessarily that  
24 everybody who lives within a certain number of miles  
25 of the --

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1 CHAIR RYAN: This is an individual dose  
2 though.

3 DR. WEINER: Oh, this is the individual  
4 dose. Well, still the -- You're assuming that it's  
5 the same individual who receives all these doses.  
6 That's what I'm trying to get at.

7 MR. DEHMEL: In the structure of the  
8 offsite dose calculation manual as well as the result  
9 of the land use census, the data or the approach you  
10 demonstrate compliance both on the dose side and the  
11 EPA standard would recognize the fact that, for  
12 example, if you have somebody that lives near the  
13 fence, the EAV, you would be exposed to external  
14 radiation and gaseous effluent releases but the  
15 discharge point, the liquid waste could be such that  
16 the dose receptor is like miles down the road and in  
17 that context, the structure and the calculational  
18 methods in the ODCM in demonstration of, in  
19 demonstrating compliance with 40 CFR Part 190, would  
20 recognize that it's impossible to have one person  
21 exposed to both pathways.

22 DR. WEINER: Thank you. That was exactly  
23 what I was getting at.

24 MR. DEHMEL: Yes. Absolutely. That's  
25 recognized.

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1 DR. WEINER: And you are looking only at  
2 individual doses. You're not looking at collective  
3 doses here. Is that correct?

4 MR. DEHMEL: There is a calculation in  
5 looking at collective dose, but it's not -- The NRC  
6 uses it or they have used it for the purpose of, for  
7 example, comparing what the ER of the application  
8 package may have said. So for a plant where it's  
9 newly constructed and it has a number of years of  
10 operational history the original inspectors may want  
11 to look at the doses that were reported, both  
12 individual and collective doses in the environmental  
13 report as well as the staff's final environmental  
14 impact statement and compare that to what the doses  
15 are currently for the purpose of determining whether  
16 or not some actions should be done. There are  
17 provisions in Part 20 and Part 50 that says that the  
18 NRC shall look at these doses, compare them to what  
19 was submitted and take appropriate action to reduce  
20 and I think Part 20 the language says to reduce  
21 collective doses. So there are dose provisions, yes.

22 DR. WEINER: Thank you.

23 CHAIR RYAN: That's on the edge of where  
24 it's technically justified and not. I mean to me and  
25 I think the Committee is on record in the letters

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1 saying that in relative of comparisons, particularly  
2 let's say an ALARA setting. Process A gives you 10  
3 REM to work as Process B gives you 5. Process B is  
4 probably better if it's about the same cost. Makes a  
5 lot of sense, but very often collective doses that  
6 have microdoses to mega people are misinterpreted in  
7 terms of their ultimate risk.

8 MR. DEHMEL: You see, this is another  
9 thing if we had to reconsider Appendix I from top to  
10 bottom, we would revisit that as well and say --

11 CHAIR RYAN: Right. Then it should be a  
12 dose criteria.

13 MR. DEHMEL: Yes.

14 CHAIR RYAN: Or some other criteria, but  
15 that's one where I think there's an opportunity to  
16 improve understanding because it is just flat out  
17 wrong to apply those probability kinds of estimators  
18 to an individual. It's just wrong. They don't make  
19 sense. You cannot apply the population probability to  
20 any one individual or small group. It's just bad  
21 statistics.

22 MR. DEHMEL: Yes, in this case you could  
23 say that if you can show that the doses to a single  
24 individual is low enough that it becomes a surrogate  
25 and you can say therefore the entire population is

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1 protected. That could be a conclusion.

2 CHAIR RYAN: And again, if that presents,  
3 even if it's probabilistic and you say this is the  
4 geometric mean or this mean or that kind of an  
5 average, you can arrive at that kind of assessment in  
6 a number of really good ways compared to just relying  
7 on a arrived --

8 DR. WEINER: Thanks.

9 CHAIR RYAN: Jim.

10 DR. CLARKE: Thanks, Mike. Just a couple  
11 of questions. Could we go to Slide 12? And I guess  
12 what I'm interested in is how some relatively new  
13 information is being brought back to the reg. guide.  
14 For example, I'm looking at your acceptance criteria,  
15 Part 2, and you do have 10 CFR 20.1406 incorporated by  
16 reference and it's No. 5 under that acceptance  
17 criteria based on meeting the relevant requirements  
18 and if we go up to the fourth bullet, ground water  
19 contamination Lessons Learned Task Force report, D&D  
20 lessons learned report, is the intent to incorporate  
21 those by reference or are you taking specific items  
22 that would be appropriate to this reg. guide and  
23 putting that language into the reg. guide or just how  
24 do you do that? How do you take what we've learned  
25 relatively recently and bring into the reg. guide? Is

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1 it by reference or do you have specific guidance, I  
2 guess, is the question. If you could just point me to  
3 it, I can find it and read it.

4 MR. DEHMEL: Yes.

5 DR. CLARKE: But I was kind of wondering  
6 in general how you intend to do that.

7 MR. DEHMEL: What we intend to do  
8 depending ultimately how the recommendation is  
9 structured and what ultimately management decides what  
10 should be implemented, we're going to look at these  
11 and essentially incorporate the ones that essentially  
12 relate to the objective of the SRP. For example,  
13 there will be recommendations addressing, for example,  
14 design features of plants that would minimize the  
15 amount of radioactivity and contamination of the soil  
16 and ground that really are targeted in the context of  
17 decommissioning.

18 11.2, 11.3, 11.4 and 11.5 are really not  
19 focusing on decommissioning. It's impact on operating  
20 components and routine effluence releases, liquid and  
21 gaseous. Now there are some -- There will be some  
22 recommendations we're going to look at. It's going to  
23 be clear that from the way they are objective, the way  
24 they are targeted, the way they are identified, that  
25 their intention is really to target decommissioning of

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1 facilitated commissioning facility or minimize in a  
2 sense spills and so on. So we're going to look at  
3 these critically and say, all right, if this feature  
4 that's proposed is a recommendation in one of these  
5 reports focuses, for example, on minimizing  
6 unmonitored and uncontrolled releases, we're going to  
7 say that falls in the context of the SRP because we  
8 want to minimize, we want to avoid essentially, all  
9 unmonitored and uncontrolled releases because that  
10 essentially is contrary to Appendix I and that's  
11 contrary to Part 20 requirements for effluent releases  
12 on their Appendix B.

13 If they are recommendations from those  
14 task forces that, for example, focus on  
15 instrumentation techniques or monitoring techniques  
16 that would provide better characterization of the  
17 effluence or provide the means to intercept a release  
18 such that you may have, for example, a early telltale  
19 indicator or something like that, we're going to  
20 import that into the SRP because again that is a  
21 feature that is salient to Chapter 11.5 and again on  
22 being able to control and monitor all effluent  
23 releases. That will be a requirement or there will be  
24 topics of discussion and recommendations that will  
25 have to do with other aspects of the life cycle of the

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1 facility which are not relevant to those to that  
2 chapter at this point.

3 DR. CLARKE: I understand.

4 MR. DEHMEL: So we're going to look at  
5 these and then essentially make sure that whatever  
6 we're importing from those recommendations fit the  
7 purpose and intent of those sections of the SRP.

8 DR. CLARKE: Sure. And with 1406 all you  
9 can do right now is incorporate it by reference.

10 MR. DEHMEL: That's all we can do.

11 DR. CLARKE: Because you don't have the  
12 rulemaking yet.

13 MR. DEHMEL: Yes, but keep in mind that  
14 for all the sections, 11.2, 11.3, 11.4 and 11.5, for  
15 the purpose of the SRP it's that we flagged 20.1406 as  
16 a requirement and then, for example, in this SRP  
17 section, let me quickly go -- I think it's on page 17  
18 in the context of what 20.1406 is all about not having  
19 the benefit of a reg. guide and not having the benefit  
20 of further recommendations from those task forces is  
21 that we said we identify a number of information  
22 notices, NUREGs, reg. guides, information circular and  
23 so on that typify the kind of issues we're concerned  
24 about. It's clear that once the reg. guide is issued  
25 that the reg. guide is going to be that long laundry

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1 list of engineering fixes, operational procedures,  
2 design features and so on. Then when we look at this,  
3 we'll be able to say "This particular type of feature  
4 addresses the concern, for example, that was  
5 identified in the information circular 77-14."

6 So we have identified this point. This is  
7 not a long laundry list, but enough of an example for  
8 the upcoming wave of reactor application to give ideas  
9 to the kind of issues where the staff is concerned  
10 about without having the benefit of a reg. guide. So  
11 those information notices and bulletins and circulars  
12 are going to be ultimately lifted out and then we'll  
13 simply refer to the reg. guide and provide some simple  
14 verbiage to essentially give the readers some general  
15 direction where the issues are and that's it.

16 DR. CLARKE: That's good. Thanks. That's  
17 what I was asking. And then another quick question  
18 following up on what Dr. Hinze if I understood your  
19 response. The next updates (long-term), I was going  
20 to ask you what you mean by long-term. But  
21 understanding that this information is going to be  
22 available at different times, will you continuously  
23 update this as that information becomes available?

24 MR. DEHMEL: My understanding is that, and  
25 I guess Steve Koenike is not here to talk about this,

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1 maybe Tim can say something, it's going to be more of  
2 a living document than it was in the past. That's my  
3 understanding.

4 DR. CLARKE: So if one of these took five  
5 years, you wouldn't hold everything up until you had  
6 that.

7 MR. DEHMEL: No.

8 DR. CLARKE: I mean is the recommendation  
9 --

10 MR. FREY: We'll have to work with our  
11 infrastructure group in new reactors. You know,  
12 certain SRP sections might be good to go and go for  
13 the foreseeable future, but we need to make sure that  
14 they understand that all SRP sections do need to  
15 continuous update and we need to work out a schedule.

16 DR. CLARKE: The point of my questions is  
17 we've been asked by the Commission under the context  
18 of decommissioning to assist as we can in making sure  
19 that information is learned through decommissioning  
20 and is factoring into up-front planning for new  
21 facilities and so that's the motivation for my  
22 question.

23 MR. DEHMEL: Right.

24 DR. CLARKE: How is that link being made?  
25 As information becomes available, how is it translated

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1 in the guidance, regulations, whatever is appropriate  
2 for examining and planning in facilities?

3 MR. FREY: I was just going to say as you  
4 said there will be different schedules. You know, one  
5 of the -- We already mentioned this, but the Lessons  
6 Learned Task Force recommendations, the main way we're  
7 getting those incorporated is the updates to reg.  
8 guides 1.21 and reg. guide 4.1 and as those get  
9 updated by NRR we'll work that guidance into the SRP  
10 11.5 and the other SRP sections. That's how we're  
11 going to get the Lessons Learned Task Force  
12 recommendations into the SRP eventually.

13 DR. CLARKE: Thank you.

14 MR. FREY: And the schedule for that could  
15 be and is likely on a different schedule than the reg.  
16 guide for 20.1406 and we'll have to work out schedules  
17 for routine updates so we're not waiting.

18 DR. CLARKE: And keep them up. As your  
19 information becomes available, you will plug it in.

20 MR. FREY: Yes. Right.

21 MR. WIDMAYER: And, Jim, the first  
22 iteration of the reg. guide on 1406, we have a  
23 presentation next month.

24 DR. CLARKE: I understand.

25 MR. WIDMAYER: Okay.

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1 DR. CLARKE: Thank you.

2 CHAIR RYAN: Jean-Claude, thank you very  
3 much. Tim, thank you as well. We'll, I'm sure, be  
4 talking as we move along. I would like to invite our  
5 next presenter up, Dr. Tina Ghosh, who is with us to  
6 talk about ISG-04, "Preclosure Safety Analysis Human  
7 Reliability Analysis." She was here a minute ago.

8 (Off the record comments.)

9 MR. WIDMAYER: Hello. Is anybody on the  
10 bridge? Hello.

11 MS. GHOSH: Susan, is that you?

12 PARTICIPANT: The Center is here.

13 (Off the record comments.)

14 CHAIR RYAN: Okay.

15 MS. GHOSH: Sorry about that confusion.  
16 We've been working with an NHRA expert from the Office  
17 of Research. Her name is Susan Cooper and she is  
18 supposed to call in on the phone bridge.

19 CHAIR RYAN: Well, you'll just have to  
20 wing it.

21 MS. GHOSH: Sorry?

22 CHAIR RYAN: You'll just have to wing it.

23 MS. GHOSH: Yes, it's not problem. If  
24 she's there, she's there. If not, I just wanted to  
25 let you all know that we've been working closely with

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1 Susan Cooper.

2 CHAIR RYAN: Okay.

3 MS. GHOSH: The topic of this presentation  
4 is "The Draft Interim Staff Guidance from the Division  
5 of High Level Waste Repository Safety on Preclosure  
6 Safety Analysis" and more specifically, on staff  
7 review of the human reliability analysis that would be  
8 part of the preclosure safety analysis.

9 And if we go to the next slide, this is  
10 just a quick outline of what I'll talk about. I'll go  
11 over the purpose of the ISG, the motivation for why we  
12 wanted to write this ISG, the regulatory requirements  
13 that the guidance is tied to and I'll give you a very  
14 high level overview of the technical staff guidance  
15 that's contained in this ISG and again just a quick  
16 summary of the recommended changes to the YMRP and  
17 I'll touch on the hypothetical example that we  
18 included in the appendix and this is just an example.  
19 It's not meant to be a comprehensive list of  
20 everything that we would look at and then I'll  
21 summarize and, of course, I'll be happy to take any of  
22 your questions at the end of this talk.

23 So the purpose of the interim staff  
24 guidance like all interim staff guidance, it's to  
25 update a existing review plan. In this case, it's the

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1 staff review plan for a potential license application  
2 for Yucca Mountain. That's the Yucca Mountain Review  
3 Plan, NUREG 1804 and this ISG is targeted to updating  
4 the staff review guidance for human reliability  
5 analysis specifically.

6 So more specifically, the reasons we  
7 wanted to do this were that there were two references  
8 that were published on HRA review guidance in general  
9 that came out after the YMRP was published. So these  
10 are newer guidance documents that are available now  
11 that weren't available at the time of the YMRP and we  
12 wanted to make sure that those were explicitly  
13 included as references in the YMRP. And then because  
14 these review guidance documents are targeted to  
15 nuclear power plant applications, we also wanted to  
16 provide some additional considerations that would be  
17 relevant for a license application for Yucca Mountain  
18 in particular.

19 So we go to the next slide. Why did we  
20 write this ISG? As I said, there were these new  
21 guidance documents out there and the reason that we  
22 were interested specifically in the area of HRA to  
23 provide length to these guidance documents is that if  
24 you look at the operating experience that's available  
25 it shows that human errors do contribute to the

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1 majority of operational events for spent fuel  
2 handling. Now there haven't been any accidents in  
3 spent fuel handling in the U.S. in the commercial  
4 industry. But if you look at the kinds of operational  
5 events that do occur such as the occasional load drop  
6 or fuel assembly or fuel element misloads, you can see  
7 that human performance figures into those events that  
8 are quite common. And if you look at some things such  
9 as load drops from cranes, it seems that human actions  
10 may dominate the failure modes for some equipment and  
11 systems and again crane load drops is one example of  
12 that.

13           Then the next thing is that human  
14 performance tends to be highly dependent on a lot of  
15 specific factors of whatever facility that you're  
16 looking at. It's a little bit more complicated than  
17 looking at hardware reliability that, for example,  
18 might be modeling hardware just fails randomly at a  
19 constant rate. People don't tend to act randomly and  
20 just fail randomly and usually performance is  
21 dependent on activity and site-specific, facility-  
22 specific factors. So it's a little bit more  
23 complicated to model and understand human reliability.  
24 Because human reliability does figure prominently into  
25 safety for fuel handling activities and there were

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1 these new guidance documents available, we wanted to  
2 update the YMRP because we think it's an important  
3 thing to do.

4 Now the key regulatory requirements that  
5 form the basis for this ISG, most of them are  
6 basically the same as those for the overall PCSA and  
7 I just included the two very high level ones here. The  
8 PCSA which is the pre-closure safety analysis must  
9 include an identification and systematic analysis of  
10 naturally occurring and human induced hazards at the  
11 GROA which is the geologic repository operations area  
12 and include a comprehensive identification of  
13 potential event sequences. And, second, this analysis  
14 of the performance of the structures, systems and  
15 components to identify, there has to be an analysis at  
16 the performance of SSCs to identify those that are  
17 important to safety and this analysis should also  
18 identify controls that are important to safety that  
19 would either limit or prevent potential event  
20 sequences or mitigate their consequences and I just  
21 want to point out that some of these controls might  
22 actually be human actions, for example, maintenance  
23 that you need to do in order to ensure that event  
24 sequences either don't happen or that the effects  
25 would be mitigated if they do start to happen.

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1                   And then in addition to the overall  
2 regulatory requirements for the pre-closure safety  
3 analysis, there are a couple of more that are  
4 important to human performance in particular and that  
5 includes, I just included two of them here, that the  
6 safety analysis report in the license application must  
7 include information about personal qualifications and  
8 training requirements. And I'll talk a little bit  
9 more about why these programmatic issues are important  
10 for human reliability analysis. In addition, the  
11 safety analysis report has to include an  
12 identification and justification for the selection of  
13 those variables, conditions or other items that are  
14 determined to be probable subjects of license  
15 specifications and this is another aspect that I'll  
16 talk about later. It provides an important link  
17 between the safety analysis and the programmatic  
18 review that we expect to take on.

19                   Just to give you a kind of overall 50,000  
20 feet perspective on what the technical guidance said,  
21 the first thing is that HRA isn't just about  
22 quantifying probabilities. You actually also have to  
23 understand how your system is going to work overall  
24 and so the first thing that we say is that qualitative  
25 analysis are going to be important as part of the HRA

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1 and the overall PCSA and by "qualitative HRA," we  
2 basically mean the conceptual understanding of how  
3 humans are going to work with the overall system and  
4 what human performance will look like in the planned  
5 operations. And we want to make sure that staff sees  
6 that the license application contains sufficient  
7 information to review this qualitative part of the HRA  
8 analysis.

9 The second thing we wanted to stress is  
10 that the HRA in different parts of the license  
11 application and the PCSA we expect to be commensurate  
12 with the associated risk significance because the risk  
13 significance of different activities and different  
14 analyses are not going to be equal. There are  
15 probably a lot of mistakes that people can make in  
16 operations that don't actually result in any safety  
17 consequences and the ones that we want to see  
18 information on, the ones that we're going to think  
19 about, are the ones that might result in safety  
20 consequences. We wanted to be clear about that in the  
21 ISG.

22 Then the third thing is that the HRA  
23 should be integrated with the overall PCSA. HRA is  
24 not really -- shouldn't be a standalone analysis, but  
25 rather should be part of the overall safety analysis

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1 and we just wanted to call this out as an important  
2 aspect.

3 If we go to the next slide, slide eight,  
4 then as I mentioned, there have been two NUREGs that  
5 have been established recently, NUREG-1792 in 2005  
6 which is Good Practices for Implementing Human  
7 Reliability Analysis and NUREG-1842 which was  
8 published in 2006 which is the Evaluation of Human  
9 Reliability Analysis Methods Against Good Practices  
10 and these two NUREGs came out as the Agency's efforts  
11 in improving the guidance for reviewing the quality of  
12 safety analyses that support license applications in  
13 general.

14 Now these are targeted to nuclear power  
15 plant applications. However, the guidance that's  
16 contained in these NUREGs, the generic guidance, would  
17 be useful for pretty much any kind of application that  
18 the NRC deals with. So what we said in the ISG is  
19 that basically we point to these guidance documents  
20 and say that the generic parts of this are likely to  
21 also be useful for our review of the license  
22 application for the GROA and we want to make sure that  
23 staff look for this, basically that the HRA is  
24 actually consistent with what's recommended and what's  
25 recognized as good practices in the industry for HRA.

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1           The next slide, slide 9 -- And just one  
2 more thing on that, one of the other things we do say  
3 in the ISG is because the operations of the GROA are  
4 likely to be different -- are going to be different  
5 from nuclear power plant operations, we expect in the  
6 license application that the guidance from these  
7 NUREGs would be considered along with the operating  
8 experience from facilities that are more similar to  
9 the GROA in order to basically adopt the good  
10 practices and shape them to what's specifically  
11 applicable for the GROA.

12           So if we go to slide nine, now one of the  
13 things that we kind of have to live with is that HRA  
14 as a practice and as methods, there has been a lot of  
15 development for nuclear power plants not as much for  
16 fuel cycle facilities or materials handling  
17 facilities. There have been some applications. But  
18 really most of the actual HRAs that have been done  
19 have been done for commercial nuclear power plants.

20           What we point out is that if in their  
21 license application, NRA methods that were developed  
22 for power plants or HRA data that were developed from  
23 power plants are applied to the GROA, we just want to  
24 make sure that there is a technical basis provided in  
25 the license application for why it's relevant for the

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1 GROA. So we point that out in the ISG.

2 And then as I mentioned before when I  
3 talked about the regulatory requirements, HRA, human  
4 reliability is one of those areas where programmatic  
5 elements are likely to be very important for verifying  
6 the assumptions that you put in the safety analysis  
7 because things like human reliability and human  
8 performance depend a lot on what training programs you  
9 have, what kind of administrative controls you have  
10 and so on and you want to make sure that programmatic  
11 aspects of the DoE's operations are going to support  
12 the assumptions that were made in the human  
13 reliability analysis for the PCSA and also vice versa.  
14 If there are important risk significant assumptions  
15 that are made in the PCSA with respect to human  
16 reliability analysis, we want to see that that's  
17 supported by the appropriate programmatic elements  
18 when the time comes down the line. So that's the  
19 point of that.

20 If we go to the next slide, again just a  
21 very high level overview of what the recommended  
22 changes were to the YMRP. We've explicitly added  
23 references to NUREG-1792 and NUREG-1842 which are  
24 these key regulatory guidance documents for HRA  
25 review. We deleted reference to NUREG-1278 mostly

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1 because that was in there because there weren't a lot  
2 of other guidance documents available at the time. So  
3 it was just one place to point staff for some  
4 knowledge base.

5 Then we added some human factors  
6 references, specifically 0700 and 0711 and 0711 in  
7 case you're not familiar is the human factors  
8 engineering program review model guidance and 0700 is  
9 the human system interface design review guidelines  
10 and again these are designed for reactor applications.  
11 But if you look at these guidance documents, most of  
12 the elements, the review elements, are very generic  
13 and can be almost adopted wholesale for other NRC  
14 applications. So they are very useful references and  
15 we expect them to be useful for the GROA license  
16 application as well.

17 Then we just added some words here and  
18 there to make sure that the consideration of how  
19 people kind of fit into the overall operations is  
20 considered in the review of the pre-closure safety  
21 analysis. In terms of -- There are some lists of  
22 different disciplines that we expect, for example, the  
23 design team of the DoE and the design review teams to  
24 have and we added human factors engineering as an  
25 expected area of expertise for these design and review

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1 teams.

2 If we go to the next slide, now one of the  
3 things we did want to do because the ISG is written at  
4 a fairly high level, I mean it's generic, it's kind of  
5 general guidance, we wanted to provide just one  
6 example to show some more concrete details of what the  
7 staff might be looking for in a license application  
8 and what kind of questions we might expect to ask. So  
9 this particular example, it's just one example.  
10 Again, it's not the universe's considerations that we  
11 might have, but it actually just gives you a flavor  
12 for what are the questions we might ask and the  
13 example builds on the example from Appendix A in ISG-  
14 02 which Robert mentioned yesterday. That ISG was on  
15 the PCSA level of information and reliability  
16 estimation.

17 In that appendix, there was an example of  
18 a crane load drop being a potential event sequence  
19 initiator and what kinds of things the staff might be  
20 looking for in the license application to support an  
21 evaluation of that event sequence. So we build on  
22 this example and basically we say that we suppose  
23 that, yes, load drop from a crane is an initiating  
24 event for a risk significant event sequence in the  
25 PCAS and that the license applicant uses empirical

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1 data to establish the -- to estimate the reliability  
2 of the crane and here "crane reliability" means with  
3 respect to load drops from the crane.

4 And we provide an example of a set of  
5 questions the staff may ask if this hypothetical  
6 situation were to come about. And just some examples  
7 of the questions are "Did human actions contribute  
8 significantly to the load drop rate in the empirical  
9 data" which in this case is yes and "If so, does the  
10 license application provide a justification for use of  
11 the data source commensurate with the risk and based  
12 on qualitative considerations in terms of how similar  
13 the situation is from the database from where the  
14 empirical data comes versus the GROA" and then "Does  
15 the license application discuss general risk insights  
16 from crane operating experience and insights into  
17 human actions and reasons for past unsafe actions" and  
18 "Does the license application the similarities and  
19 differences" and "What might be the implications of  
20 any differences" and "Has the application identified  
21 the key administrative controls for establishing  
22 reliability" and so on. So again, this is one example  
23 of a set of considerations that the staff would be  
24 looking for if this were a hypothetically important  
25 event sequence.

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1                   Just to summarize, the draft ISG-04  
2 updates and supplements the YMRP, providing guidance  
3 to the staff in the area of reviewing human  
4 reliability analysis which is part of the PCSA or pre-  
5 closure safety analysis. We also are soliciting  
6 public comments through June 4<sup>th</sup> and I've just  
7 provided a web link to the *Federal Register* notice and  
8 you can also get to the draft ISG if anybody is  
9 interested. With that, I'll be happy to take any of  
10 your questions.

11                   CHAIR RYAN: Thanks, Dr. Ghosh. Jim.

12                   DR. CLARKE: Thank, Tina. Just a couple  
13 questions to make sure I understand how all this fits  
14 together if I could. As part of the pre-closure  
15 safety analysis, the doee will have to address human  
16 factors, human reliability, I guess, within the  
17 context of event sequences. Is that the way it's  
18 framed? As they look at things that can happen, they  
19 need to not only talk about system hardware  
20 reliability but people factors as well.

21                   MS. GHOSH: Right.

22                   DR. CLARKE: You've prepared a draft  
23 interim staff guidance document that addresses this  
24 and from that draft you will recommend changes to the  
25 review plan. That's where you are right now.

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1 MS. GHOSH: Yes.

2 DR. CLARKE: And I guess the thing that  
3 really made this necessary is that since the review  
4 plan was prepared two documents, two very pertinent  
5 documents, have come out. The NUREGs that you  
6 mentioned, they supersede really the one that you're  
7 deleting and so really what a lot of this is about is  
8 taking what was learned in this NUREGs and getting  
9 them into the review. Is that correct?

10 MS. GHOSH: Yes. Right.

11 DR. CLARKE: Okay. Thank you.

12 CHAIR RYAN: Ruth.

13 DR. WEINER: My questions and comments are  
14 fairly general. There are a number of industries not  
15 the nuclear industry which provide examples for  
16 mitigating and minimizing the effects of human error.  
17 The fuel handling facilities and spent fuel handling  
18 facilities isn't big. You're handling large, heavy  
19 objects with cranes basically.

20 MS. GHOSH: Yes.

21 DR. WEINER: Are you taking into account  
22 some of the lessons learned from these other  
23 industries? Are you incorporating that?

24 MS. GHOSH: Yes. I agree completely.  
25 There is actually a large wealth of information out

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1 there. As Dr. Ryan mentioned yesterday, he calculated  
2 3,000 years of spent fuel operating experience.  
3 Similarly if you look at most of the activities that  
4 are going to go on at Yucca Mountain, there is a lot  
5 of experience out there to draw from and the  
6 Department of Energy has the flexibility to develop  
7 their license application and decide what they're  
8 going to rely on in order to demonstrate compliance  
9 with the safety objectives and we expect that whatever  
10 path they choose in terms of what they're relying on,  
11 they will go to the operating experience that's  
12 available and draw on the insights and provide a very  
13 clear basis for why they think their chosen path to  
14 demonstrating safety is going to work.

15 We definitely expect that and from the NRC  
16 staff side, I think Robert mentioned yesterday we are  
17 in the middle of an operating experience review test  
18 to help us get ready to review the license application  
19 and we're certainly looking at a lot of that  
20 experience as well for our own purposes.

21 DR. WEINER: I'm impressed that you have  
22 on your slide 10 that you want to address the  
23 relationship between human actions and design features  
24 and it seems to me that the direction -- Let me ask it  
25 as a question. Is the direction that you're going to

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1 look at the design features from the point of view of  
2 how can you design to mitigate the effects of human  
3 error because you know human errors are going to  
4 happen? You can't eliminate. It would be nice if you  
5 could.

6 MS. GHOSH: Right. And again that's  
7 another area that we certainly hope the Department of  
8 Energy is going to consider in their license  
9 application. Based on preliminary interactions with  
10 them, our tech exchange last year where we did talk  
11 about human reliability analysis, our understanding is  
12 that their PCSA team and their design team are working  
13 very closely together so that the design team has an  
14 understanding of what needs to be achieved in terms of  
15 maintaining safety and certainly if there are risk  
16 significant aspects of the design or event sequences  
17 that have to be mitigated we do expect that the  
18 license application will show what are the risk  
19 insights from industry experience, maybe even  
20 international experience, with respect to the system  
21 and how have those insights been incorporated into the  
22 design process.

23 Now the NUREGs I referenced were the human  
24 factors engineering, 0711 and 0700, those actually  
25 outline in great detail how one might go about doing

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1 such a thing and also how the staff might review such  
2 a thing. So we do expect that to happen.

3 DR. WEINER: Thank you.

4 CHAIR RYAN: Allen.

5 VICE CHAIR CROFF: Yes, I'm trying to get  
6 a little bit more of a, I'm going to call it, physical  
7 feel on this human reliability thing. I'd like to  
8 focus on the load drop that seems to be of concern and  
9 what I'm trying to do is understand what human  
10 behaviors or actions lead to load drops. I mean, are  
11 we talking about a crane operator pushing the wrong  
12 button at the wrong time or riggers not hooking it up  
13 properly, not suspending the load properly or what are  
14 the important human behaviors in that particular case?

15 MS. GHOSH: I can give you some examples.  
16 Actually, if you look at the database that's out  
17 there, NUREG-1774 tries to capture a lot of the crane  
18 experience from 1968 to 2002 and if you look at the  
19 events that are there, a lot of the load drops have to  
20 do with what they call below the hook incidents,  
21 rigging errors. The cranes in general especially the  
22 single failure proof cranes tend to be fairly  
23 reliable. But if there is rigging involved such as  
24 putting a sling around a load or hooking something to  
25 a load, that tends to be a more vulnerable phase in

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1 terms of human performance. So just one of the things  
2 that I'm trying to remember off the top of my head is  
3 I remember there was one incident where the slings  
4 weren't plugged in in the right direction. So when  
5 they started to try to move the load, the load  
6 dropped. But that gives you some kind of idea.

7 Now the reasons for why these unsafe  
8 actions might occur, there are a variety of reasons.  
9 For some of the older data, it's not completely clear  
10 because if it's something that happened in 1970 and  
11 they didn't capture all the information at the time  
12 we're not completely sure why. But one of the things  
13 is that sometimes there may be procedures in place,  
14 but when people actually go to perform a certain  
15 activity, they may end up circumventing some steps in  
16 the procedure for whatever reason. Maybe it's  
17 impractical to carry out the procedure as it is.  
18 Maybe you're under time pressure, whatever it could be  
19 and sometimes something like that could lead to  
20 connecting the cables in the wrong place because they  
21 skipped a procedural step or something of that nature.

22 But we can have a much longer discussion  
23 about all the different things that goes wrong. But  
24 I hope that gives you a flavor for what kinds of  
25 things may go wrong.

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1 VICE CHAIR CROFF: That helps. Thanks.

2 CHAIR RYAN: Bill.

3 DR. HINZE: Thank you. Yesterday Robert  
4 Johnson very appropriately pointed to us in his  
5 presentation that this is a first of a kind and I'm  
6 wondering in what way have you captured the fact that  
7 this is a first of a kind facility. For example, the  
8 construction license certainly will include the mining  
9 of the drifts and I think we all are cognizant of the  
10 fact that mining is one of the most deadly of the jobs  
11 that a person can have. What way have you taken into  
12 account the mining, the transportation, etc. into this  
13 document?

14 MS. GHOSH: Okay. So let me -- There are  
15 a number of things in there that I would like to  
16 address. First, you started with mentioning that  
17 Robert pointed out this will be a first of a kind  
18 review in many ways. I think it's true that it will  
19 be a first of a kind review in many ways. In terms of  
20 the actual operations, the vast majority of those  
21 operations I think as we've discussed, there's a lot  
22 of operating experience out there for those  
23 operations. I think that one of the reasons we say  
24 first of a kind is that our rule is risk-informed and  
25 performance-based. So we have a slightly different

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1 basis for our review versus, for example, the ISFSIs,  
2 the Independent Spent Fuel Storage Installations, that  
3 are out there, nuclear power plants spent fuel  
4 operations and so on. The NRC has a lot of experience  
5 in licensing and inspecting and overseeing operations  
6 that are very similar to what is going to happen at  
7 the GROA.

8 The first of a kind aspect comes from the  
9 rule Part 63 which is more risk-informed and  
10 performance-based. But there is a lot of information  
11 out there already for the majority of the operations.

12 Now in terms of the mining operations, I  
13 think it's definitely true that historically mining is  
14 tough. Mining can be challenging, but from the NRC's  
15 regulatory standpoint our rule basically has to do  
16 with meeting radiological dose objectives and a lot of  
17 the mining before you ever put any waste in there  
18 might be challenging but those are more kind of  
19 occupational safety issues rather than radiological  
20 issues.

21 If you look at once waste starts being in  
22 place what the potential might be for radiological  
23 consequences, I think we're certainly also prepared to  
24 review that aspect of it because there is information  
25 out there on mining and human reliability during

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1 underground operations and so on. But how much we  
2 look at that will really depend on whether there's any  
3 event sequence possible underground where you might  
4 get a radiological consequence and as Robert mentioned  
5 yesterday, there are different levels for the expected  
6 event sequences which are called "category one" versus  
7 the "category two" event sequences where in that case  
8 you only look at the dose consequences to members of  
9 the public outside the site boundary.

10 So we're prepared to -- There may be event  
11 sequences that end up having radiological  
12 consequences. There may not be. We're prepared to  
13 review it either way, but there's a lot of defense-in-  
14 depth or layers of protection that are built in for  
15 the underground operations once the waste implacement  
16 is actually happening.

17 DR. HINZE: Will the license application  
18 include human reliability concern with mining?

19 MS. GHOSH: I think that we expect that.

20 DR. HINZE: What you're requesting.

21 MS. GHOSH: Sorry.

22 DR. HINZE: Is that what is requested  
23 here?

24 MS. GHOSH: I think that depends on what  
25 the Department of Energy's safety case is based on.

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1 So, for example, we expect that their application and  
2 different parts of their application will be  
3 commensurate with the risk significance in different  
4 activities and parts of the operation. If it turns  
5 out that it's virtually impossible to get any kind of  
6 radiological dose from a subsurface operation, we may  
7 not expect the same kind of treatment that we would,  
8 for example, perhaps in the wet handling facility  
9 where you may have some consequences.

10 DR. HINZE: So, for example, the  
11 possibility of health and safety with relationship to  
12 the operation of the tunnel boring machine will not be  
13 considered as part of the license application?

14 MS. GHOSH: I believe the NRC's regulatory  
15 purview has to do with the radiological consequences  
16 and have a memorandum of understanding with OSHA for  
17 the occupational safety aspects of it. So again, if  
18 there's a radiological hazard, I think we would do  
19 that review. If it's an occupational hazard, that's  
20 kind of outside of Part 63. There are other  
21 requirements for that.

22 CHAIR RYAN: I think the key point here is  
23 it doesn't relieve DoE from any obligations they might  
24 have under other regulations for mine safety and so  
25 forth.

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1 DR. HINZE: That's right and I'm wondering  
2 if OSHA has been brought into this in terms of --

3 CHAIR RYAN: Well, she has a -- of  
4 understanding.

5 DR. WEINER: Yes.

6 DR. HINZE: Yes, in terms of updating this  
7 ISG. Are there any updates from OSHA memoranda?

8 MS. GHOSH: I think OSHA has their own  
9 approach to reviewing with mining operations. They  
10 certainly regulate other mining operations. I'm not  
11 familiar with them.

12 DR. HINZE: Let me ask you another  
13 question then. We know that we don't have the final  
14 design considerations of the pre-closure facility and  
15 the pre-closure operations. In what way are you  
16 building in a sufficient amount of flexibility  
17 comprehensiveness to handle the final designs in this  
18 ISG?

19 MS. GHOSH: I don't know if you had a  
20 chance to read the ISG, but if you do read it, you'll  
21 see that it's very general and exactly for that reason  
22 because we wanted to make it general enough to  
23 accommodate any specific situations that might arise.  
24 So it's based on our current level of understanding  
25 and leaving us the flexibility to use it regardless of

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1 what final design and operations look like.

2 DR. HINZE: Thank you.

3 CHAIR RYAN: Thanks, Bill. Just looking  
4 ahead a little bit, we had a briefing yesterday. We  
5 have your briefing today and another one next month.  
6 So rather than write three individual letters, we're  
7 probably going to consolidate our thoughts on those  
8 three items in one letter. So don't expect an  
9 individual letter here, but we might make comment on  
10 the overall letter which will probably a couple months  
11 down the line just to give you a preview.

12 MS. GHOSH: Okay.

13 CHAIR RYAN: I think that will close our  
14 morning --

15 DR. CLARKE: Can I ask another quick  
16 follow-up question?

17 CHAIR RYAN: Yes. We're already behind  
18 schedule.

19 DR. CLARKE: Okay. Tina, just a quick  
20 one. Did your research, your information base for  
21 pulling all this together focus exclusively on the  
22 nuclear industry or was it broader than that? Is  
23 there merit to looking at chemistry process  
24 industries?

25 MS. GHOSH: You know we're initially

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1 focusing on the nuclear industry for I think one big  
2 reason which is that the regulatory regime in the  
3 nuclear industry is quite different than that in the  
4 chemical industry. I'm familiar with a lot of the  
5 accidents that have happened in the chemical industry  
6 and the cultural issues and some human reliability  
7 aspects, but I don't want to generalize too much, but  
8 I think if you speak to people from the nuclear  
9 industry and I tend to agree they're under a more  
10 tight regulatory framework than the chemical industry.

11 DR. CLARKE: A lot of this is basic to any  
12 industry I think.

13 MS. GHOSH: Sorry? Yes.

14 DR. CLARKE: Okay. Thank you.

15 CHAIR RYAN: Tina, I can second that from  
16 firsthand experience in a facility that dealt with  
17 both radioactive material requirements and chemical  
18 because it was a mixed waste processing facility with  
19 a thermal destruction unit. So I would tend to agree  
20 with you that the nuclear requirements were often  
21 complimentary to but very often were more robust than  
22 some of the chemical requirements on particularly some  
23 of the process hazards analysis aspects including  
24 human reliability. So I think your general sense  
25 there probably seems right to me. I wouldn't want to

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1 generalize too much either, but it seems like the  
2 right track.

3 DR. CLARKE: Thank you.

4 CHAIR RYAN: Okay. With that, we will  
5 adjourn our morning session and return promptly at  
6 1:00 p.m. for our afternoon briefing. Thank you very  
7 much. Off the record.

8 (Whereupon, at 11:45 a.m., the above-  
9 entitled matter recessed to reconvene at 12:58 p.m.  
10 the same day.)

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A-F-T-E-R-N-O-O-N S-E-S-S-I-O-N

12:58 p.m.

CHAIR RYAN: On the record. Okay. It is the appointed hour of 1:00 p.m. and we have a briefing this afternoon from a team of folks from the Research it looks like and we're going to lead off with Christiana Lui. Christiana, maybe I'd ask you to introduce your teammates and go ahead and jump right on in.

MS. LUI: Okay. The biggest teammate I would like to introduce is our Office Director Brian Sheron.

CHAIR RYAN: Thank you.

MS. LUI: And I also have with my team right up in front here is Rob Tregoning on my left inside. He's the Senior Advisor for Materials and then right next to Brian is Don Helton. He's the Reactor Systems Engineer and to the right of Don Helton is Dr. Nathan Siu. He is the Senior Advisor for PRA. So Brian.

CHAIR RYAN: We really appreciate your getting our new name right up there on your slide.

(Laughter.)

MR. SHERON: I want to thank you for the opportunity for first the staff to come down here and

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1 I think this is probably the first time I've been down  
2 here in front of the Committee.

3 CHAIR RYAN: Welcome.

4 MR. SHERON: So I'm looking forward to a  
5 few more meetings I hope. I've been in the office now  
6 just about a year. I think May 1<sup>st</sup> was my one year  
7 anniversary and just so you know my background, I've  
8 been with the Agency since '76 and with the Federal  
9 Government since '73. So I've been around here awhile  
10 and mostly on the reactor side in NRR, although I did  
11 work in Research from 1987 until 1994. So I have a  
12 fairly good feel for both offices.

13 But what I'd like to talk to you about a  
14 little bit is just the background for the long-term  
15 research plan that we put together. As I talked to  
16 DCRS, I think, a few weeks ago when I told them the  
17 same thing and that was I was up in the Chairman's  
18 office during a periodic meeting with him and he asked  
19 me what the long range plan was in Research and as  
20 usual, I said we're starting to get ready to look at  
21 the '09 budget and go through that process and he went  
22 "No, no. I'm talking like five, ten, fifteen years  
23 from now. What are you doing to make sure the Agency  
24 is ready to meet the challenges it will have then?"  
25 And I said, "We normally don't plan out that far."

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1                   But I could tell that's really the, I  
2 think -- The Chairman is a strategic thinker and I  
3 could tell that he felt that this is something that  
4 was an implicit part of our responsibilities is to  
5 look beyond the immediate future and I kind of like  
6 that and I took it as a challenge. And I said, "Let  
7 us go and see what we can do."

8                   So I talked with Luis Reyes as the EDO and  
9 he agreed and we decided to put together a long-range  
10 research plan and we figured looking at the schedule,  
11 the Chairman I think wanted something in a couple  
12 weeks which I can't get anything through concurrence  
13 in a couple weeks. But I thought that for the time  
14 which was right around the beginning of December of  
15 2006 I figured maybe in around three months we could  
16 pull something together. So we embarked on that.

17                   First off, I wanted somebody that could  
18 devote almost full-time to developing this report and  
19 I asked Chris if she would do that and she actually  
20 stepped out of her line management job and took this  
21 on as a full-time task and as you heard, the rest of  
22 the team here, Don, Rob, Nathan, all participated with  
23 her as well as the rest of the Research staff. This  
24 was not just a small group. We actually went out and  
25 solicited input from the entire Research staff.

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1           But the intent was to say what kind of  
2 challenge is this Agency going to face down the road.  
3 What can we think of in five, ten, fifteen years? I  
4 realize there's a lot of uncertainty. I mean if  
5 somebody told me six years ago to plan research in the  
6 future I'd probably say I'm going to work on  
7 decommissioning because that's where we were heading  
8 back then. But as you can see, things turned around  
9 and I certainly wouldn't be surprised if other factors  
10 come into play in the coming years and we have to  
11 readjust.

12           But right now, we're looking at an  
13 expanding industry which means that there will be not  
14 only new reactors being licensed and built, but we're  
15 seeing an increase in fuel fabrication facilities.  
16 We're seeing proposals by DoE to better utilize the  
17 existing fuel, the waste fuel that's come out through  
18 GNEP and the like. And so what we're doing is we're  
19 trying to anticipate and say what kind of regulatory  
20 challenges will this Agency be faced with down the  
21 road and is there work that we need to do now, that we  
22 need to start now, in order to be prepared so that  
23 when these challenges do come in that we'll have the  
24 tools, we'll have the technology available. That's  
25 really what our starting point was.

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1           We were not trying to include all of the  
2           current research that we have going on. We said those  
3           programs are in place. They're documented and the  
4           like and even for some of the near term like on some  
5           of the advanced reactor work and the like we did not  
6           want to look at that.

7           We're thinking down the road like, for  
8           example, on the reactor side. Plants right now can be  
9           relicensed for an additional 20 years. But we have  
10          gotten indication from a lot of utilities that the  
11          investments they are making in those plants are so  
12          tremendous that they envision they'll want to go  
13          beyond 60 years. And so one question is what are the  
14          technical challenges, what are the technical  
15          obstacles, if any, to operating a nuclear plant beyond  
16          60 years and do we need to start looking at those now  
17          and identifying what they are not so that we're going  
18          to solve them, but at least we can identify them to  
19          the industry and let the industry start to think about  
20          what they may need to do. Are they going to annelle  
21          vessels for example? Are they going to replace  
22          vessels? Questions like that.

23          We see digital I&C as a technology that  
24          just keeps changing. Fiber optics, a lot of questions  
25          about, for example, under fire situations. We do a

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1 lot of work right now looking at cable behavior under  
2 fires, but what about fiber optic cables? Is the  
3 industry going to move to that? Nanotechnology is  
4 another one. We don't even know how it might be used,  
5 but there's a potential. So what we tried to do is to  
6 solicit not only from the Research staff, but also  
7 from our user offices to kind of pick their brain and  
8 ask them what kind of work do they think they're going  
9 to see coming in down the road that we should start  
10 planning for now.

11 That was the first phase of the program.  
12 We were trying to finish that up by the end of  
13 February. We actually got it done by the end of March.  
14 We got a commission paper up to our Commission. We  
15 told them this finished up first phase.

16 Phase two is when we would engage external  
17 stakeholders and that includes both the ACRS, ACNW,  
18 National Laboratories, other foreign governments, our  
19 counterparts that we cooperate in research in,  
20 industry, other Federal agencies, some other  
21 stakeholders like the Union of Concerned Scientists.  
22 But we want to get their input and say what do they  
23 see as something that might be needed.

24 What we'd like to do is sort of get this  
25 consensus and see if there is a consensus on the areas

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1 that need to be focused on.

2 We see the plan as a living plan. This is  
3 not something that's a one-time static thing where we  
4 write it and issue it and then we put it on the shelf.  
5 The plan is is that it will serve as the basis for  
6 budget planning. Our budget planning right now, we're  
7 in the '09. We're trying -- We're in 2007 and right  
8 now, we're putting together the budget for 2009. One  
9 of the things the Chairman wanted to do was if we were  
10 going to put planning money or a planning which money  
11 to do this long-term research we would need to be  
12 putting it in now to get it in the '09 budget and he  
13 really didn't want to go forward and I agree with him  
14 100 percent. You don't want to go in and just say  
15 "I'm going to put \$5 million in the budget for long-  
16 term research and trust me. I don't know what it is  
17 but trust me." This report hopefully will provide  
18 some technical basis for the amount of money that we  
19 want to put in the budget for 2009.

20 I would expect every year we will revisit  
21 the report because as we go through the budgeting  
22 process, next year it will 2010 budget. We'll need to  
23 see do we need to add things. Have we learned  
24 anything in the year that says that maybe we should  
25 drop things out or give them a lower priority? Are

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1 there other things that need to go in? So we see it  
2 as a living document.

3 I very much would appreciate the Advisory  
4 Committee's input on this. I think you all bring a  
5 very unique perspective to the Agency and to the  
6 Research program and so the more that you can provide  
7 to us, I think, the better the report will be.

8 The Commission had asked the ACRS actually  
9 to identify long-term research at their last meeting  
10 with them and I would presume that that request  
11 implicitly carried over to this Committee. So any  
12 input, any guidance you can provide us would be very  
13 useful.

14 The plan right now, Chris can go through  
15 it in more detail, but I think we want to get the  
16 second phase and this report finished up by the end of  
17 July. So with that, I'm going to -- If you have any  
18 questions of me -- I apologize. I'm going to have to  
19 run. I'm going let these guys go over the details.  
20 I have another meeting.

21 CHAIR RYAN: Okay. We'll go over the  
22 details and we'll get back to you.

23 MR. SHERON: Yes.

24 CHAIR RYAN: Any questions at this point  
25 or do you want to just dive into the details?

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1 DR. WEINER: No. We just want to thank  
2 Brian for coming and giving a good introduction.

3 CHAIR RYAN: Thank you, Brian. Okay.

4 MS. LUI: Good afternoon. My name is  
5 Chris Lui and I'm the Director for New Reactors and  
6 Computational Analysis and I'm the lead for the  
7 development of the Long-Term Research Plan and I'm  
8 just going to give this presentation by providing a  
9 little bit more detail regarding the context whereby  
10 Brian has actually already given you a lot of the  
11 information. And Don, Rob and Nathan will go through  
12 a number of technical topics identifying the current  
13 version of long-term research plan that we would like  
14 to discuss with you today. And the purpose today is  
15 that we would like to solicit your comments on this  
16 set of topics and any other topics that you believe  
17 that we should consider for incorporation into a long-  
18 term research plan.

19 As Brian has indicated, we set out to  
20 develop an Agency-wide long-term regulatory research  
21 plan that will focus on new program areas and emerging  
22 technologies and we did that by engaging the other  
23 program offices and also engaging the Office of  
24 Nuclear Regulatory Research staff to help us to really  
25 focus on that particular task and there will be more

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1 regarding the scope on the next slide later on.

2 And the current version again is a  
3 relatively high level document that's for a planning  
4 purpose and provides the technical basis for our  
5 budget request. We also intend to use this particular  
6 version to develop communication tools that will help  
7 us to communicate what we intend to do and what will  
8 be the focus of the technical program and what we  
9 intend to get out from this set of activities. And  
10 again, this is the initial version and it's a work in  
11 progress and as new information becomes available we  
12 will be updating the long-term research plan on an  
13 annual basis.

14 Scope. We actually had a fair amount of  
15 existing planning documents in many or not all the  
16 program areas and technical areas. A few of them  
17 actually focused on forward-looking activities such as  
18 a proactive material research program plan. And some  
19 also contained long-running activities. One of the  
20 things I can point my finger to is one point we have  
21 actually a PRA research plan that contains a lot of  
22 long-running activities. But again, this planning  
23 document as Brian has indicated generally focus on  
24 current and near-term needs and they're not really  
25 geared towards long-term needs for the Agency.

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1           So given that we already have certain  
2 activities identified in these other planning  
3 documents, our goal is not to duplicate where there  
4 already documents elsewhere. It's really to go  
5 through a process to really get people to focus on  
6 thinking other long-term research activities and we  
7 also started by looking in the various technical areas  
8 such radiation protection, environmental assessments,  
9 GRA human factors, security, just to name a few and  
10 because we carved out what's the scope of these  
11 particular documents not to duplicate others, we only  
12 include those that have not been discussed elsewhere  
13 in other documents.

14           As Brian has indicated, we developed these  
15 documents really to develop a planning wedge for the  
16 FY '09 budget formulation. So the time line was  
17 somewhat dictated by how the Agency budget development  
18 process is and also because this is our initial  
19 effort, we were mapping out a process where we're  
20 doing the development of the plan. At the end of this  
21 particular initial effort, we also expect that we will  
22 be able to come up with a more systematic process for  
23 the future updates.

24           With that, we recognized that the  
25 environment that we are in is not stagnant and we

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1 fully expect that things will change and we will need  
2 to be responsive to those changes. Therefore, we  
3 intend to keep this as a living document. And based  
4 on our observations so far, there are people who want  
5 to participate, but they are also watching how this  
6 whole effort will evolve to see whether the agencies  
7 truly want to focus on long-term efforts. So the  
8 success of this initial effort will pretty much help  
9 us, will pretty much determine the future  
10 participation regarding whether people will really  
11 look forward to come forward with good ideas or this  
12 is going to be one of those activities that kind of is  
13 a one-shot deal. So the success of our efforts is  
14 going to help to set a tone for future participation.

15 Slides five and six provide the summary of  
16 these proposed activities that's identified in the  
17 current version and your slide package contains  
18 materials for all the topics included on slides five  
19 and six. And those that we don't plan to discuss for  
20 the rest of this hour are included as the backup  
21 slides to the package. So it's for your information  
22 and at the same time during the next 40 minutes or so,  
23 materials come up and topics come up that will bring  
24 us to those backup slides, we do have that available.

25 So the four topics that we would like to

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1 discuss with you today are the DoE Global Nuclear  
2 Energy Partnership program or GNEP, the Advanced  
3 Offsite Consequence code as on the bottom of slide no.  
4 5 and on slide no. 6, to identify Extended in-Situ and  
5 Real-time Inspection & Monitoring Techniques and also  
6 the Advanced Quantitative Risk Assessment Methods.  
7 With that, if there are any questions for me, I have  
8 the time. Otherwise, we will proceed with the  
9 discussion of these four topic areas.

10 DR. HINZE: I'm sorry. What are you  
11 asking from us at this point?

12 MS. LUI: Okay. We would like to get your  
13 feedback regarding whether the focus of these topics  
14 are the right ones in terms of long-term research and  
15 also if there are any additional topics that you feel  
16 that we should start in FY '09 or beyond. We also  
17 would like to hear those.

18 CHAIR RYAN: That's a big question.

19 DR. HINZE: Can I kick off one? One I  
20 don't see here and when I went on this committee  
21 originally back in '88 or '89, I think that one of the  
22 major interests that I had and one of the major  
23 interests that I was told to have was on information  
24 and data and I still believe that the Commission, all  
25 of us, are not giving sufficient due to information

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1 and data storage, transfer and presentation and that  
2 leaves us to artificial intelligence and if we're  
3 thinking down the pike with a mass of information  
4 that's coming into us and that we have to absorb and  
5 we're right here at the firing line of this massive  
6 information, readily accessing and presentation and  
7 use of artificial intelligence to help us is going to  
8 be a major contributors to the success in regulation  
9 in the next decade.

10 MS. LUI: Thank you for your input. We do  
11 have other related programs. We may not touch upon  
12 your point exactly, but the Agency is actually --

13 DR. HINZE: I guess I'm having a hard time  
14 hearing you, Chris.

15 MS. LUI: The Agency is actually  
16 undertaking knowledge related program and I think  
17 certain aspects of that will touch up the data or the  
18 information of data storage and research issue,  
19 although that's not the focus of the knowledge  
20 management program. On the other hand, we have  
21 identified certain topics here that is kind of looking  
22 at the acquisition of data and also use of better  
23 methods to do our work. So there are aspects of what  
24 you have brought up that we will probably touch upon  
25 but not in a concerted effort as what you have

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1 identified here.

2 DR. HINZE: Nothing is moving faster than  
3 information technology today and I don't see any  
4 slowdown in that. I think that what we have to do is  
5 we have to think out of the box as they say and think  
6 about what kinds of technologies will be available in  
7 two, five, ten years and how we can capitalize on that  
8 for the Agency.

9 MS. LUI: Right. We definitely have  
10 thought about that and some of the topics that we have  
11 identified here are really looking at the information  
12 technology advancement to help us do our work a little  
13 bit more efficiently and effectively.

14 DR. HINZE: I really find that the  
15 information transfer in this agency is highly  
16 deficient. I could use even stronger terms and I  
17 think that it's incumbent upon the Research group to  
18 show the way here.

19 MS. LUI: Okay. Thank you for your  
20 feedback.

21 CHAIR RYAN: Just a small second on  
22 Professor Hinze's comment. ADAMS is an example of  
23 something that's very hard to use on information  
24 management and I'm still not qualified to use it.

25 But in a broader sense, I think you need

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1 to do something on time frame. You talk about '09.  
2 '09 is tomorrow as far as research goes. It's not  
3 future research. 2010, that's tomorrow. They're  
4 creating that plan now and once it's a plan, that's  
5 what you're going to do. You can tweak it and that.  
6 So I want to understand better. When you say "long-  
7 range research" what do you really mean?

8 I think about now as now to the next six  
9 years. I think intermediate time frame you talk about  
10 a decade or more. Long-range is, I think, we heard  
11 earlier the Chairman's idea was 15 years plus. So let  
12 me finish.

13 MS. LUI: Right.

14 CHAIR RYAN: I think you very carefully  
15 need to communicate to people what you mean by the  
16 time frames of "short-term," "intermediate-term" and  
17 "long-term" research goals so that everybody is on the  
18 same page because what's long-term to me or long-term  
19 to somebody who had been here five years is not long-  
20 term to somebody that's been here 32 and looking at  
21 retirement. So I think you need to create a time  
22 scale that's common for everybody to think about.  
23 That's one.

24 And then I think you need to sort out --  
25 I'm just looking on the list that's on the screen

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1 behind you. Offsite mitigation strategies, well,  
2 that's going to be probably something you can talk  
3 about in any one of my three time frames. Fire  
4 effects on fiber optic cables, I'm going to guess  
5 there could be a technical solution or replacement for  
6 fiber optics in 15 years. Maybe it will all be radio  
7 transmitted at some point.

8 So every one of your projects, you need to  
9 think about where will technology be and what will be  
10 the issues in short, intermediate, long range and  
11 where do you want to put it. So I can't think about  
12 long-range research without thinking about what's the  
13 time scale there.

14 MS. LUI: Yes, actually we -- At the  
15 beginning when we tried to put together this we had a  
16 lot of discussion of within the core group that you're  
17 seeing up front there and also discussion with the  
18 other program offices and also with our staff. So for  
19 this initial effort, we are pretty much looking at  
20 anything that we don't have a program plan already  
21 that will become -- I mean that we expect the Agency  
22 will need a product about five years and beyond.

23 CHAIR RYAN: Five years is tomorrow.  
24 That's not very long range.

25 MS. LUI: And most of our current

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1 regulatory work we focused on today really, meaning  
2 today and/or two or three years out. So even five  
3 years sometimes we have a little bit of trouble  
4 getting people to come forward with what we see five  
5 years from today. And like Brian has indicated that  
6 five years ago he would think that the bulk of the  
7 business would be in decommissioning, but how quickly  
8 things change. So we also need to be aware of the  
9 dynamic environment that we are in.

10 CHAIR RYAN: That's a good example.  
11 Pardon me, Ruth. I'm sorry.

12 DR. WEINER: Sure.

13 CHAIR RYAN: But that's a good example.  
14 What caused that change?

15 MS. LUI: A lot of that, I would guess, is  
16 the cost, the economy.

17 CHAIR RYAN: That's economy. New reactor  
18 license applications and now covered by insurance.

19 MS. LUI: Correct.

20 CHAIR RYAN: That's it. That's what made  
21 the change. So in any long-range planning, you have  
22 to understand what the force majeure could be to  
23 actually take your plan and just chunk it in the trash  
24 can and start over because something big has changed.  
25 Well, the fact that the licensing for new plants

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1 became much more doable because of that insurance  
2 requirement, that changed the game.

3 MR. TREGONING: But I would argue it's  
4 more complex than that because the economics  
5 associated with operating a current reactor also has  
6 had a big impact in terms of sites looking at  
7 decommissioning as well as plants making larger  
8 capital investments that at one time would not have  
9 been deemed feasible.

10 CHAIR RYAN: But the key thing is that  
11 investment is protected now.

12 MR. TREGONING: For a specific subset of  
13 new reactors it's protected.

14 CHAIR RYAN: Right.

15 MR. TREGONING: Not --

16 CHAIR RYAN: But that's -- Of course, that  
17 thing snowballed. So there are lots of variables and  
18 I'm not trying to -- Please do accept me as  
19 oversimplifying it. But I'm just trying to understand  
20 a little bit about your time frame and what are these  
21 bigger issues in the drivers of research? What are  
22 you thinking about? If you're thinking about your  
23 normal planning for budget cycles, that's not a real  
24 driver of research. That's responding to what's  
25 already on the table. I'll stop. I'll let you guys

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1 go ahead. Sorry.

2 DR. WEINER: I had a question that you may  
3 be going to answer. So just me if I'm anticipating.  
4 I was just interested in what your thinking was that  
5 picked out these four particular areas from the whole  
6 list and if you're going to go into that just say so.

7 MS. LUI: We looked at the extent of the  
8 topic that we had identified in the report and we  
9 thought that this would fit with the ACNW&M much  
10 better than the other topics because some of the other  
11 topical areas really focus on the actual work.

12 DR. WEINER: I see.

13 MS. LUI: And the overlap with the  
14 material waste side is even none or minimal and also  
15 in the interest of time we thought that we wanted to  
16 provide -- we wanted to offer these up and at the same  
17 time, if you have a different selection, we are ready  
18 to discuss them today, too.

19 DR. WEINER: So you really looked at these  
20 and said these are the ones that seem to fit ACNW best  
21 and the rest of them are more suited to ACRS. But  
22 this is still a negotiable thing.

23 MS. LUI: Correct.

24 DR. WEINER: Thank you. That's all I  
25 wanted. Why don't you go ahead?

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1 DR. HINZE: Mike, could I add something?

2 CHAIR RYAN: Well, Ruth is in charge of  
3 this session.

4 DR. WEINER: Yes. Go ahead.

5 DR. HINZE: I don't know if you're aware  
6 but the ACNW held a research working group meeting I  
7 think in 2002. The only people that are at the table  
8 or in the room or at least at the table that were  
9 involved were Mike and I. In fact, that's the first  
10 time I met Mike and that looked at both short and  
11 long-term and there was some really good interchange  
12 of ideas and there are reports on that and there's a  
13 transcript which is even more interesting to mind and  
14 there were some really excellent ideas by a number of  
15 individuals representing both the agency and those  
16 outside the agency and it also included Commissioner  
17 Rogers who by that time had retired from the  
18 Commission, but as you know, was an extremely strong  
19 supporter of research in the agency and had some  
20 excellent ideas and I really encourage you to look at  
21 that. It's a resource of some pretty knowledgeable  
22 people.

23 MS. LUI: Yes. Thank you. And I would  
24 like to guess that the findings from your 2002 working  
25 group, some of the work and your suggestions that you

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1 have already made into our planning documents.

2 DR. HINZE: You know, they are in the  
3 report. I don't recall. I was a consultant to the  
4 Committee at that time. So I don't know who -- I  
5 didn't follow it exactly, but I don't know who wrote  
6 the report up, but there was a report that came out.

7 CHAIR RYAN: I don't remember. I would  
8 have to go back and look.

9 DR. HINZE: But I remember, Mike, you gave  
10 a presentation on health physics that covered a lot of  
11 really interesting areas.

12 CHAIR RYAN: Wow. That was good. Thank  
13 you, Bill.

14 MS. LUI: Proceed?

15 DR. WEINER: Yes, go ahead.

16 MS. LUI: Don.

17 MR. HELTON: Don Helton, Office of Nuclear  
18 Regulatory Research. The first topic that we wanted  
19 to bring in front of you is one that you are  
20 intimately familiar with. It's DoE's Global Nuclear  
21 Energy Partnership. There is some work going on in  
22 '07 and '08 dealing with some of the higher level  
23 infrastructure issues associated with GNEP and the  
24 idea is that in fiscal year 2009 work would start in  
25 earnest to develop the regulatory infrastructure that

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1 we would need to license both the consolidated field  
2 treatment center and the advanced burner reactor.

3 The NRC is already interacting with DoE on  
4 this issue and as you likely know, the staff is also  
5 developing licensing options that they put forward in  
6 front of the Commission for the approach that would be  
7 taken for licensing those facilities. The two  
8 technologies that are currently being -- that seem to  
9 be in the forefront are chemical separation for the  
10 reprocessing side of things and a sodium cooled liquid  
11 mineral reactor for the advanced burner reactor.

12 The main uses for the work that we would  
13 be starting in fiscal year 2009 would be to develop  
14 the technical bases for both the CFTC and the ABR. We  
15 would also be looking at the risk strategies and the  
16 acceptance criteria that would be appropriate for  
17 licensing those facilities. As you also probably are  
18 aware, DoE has a June 2008 deadline currently for the  
19 selection of technologies for GNEP and while we have  
20 some indications as to which direction they're  
21 heading, that Secretary's decision will certainly  
22 heavily influence the specific work that we do in  
23 fiscal year 2009.

24 DR. WEINER: Would you like to take some  
25 questions now?

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1 MR. HELTON: Absolutely.

2 DR. WEINER: Jim, do you have any?

3 DR. CLARKE: I was going to save mine  
4 until the end, but since you gave me this opportunity,  
5 I'm struggling with an even more basic question and  
6 that is how you're defining research. I mean, are you  
7 talking about actually developing models? Are you  
8 talking about working with people who develop models?  
9 Are you talking about bringing your staff up to speed  
10 on models that are already available?

11 I guess the reason I have this question is  
12 I don't see a step that usually comes before this  
13 which is the needs analysis. What do you need that  
14 you don't have and then how can you focus the research  
15 effort on that? If you want to think about that and  
16 we can talk about that afterwards, it's really not a  
17 question about GNEP. But it's a more basic question  
18 about what you're trying to get to.

19 MR. HELTON: Let me take a quick stab at  
20 it and some of my colleagues here may want to add onto  
21 what I say. That's something -- That's actually one  
22 of the very first questions that we asked ourselves  
23 when we started this back in December is what we are  
24 going to consider research to be and we went out  
25 trying to get some guidance on that from Brian Sheron

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1 and others because that's going to directly influence  
2 the scope of what type of work you identify.

3 Here we've used research to describe the  
4 development of the methods, tools, experiments if  
5 they're needed and to build up the technical bases of  
6 the infrastructure you need to fulfill a regulatory  
7 need. An example that we cited before is that if you  
8 were developing the technical basis for a rulemaking  
9 that would be research. The actual writing of the  
10 rule and the interaction between the different NRC  
11 offices as the development of the rule would not be  
12 considered research. That would be considered part of  
13 our nonresearch function.

14 So it's a good point to make sure that you  
15 understand that in Brian Sheron's eyes and others  
16 what's been defined as research in this report does  
17 not encompass everything that the Office of Nuclear  
18 Regulatory Research does. It encompasses a subset of  
19 what we do, but we do a lot of things that are  
20 consultation or assisting in rulemaking or licensing  
21 or decisions that use research, but in and of  
22 themselves are not research.

23 DR. CLARKE: But am I correct in assuming  
24 that before you got to this list that you're showing  
25 us that has the four items that you want us to look at

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1 in particular you did a needs analysis? In other  
2 words, there are some activities that took place  
3 before you got to where you are. That's kind of where  
4 I'm going. Basically, where did this list come from?  
5 How did you define these priorities? You're asking us  
6 if there are any omissions and I think it would be --  
7 But again, I don't want to distract you from your  
8 presentation. You have more than you have in this  
9 meeting so far, but these are some of things that I'm  
10 kind of wrestling with right now.

11 MR. HELTON: Yes, if I may. Some of the  
12 activities that you mentioned certainly like, for  
13 example, coming up to speed on what's available. One  
14 might say that's a necessary part of a research  
15 program. One might say that's the end of research.  
16 But we're pretty broad in our definition of what could  
17 be included in the research program. So you'll see a  
18 mixture of these different activities.

19 There was a need analysis done. I would  
20 say it was done less formally than maybe you would see  
21 in a later incarnation of the plan. Certainly when we  
22 went out to the different subject matter experts in  
23 the areas and said, "What do you think we should be  
24 looking at," already in some ways that needs analysis  
25 has been performed and what you see is a reflection of

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1 that. But we didn't go back from scratch and say,  
2 "Okay, here is the environment." We thought about the  
3 environment. We thought about scenarios. We thought  
4 about the different disciplines and we were rapidly  
5 bogged down in the time frame that would permit formal  
6 analysis. So I would say informally there is that  
7 aspect. I don't think you will find that in the  
8 document itself to say here's the full analysis that  
9 leads to the conclusion.

10 DR. CLARKE: Yes, that might be helpful in  
11 understanding how you got there.

12 MR. DEHMEL: Sure.

13 DR. CLARKE: That's fine and that's very  
14 helpful and let me stop and --

15 MR. TREGONING: The other thing, I guess,  
16 the point I would make, Tregoning from Research, if  
17 you look at many of the individual activities and  
18 what's specifically proposed for our plan in many  
19 cases within that specific area it's essentially a  
20 needs analysis being conducted within that given  
21 technology area where we're doing scoping analysis to  
22 see where the industry might be heading, to see what  
23 regulatory and technical hurdles we would have in that  
24 area and looking at potential applicability for  
25 nuclear applications on down the line. So the scoping

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1 analysis that are again a fundamental part of many of  
2 activities at least within those narrow areas will  
3 serve exactly the purpose that you're describing.

4 DR. CLARKE: Okay. Fine, and I guess I  
5 just offer the suggestion that you write this up.  
6 There may be merit to helping the reader understand  
7 how you got to where you are.

8 MS. LUI: Thank you.

9 DR. WEINER: Mike? Allen?

10 VICE CHAIR CROFF: Yes. A couple of  
11 things. First, you say "develop regulatory  
12 infrastructure." What are regulatory infrastructure  
13 needs? What is regulatory infrastructure?

14 MR. HELTON: Again, I'll take a stab at  
15 this and let my colleagues jump in. What we're going  
16 for here is the idea that if we're going to license  
17 the AVR and the CFTC several years from now there's a  
18 certain -- What we're referring to is infrastructure  
19 but there are needs that we'll have to make those  
20 licensing decisions, to support those licensing  
21 decisions, to point to a technical basis for why the  
22 regulatory decision that we're making is the  
23 appropriate one and being able to identify those needs  
24 and assess those needs and make that regulatory  
25 decision will require individual expertise, models,

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1 analyses, experiments. It will require all of those  
2 to be able to in the end make the licensing decision.  
3 So is that more vague than what you're looking for?

4 VICE CHAIR CROFF: Yes, but --

5 MS. LUI: Let me try to jump in. It is  
6 our responsibility to develop the regulations and also  
7 regulatory guides and standard review plans in order  
8 to license these facilities related with GNEP, I mean,  
9 if DoE comes over to us to basically ask us to review  
10 any applications. Our understanding is that it's up  
11 to DoE to decide whether they want to seek an NRC  
12 license and at the same time through all the  
13 communications that we've had with DoE so far, even  
14 DoE does not formally seek NRC license. They want all  
15 the facilities to be licensable. Therefore, when we  
16 say "regulatory infrastructure" from the research  
17 perspective it's really to develop the technical basis  
18 and the analytical tools to allow us to provide the  
19 potential applicants all the regulatory guidance and  
20 the regulations so that they can submit a quality  
21 application and at the same time, develop the  
22 necessary tools to allow our own staff to review the  
23 application.

24 VICE CHAIR CROFF: Okay. That helps some.  
25 I'm not going to try to offer any specific suggestions

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1 until your thinking and DoE's thinking may be more  
2 important until we get a bit further along. I'll  
3 offer a very general comment. We've had multiple  
4 briefings on fuel reprocessing, on GNEP, in this  
5 committee, the latest one being yesterday and there  
6 are two key aspects to getting fuel recycle, let me  
7 call it, licensed.

8 One that I think you focus on here is  
9 licensing a couple of big facilities, but the other  
10 comes under the sort of collateral damage thing. If  
11 you start recycle, you process a lot of different  
12 waste and you raise a lot of different effluent issues  
13 that have to be dealt with there sort of outside the  
14 facility itself. In other words, what do you do with  
15 recovered cesium and strontium? There's a whole other  
16 set of issues there that this recycle raises. So I  
17 would urge you not to focus only on the facilities.  
18 There are other things that have to come along with it  
19 that are maybe going to be, well, in my view, will be  
20 more difficult than the facility itself which is just  
21 another facility handling nuclear materials. Let me  
22 leave that as a comment.

23 MR. HELTON: Okay. And I'd actually like  
24 to respond to that. It's a very good point and what  
25 you're seeing on these slides it does focus quite a

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1 bit on the facilities, but the staff that is working  
2 on is aware of the waste disposal issue. They did  
3 even as recently as yesterday remind me of the fact  
4 that that's something that's very near and dear to the  
5 heart of the ACNW and it's something that they are  
6 keyed in on. So I'm glad you brought it up. It's a  
7 very good point.

8 VICE CHAIR CROFF: Thanks.

9 DR. WEINER: Bill.

10 DR. HINZE: Well, let me bounce back to  
11 facilities for one moment. I recently have been  
12 looking at the history and evolution of the  
13 characterization of nuclear facility sites and I've  
14 been amazed at the change that we've seen in that  
15 evolution and I think there might be some parallels of  
16 what might be happening in the future. I think as we  
17 look at GNEP and we look at the facilities to be used  
18 in GNEP as well as new reactors that there certainly  
19 is a long-range view here as to how characterization  
20 regulations will change in the future.

21 CHAIR RYAN: Just to take your  
22 conversation with Allen a step further, I think  
23 there's a bigger question that's a research question.  
24 This would be the only country in the world that  
25 doesn't have an intermediate waste category that

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1       recycles. Regulatory structure of having high and low  
2       level waste only support a recycle facility. In other  
3       words, can you fit all these waste that Allen alluded  
4       somehow into the system that we have? My own view is  
5       that you could say yes or no based on your point of  
6       view. So that's a research question that's completely  
7       apart from the facility itself.

8               The other part that is more related to the  
9       facility is this is a -- And again, I'm going by what  
10      I've heard in briefings and some of the trade press  
11      I've read. The current plan is to build what would be  
12      the largest reprocessing plant or one of the largest  
13      in the world, yet they're going to skip the detailed  
14      engineering design step and go right to construction.  
15      How do you all feel about that?

16              So I guess my point is that very much of  
17      the GNEP research needs are going to be a little bit  
18      hard for you to nail down and I mean that honestly.  
19      You just can't guess what some of the research needs  
20      will be because it's not real clear what the  
21      directions and the decision points are that would  
22      shape what you need to know and focus on. To that  
23      end, do you have any if/then kind of thinking in your  
24      document? Do you know what I mean? I mean if you  
25      have any optional thinking if it goes in this

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1 direction we'd have to focus research here. If it  
2 went in this direction, we would have to focus  
3 research here. I'd suggest particularly in the longer  
4 range view that's very typically what you see is kind  
5 of a one-off analysis. If it goes in one of these  
6 three directions, the research needs would shift from  
7 A to B to C and you'd have a profile. You might want  
8 to think about using that approach for some of these  
9 programs that are longer range like GNEP and maybe  
10 some of the others that you could think of three  
11 plausible paths and what would the research profile  
12 be? Would it be the same or would it change?

13 One other thing that I guess I have  
14 mentioned yet is manpower. We're already in a  
15 manpower crisis in terms of technical skills,  
16 capabilities, across a broad spectrum of nuclear  
17 engineering, health physics and others and programs  
18 are coming back a little bit. But if you think to  
19 '09, I don't know the exact number, but it's dozen of  
20 people that leave the Agency every month or so.  
21 What's the experienced man/horse power going to be of  
22 folks who are here and is that an ongoing issue for  
23 research to think about? How are we going to keep the  
24 place filled up with talented people? Just a thought.  
25 Thank you, Ruth.

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1 DR. WEINER: I have been focusing on one  
2 question. If you could go back one slide, you  
3 mentioned in the technical background and you do allow  
4 yourself wiggle room by saying technology selection  
5 which will likely involve technologies such as  
6 chemical separation. Well, the techniques that you  
7 have mentioned here are those which we have been doing  
8 in the United States. We've been doing chemical  
9 separation for decades. Have you looked at or are you  
10 looking in your plan at other techniques that would  
11 apply to GNEP? In other words, there have been some -  
12 - The shutdown of the EBR-2 reactor handling that  
13 waste was a very unique and clever system that I'm  
14 very slightly familiar with and I'm sure there have  
15 been others.

16 In other words, my question is to what  
17 extent are you thinking outside of the current GNEP  
18 box. Everything here says GNEP as it is currently  
19 conceived is where it's going to go and since you are  
20 looking ahead long-range, have you considered  
21 alternatives or would you like suggestions about  
22 alternatives?

23 MR. HELTON: I'm actually not at all  
24 qualified to answer that question. So I'm going to  
25 see if any, either the folks from NMSS or one of the

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1 folks from research wants to jump in and talk about to  
2 what extent other things other than the UREX plus 1A  
3 process are being considered.

4 DR. WEINER: Anyone?

5 MR. HELTON: Yes.

6 MR. REED: Maybe I can help answer the  
7 question. My name is Phil Reed and I'm in the Office  
8 of Research. Right now, we've only evaluated  
9 essentially what the DoE has presented. We're not in  
10 the position at this point to look at other  
11 technologies since as a license evaluator we can only  
12 evaluate what the licensee sends to us.

13 With regard to EBR-2, yes, we're very  
14 familiar with the pyrochemical processes of EBR-2. We  
15 have actually toured their facilities and we have  
16 asked a number of questions related on the specific  
17 areas of about separating uranium from the  
18 transuranics, from the fission products, and things  
19 like that.

20 We are also well aware of the General  
21 Electric, the presentation that's been made to us in  
22 March. They talked about another approach using the  
23 EBR-2 which is totally different than aqueous  
24 reprocessing. So we are familiar with those  
25 techniques and we do plan to do work in those areas.

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1 DR. WEINER: So I can take it that you  
2 would plan to look at some other things than what DoE  
3 is presenting or are you constrained in some way to  
4 the DoE --

5 MR. REED: We're pretty constrained in  
6 what DoE will send to us. We did not originally plan  
7 to look outside the box and look at other methods and  
8 technologies. That's essentially a DoE type of  
9 research effort. At least that's the way we've been  
10 considering now.

11 DR. WEINER: Thank you. Do you want to go  
12 ahead or does somebody else want to jump in on this?

13 MS. LUI: Ideally, maybe we can come back  
14 to answer some of the questions.

15 DR. WEINER: So move right along.

16 MR. HELTON: I'll also be covering the  
17 Advanced Offsite Consequence Code slide here. The  
18 objective here is to look and see if starting in  
19 fiscal year 2009 it's warranted to start development  
20 of a next generation offsite consequence code. The  
21 two codes that I list here under the technical  
22 background are traditionally reactor codes. We  
23 certainly are interested in that issue, but we're also  
24 open to issues that would be of interest for other  
25 licensing activities such as transportation, dry cask

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1 storage, GNEP, fuel cycle facilities.

2 But the codes that we currently have we're  
3 evolving to meet changing needs to increase realism as  
4 we move towards best estimate plus uncertainty and  
5 risk informed regulation. But they do have  
6 fundamental code architecture constraints that limit  
7 to some extent the ability to revolutionize them and  
8 for that reason, in 2009 we're proposing a scoping  
9 study that would look at whether or not the time is  
10 right to step back away from those codes and develop  
11 a code from scratch that would not share some of those  
12 historical constraints.

13 I've already talked about the uses and  
14 I've pretty much covered the FY '09 activities. If we  
15 get to the point where we think that the improvement  
16 in realism that could be realized by undertaking this  
17 effort is warranted, then in fiscal year 2009 we would  
18 prepare a code development plan.

19 DR. WEINER: Questions? I would only make  
20 the comment that there is considerable chatter in  
21 various blogs associated with code development on the  
22 web on the question of developing a brand new code as  
23 distinct from improving an existing code and I  
24 encourage you before you undertake a brand new one to  
25 look into that, remembering that existing codes can be

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1 modified, but you're working on a base that has  
2 already been QA'ed, had the bugs worked out and so on.

3 MR. HELTON: Right, and that's hopefully  
4 along with the great things of these committees as we  
5 engage external stakeholders as part of step two as  
6 well, we're hoping that some of that activity will  
7 come to the forefront so that we'll be aware of them  
8 when the time comes.

9 DR. WEINER: Okay. Moving right along to  
10 the next topic.

11 MR. TREGONING: I have the next one. Rob  
12 Tregoning from the Office of Research. This topic is  
13 on extended in-situ and real-time inspection &  
14 monitoring capabilities, simply referred to sensors by  
15 and large and as it's written and was envisioned in  
16 the research plan, this is a very broad area. It  
17 incorporates sensors that would be evaluating things  
18 such as real-time material degradation, reactor states  
19 even in normal and accident conditions, but as well as  
20 issues related to issues that this committee would  
21 have concern about such as environmental monitoring of  
22 groundwater and groundwater conditions, real time and  
23 in-situ and I look at this one as really the first  
24 step. You mentioned information technologies. Well,  
25 this is the first step in that, getting more robust,

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1 more precise data so that you can evaluate the  
2 conditions and assess performance in a more meaningful  
3 way as time marches along.

4 DR. HINZE: Also you have the opportunity  
5 to assess a lot more data which gives you the  
6 statistical robustness that you need.

7 MR. TREGONING: Right. So I think a lot  
8 of staff -- the environmental staff was very  
9 passionate about this issue and this need and I think  
10 it dovetails nicely with opinions that this committee  
11 has had and gone on record as saying that we're  
12 particularly deficient in these area, again,  
13 especially in monitoring effluence from waste  
14 containers and the like and I think some recent  
15 National Academy of Science-National Research Council  
16 studies also back up that this is an area that we  
17 really need to put some additional thinking and effort  
18 in in terms of evaluating what sensors are out there  
19 and then what sensors can we possibly employ to really  
20 improve our knowledge so that again we can do more.  
21 We can make better regulatory decisions. We can  
22 assess in terms of monitoring and performance  
23 assessment, how we should be evaluating these  
24 capabilities.

25 So I just really wanted to focus on that

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1 one particular use on slide 12 which was again  
2 assessing radionuclides and chemical species in  
3 groundwater and soil. This is one of those activities  
4 in FY '09 that we're really proposing a scoping study  
5 to begin in '09 where we'll be -- What I don't show  
6 here is activities that we will be doing in '07 and  
7 '08 which is essentially canvassing the industry.

8 We're already a part of the NERI  
9 initiative at NIST which is an advanced sensor  
10 initiative. So we'll certainly maintain our activity  
11 in that area, but we'll also be planning to canvas  
12 industry in a variety of these areas and see what  
13 applications they actually propose. We think in terms  
14 of groundwater monitoring as Tom Nicholson and others  
15 always have been briefing me on incessantly, this is  
16 one area where industry is actually pretty well ahead  
17 of us and we need to make sure that we have the  
18 ability to ensure what they're doing is technically  
19 feasible and acceptable.

20 So '09 again, we'll be evaluating  
21 promising sensor candidates. We'll be evaluating  
22 regulatory safety considerations and then as  
23 appropriate, we'll be developing research plans for  
24 viable sensor candidates.

25 DR. WEINER: We have a committee member

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1 who is also passionate on this issue, Dr. Clarke.

2 DR. CLARKE: Yes, I want to identify --

3 MR. TREGONING: I hope I didn't offend  
4 you.

5 DR. CLARKE: Not in any way. I'm glad  
6 that you're looking at this. I want to join that  
7 passion and a couple of things. I would encourage you  
8 to think beyond groundwater monitoring. My view of  
9 groundwater monitoring is it gives us the flat line  
10 response. In other words, it tells us that we've had  
11 a release. So again, I would temper that by saying  
12 that I think monitoring needs to be risk-informed. So  
13 as you go into a monitoring strategy, I think we need  
14 to think about consequences as well as likelihoods and  
15 then if there are significant consequences, we may  
16 want to do more monitoring and different kinds of  
17 monitoring the way we would otherwise do.

18 So as you would monitor the real-time for  
19 facilities, we might want to monitor environmental  
20 containment systems in a similar way again depending  
21 on the consequences and even in addition to that, just  
22 to get some data. I mean we've done a lot of  
23 groundwater monitoring. We've done very little what  
24 I would call system monitoring. They're doing some at  
25 Fernald on the disposal of cells there. There are

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1 some other limited applications. It's a good way to  
2 generate a lot of data in a short time. What do you  
3 do with it and a lot of questions, I think, still need  
4 to be answered.

5 We work closely with some folks in this  
6 room on a two-day modeling and monitoring workshop.  
7 I think there is a lot that came out of that that you  
8 would want to take a look at. But again, I encourage  
9 you to do this and think beyond traditional ways of  
10 monitoring when consequences are significant and risks  
11 are potentially high.

12 MR. TREGONING: Thank you and I know our  
13 staff is familiar with the workshop and the  
14 recommendations that came out of that. So I know  
15 that, not me personally, but we do have staff that  
16 follows that very closely.

17 DR. CLARKE: Other key words as I think  
18 Dr. Hinze will agree are "noninvasive," if possible,  
19 "risk-informed, noninvasive."

20 DR. HINZE: And I would add one more word.  
21 My two words are "precursory" and --

22 DR. CLARKE: Yes. I was getting to that.  
23 Thank you.

24 DR. HINZE: -- "noninvasive." Precursory  
25 is really very important.

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1 DR. CLARKE: We've been monitoring for  
2 failure. Our monitoring right now demonstrates that  
3 the system failed. Obviously, we want to know before  
4 the system fails that things are not going according  
5 to plan in those cases where we need to know that and  
6 again, I don't think we want to do this on everything.  
7 I don't think we can afford to do this on everything,  
8 but in those special situations where the consequences  
9 are particularly significant, it would merit that.

10 DR. WEINER: Mike Ryan.

11 CHAIR RYAN: I would add one thing to this  
12 particular topic which I think is a very good one. I  
13 want to put on my former licensee's hat. What do I  
14 get for all this if I do it? You need to figure out  
15 what is the value to the stakeholder and I think we've  
16 mentioned possibilities like lower decommissioning  
17 costs. If my reliability goes up in terms of  
18 understanding a facility through all this monitoring,  
19 there should be a benefit to the licensee. Whether  
20 that's a lower license cost or a lower inspection rate  
21 or a lower decommissioning trust fund obligation or  
22 all of the above, somehow this expense has to be tied  
23 to a benefit and to me the benefit is quite clearly  
24 the potential for a much higher regulatory confidence  
25 reliability factor. You need to tie that to something

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1 to gain the interest, I think, you're seeking from the  
2 regulated community.

3 MR. TREGONING: Yes, I think that's a  
4 great point and I can say in other areas, not  
5 environmental sensing, but when we've developed  
6 sensors in the past that's been in my opinion the  
7 prime impediment for actually implementing those in a  
8 plan or in another industrial application has been  
9 being able to make the case and have the flexibility  
10 as an agency to make the case that there is some true  
11 benefit for the licensee to actually installing more  
12 advanced technology.

13 CHAIR RYAN: And that boat will leave the  
14 dock if you don't include it in your research plan.

15 MR. TREGONING: I think that's an  
16 excellent point and again it's one historically that  
17 we struggled with.

18 CHAIR RYAN: And the winning example to me  
19 is all the efforts in water quality and reactor  
20 cooling waters 20 years ago. Nobody wants dirty water  
21 anymore because they get lower doses, they get shorter  
22 outages and we all know outages are very expensive  
23 things. If you can shave an hour out an outage,  
24 that's a win.

25 So there's many examples where once people

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1 realize that the investment pays off ultimately,  
2 that's like you say, when you get everybody to come on  
3 board with this. So I would try and find those  
4 elements right here at the beginning.

5 MR. TREGONING: And that's the challenge.  
6 Sometimes it's not clear or apparent in the beginning  
7 what those advantages will necessarily be.

8 CHAIR RYAN: Another element of this which  
9 is also well within NRC's wheelhouse is  
10 decommissioning, not just reactors but other  
11 facilities. If I could -- And this is a favorite  
12 topic of Commissioner Merrifield. What can I do to  
13 avoid creating headaches down the line in  
14 decommissioning? All the major earth movements at  
15 some of the reactors so far have been very slow and  
16 long-term kind of leaks from a fuel pool or wherever  
17 it might be that created very dilute, large volumes of  
18 soil or concrete or rubble or all of the above that  
19 had to be managed. So if I do facility monitoring,  
20 I'm thinking more of bigger structures like new  
21 reactors and others where again if the reliability  
22 goes up, what's the benefit to that licensee for  
23 avoiding headaches? You can monitor an existing  
24 situation, but if you can monitor to demonstrate you  
25 have successfully avoided a headache, now we're

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1 talking.

2 So there are two aspects there. There is  
3 dealing with ongoing recognized problems so you can  
4 effectively demonstrate compliance and then there is  
5 newer facilities or new systems where you can avoid  
6 ever getting to a compliance question. Enough said.

7 DR. WEINER: Allen. Dr. Hinze?

8 (No response.)

9 DR. WEINER: Moving right along to the  
10 last topic, Quantitative Risk Assessment.

11 MR. SIU: Okay. This one is mine. Nathan  
12 Siu, Office of Research. I think as you're all aware  
13 we've been performing risk assessments for facilities  
14 for a long time. The technology for performing those  
15 risk assessment hasn't changed much over the years.  
16 It's basically logic-based models quantified using  
17 certain algorithms and as time has gone by, the staff  
18 has been aware of various efforts to improve  
19 approaches both to the numerical solution of existing  
20 content to improve ways to model systems, cause-effect  
21 relationships between the key parameters and, let's  
22 say, the failure parameters that go into the risk  
23 models. But we haven't really done much work in that  
24 area and we're starting to become aware of  
25 applications to current systems and we see potential

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1 advantages as we look at advanced systems and thinking  
2 of passive systems in the case of advanced reactors'  
3 systems where the phenomenal logical response of the  
4 plant, let's say, or the facility to an upset  
5 condition very much changes the likelihood of  
6 successful performance of defenses, defense-in-depth.

7           So the notion behind this is to look at a  
8 number of specific techniques that have been proposed  
9 and aren't necessarily industrial strength yet in  
10 terms of applications but can be anticipated to be  
11 developed along the way partly because of the advances  
12 in computing technology available. So in some sense,  
13 we've done the what if. We're thinking about looking  
14 ahead. Applications may come in that exercise these  
15 technologies.

16           A binary decision diagrams is a particular  
17 technique used to quantify risk models without some of  
18 the standard approximations used in current PRAs.  
19 Bayesian belief nets, a way to represent relationships  
20 between causal factors in a nondeterministic fashion  
21 and the relationships are influenced by available  
22 data. And near and dear to my heart at least, more  
23 simulation-based risk assessment approaches where  
24 we're starting to integrate the key phenomena  
25 associated with the system and behavior into the risk

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1 models. Now I know that's done in other arenas  
2 looking at, for example, groundwater transport, but  
3 this is an application now to facilities where again  
4 in the past we have typically used the event  
5 tree/fault tree methodology to represent accident  
6 sequences and the likelihood of those sequences.

7 So this is an initial effort. If we learn  
8 from our scoping assessment that there's work that  
9 needs to be pursued more seriously, that would be the  
10 outcome of this activity. So in a way, it's the needs  
11 analysis that you mentioned earlier and that's what we  
12 would be doing in '09.

13 DR. WEINER: Since we're almost to the end  
14 of the program, why don't you wrap up, Christiana, and  
15 then we can --

16 MS. LUI: Okay.

17 DR. WEINER: Anyone can ask any other  
18 questions.

19 MS. LUI: Okay. I just want to wrap up  
20 the session that we have discussed. An example that  
21 key piece has been incorporated into the current  
22 version of the long-term research plan that we plan to  
23 start in FY 2009 and as Brian has mentioned in his  
24 opening remark that we are committed to provide the  
25 draft final to the Commission by July 2007. So any

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1 recommendations that you have based on today's  
2 exchange if you plan to send us a letter we will take  
3 that into consideration when we update the current  
4 version and when we provide the final to the  
5 Commission in July 2007.

6 And I just want to come back and answer  
7 Dr. Ryan's question about the events scenarial type of  
8 approach. We actually thought about doing that and we  
9 were trying to identify and define the purpose of this  
10 particular version of the plan as we developed the  
11 plan. We were focusing on the level of detail that we  
12 should go into and at that particular point, we  
13 decided that we were not going to pursue the event  
14 scenario and with that said, it does not mean that  
15 that's not what we intend to do. Given that we want  
16 to keep this as a living document, whatever new  
17 information comes up, we will incorporate that and  
18 update our plan.

19 And at the same time because we need to  
20 apply for resources, we were doing that based on our  
21 best information at this point in time of what we may  
22 need two years from now and also in the budget  
23 process, every year when we prepare the budget two  
24 years from now, we have an opportunity to reprioritize  
25 and restack the budget for the following fiscal year.

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1 So we have opportunities to even though not explicitly  
2 considering the scenario planning type of approach  
3 that you have mentioned, that we can easily  
4 accommodate that.

5 The other issue about critical skill sets,  
6 our office is continuously looking at the critical  
7 skill areas and either for recruitment or training or  
8 development that we have identified areas that we  
9 definitely want to maintain core capability. So that  
10 is an ongoing effort and that has not been forgotten.

11 CHAIR RYAN: Some of these points that  
12 you're articulating, you ought to put in your report  
13 as bounding conditions, the structure and limitations  
14 and grounding conditions that you have constrained  
15 your report to provide would help the reader a lot.

16 MS. LUI: Okay.

17 CHAIR RYAN: Because when you think about  
18 -- And I guess quite frankly even the title of "long-  
19 range" I challenge. 2009 is tomorrow. It's not long-  
20 range. So I would think carefully about what you're  
21 really offering in terms of forward thinking. I'm not  
22 criticizing the thinking. I'm just saying "long-  
23 range" people are going to be looking for that  
24 what/if/then kind of analysis. 2008 November a new  
25 president is elected and may decide GNEP is off the

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1 radar screen. Done. That's a force majeure. There's  
2 nothing you can do about that if the rules change.

3 MS. LUI: Right.

4 CHAIR RYAN: Again if you want to limit  
5 and not do those kind of things, I think it would  
6 strengthen your report to tell folks that's an  
7 intentional thing you've done.

8 MS. LUI: Okay.

9 CHAIR RYAN: And just be real explicit  
10 about what you haven't done as well as what you have  
11 done. That way you're sharing your thinking more than  
12 just saying here's a bunch of research topics which I  
13 think will help people appreciate the collaboration  
14 you've made on this document. Thank you.

15 DR. CLARKE: If I could just add to that.  
16 I would throw in again it would help people like me to  
17 know what you mean by "research" as well as what you  
18 mean by "long-term" and how you got to where you are.  
19 I think that kind of up front needs assessment that's  
20 typically done before you get to the end, a gap  
21 analysis, some of the other tools that are out there  
22 to help you focus your efforts. I think that would be  
23 very helpful so the reader can understand how you got  
24 to this list.

25 CHAIR RYAN: And if I may, Ruth. Again,

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1 it kind of feeds off of Professor Clarke's comment.  
2 If I were in your shoes, I would try and identify each  
3 major program area in the agency that each area that  
4 you're identifying would serve. I understand the  
5 modeling stuff. We've all talked a lot about that  
6 with you all and with folks out here and we've had  
7 workshops. But we're speaking Klingon as far as most  
8 folks go when they come to try to figure out what are  
9 we talking about. So it would be nice to identify  
10 this serves the Office of something or the program of  
11 something and then each research elements could be  
12 applied maybe one, two or 20 or agency-wide and if you  
13 could just identify who it would serve a little bit,  
14 I think that would -- even if it's a new initiative  
15 like GNEP, that's a different thing. But just where  
16 would this research land and be useful? That would be  
17 a helpful way to again share your thinking and what it  
18 would serve.

19 MR. HELTON: Thank you for that comment.  
20 It's actually something that I think each of us is  
21 thinking in the back of our mind. In a previous  
22 incarnation of the report, there was what we called a  
23 crosswalk table that listed 20 technical areas versus  
24 seven program areas and attempted to do what you're  
25 describing and one of the issues we ran into is we

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1 have very few empty spots. It seems like every  
2 program in some ways supported by almost every  
3 technical discipline that the Agency engages in. It's  
4 something that going forward we shouldn't forget and  
5 we should try to see if there's a better way to  
6 accomplish the --

7 CHAIR RYAN: What a great message that is.  
8 We've done a crosswalk of the programs and the  
9 elements and we found that these research projects  
10 basically can be in any one box. That's a great thing  
11 to put in.

12 MR. TREGONING: And that was the intent  
13 with all the crosscutting activities that we  
14 identified, the idea that they would support multiple,  
15 if not, most of the programs here at the Agency. We  
16 did try to parse out those elements of research that  
17 would support specific program initiatives like GNEP,  
18 like the offsite.

19 CHAIR RYAN: Right. And again, tell that  
20 story. Show what you did, even the fact that -- I  
21 would just put all that in there. That's great  
22 information. And again, I'm not thinking of the folks  
23 necessarily in this room that understand all that.  
24 I'm thinking of the broader audience of folks that if,  
25 for example, the Chairman decides to seek some funding

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1 from Congress for research money. It's going to have  
2 to be something that will translate beyond the  
3 technical realm and technical people. So those things  
4 really help. They've analyzed where this would fit  
5 and how it would in the agency and who it would serve.  
6 That's a great message. And the fact that it's broad  
7 scope and broadly applicable stuff that's on your top  
8 list, what a great message.

9 DR. WEINER: Allen.

10 VICE CHAIR CROFF: Yes, a couple of  
11 comments. On the risk assessment methods, I guess  
12 maybe the most blunt way to say it is don't fall into  
13 reactor think. We do fuel cycle and PRAs are rarely  
14 or have been rarely applied in the fuel cycle. I mean  
15 things like a uranium melt just don't really require  
16 it.

17 But that then raises the question first  
18 for what fuel cycle facility is something like a PRA  
19 required and are there any differences in how you go  
20 about in a reactor? Secondly, for those where a PRA  
21 may not be justified, what should be done? So keep in  
22 mind the fuel cycle.

23 Sort of a similar conceptual thought, one  
24 of the things we didn't talk about here is test  
25 facilities. You list a couple which appear to be

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1 reactor oriented, but especially if GNEP processes,  
2 you're going to need some test facilities. You're  
3 going to need some access to some hot cells and some  
4 other fairly specialized things that you haven't had  
5 access to and from experience, a hot cell that tears  
6 apart a fuel assembly for post irradiation examination  
7 doesn't cut it if you're handling liquids. You know  
8 there are hot cells and then there are hot cells and  
9 you need to think about what test facilities the NRC  
10 needs, test experimental facilities, and look around  
11 because they're getting fewer and fewer every day.

12 DR. SIU: If I may. On the risk  
13 assessment aspect, yes, we've been reminded many times  
14 that we deal with reactors, that problems on the fuel  
15 cycle are probably different, the assessments are  
16 different. There are activities underway now,  
17 arguably you would say more qualitative in nature,  
18 that are aimed at looking at the safety of the fuel  
19 cycle facilities that if you will borrow from some PRA  
20 concepts but are being applied in a new way to the  
21 other facilities. That wasn't included very much in  
22 this topic.

23 Obviously, the topic was labeled  
24 "quantitative risk assessment." In a way it was  
25 looking forward. It is somewhat an if/then. If we

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1 worked towards more quantitative risk assessment  
2 methods for these kinds of facilities, what would that  
3 require? And we've explored the -- That's why it's  
4 under this particular banner and it also applies, of  
5 course, to the reactor side. So the overall heading  
6 was "advanced reactor fuel cycle facilities" but I  
7 appreciate that there are differences between the two.

8 DR. WEINER: Dr. Hinze.

9 DR. HINZE: I hate to mention the word  
10 "low-level waste" because we have the expert here.  
11 But I was struck by hearing once again yesterday from  
12 Commissioner Merrifield the concern about the Low-  
13 Level Waste Policy Act and how it has been a failure  
14 to this nation and sooner or later, we're going to  
15 have to face that problem of a proper low-level waste  
16 repository and policy.

17 And I think that one of the things that a  
18 research group might do is try to look down the pike  
19 and see what could be done and what encouragement  
20 could you give and support could be given to Congress  
21 to really, when it's ready, change this in a proper  
22 way.

23 DR. WEINER: Any staff questions?

24 CHAIR RYAN: There are a bunch of letters  
25 on that topic.

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1 MS. LUI: Thank you.

2 DR. WEINER: John Flack.

3 MR. FLACK: Yes, John Flack from ACNW.  
4 You know having been on the other side of the fence  
5 for all these years in the Office of Research it's  
6 always difficult for this agency, I think, as a whole  
7 and I can say that now because I'm here with an  
8 independent body to see the real value of research.  
9 It's always a struggle to get that value out there and  
10 show that it has value in the way they do business and  
11 I think sometimes my only friends were the committees  
12 when I came down here because I think both committees  
13 always to large extent supported research more than  
14 the general agency did and saw the value of research.  
15 So I think it's great that you came down here and just  
16 laid things out for the committees in general and I  
17 think it was a great idea. That's all I wanted to say  
18 as a comment.

19 DR. WEINER: Thank you. Since we are  
20 somewhat over our time, I'd just like to thank you all  
21 and encourage you when you want ACNW and, it doesn't  
22 sit very well, when you want our advice on something  
23 or want to bounce something off of us, we come, all of  
24 us, from research backgrounds and we all have slightly  
25 different views of what that means. But please feel

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1 free to contact us and if you want our input and seek  
2 it, that this is an area that we're very, very  
3 interested in and I wanted to thank you all again.

4 Does anyone else have any more closing  
5 thoughts?

6 CHAIR RYAN: Yes, I'd like to just touch  
7 on the idea of a letter before we have the folks  
8 leave.

9 DR. WEINER: Yes.

10 CHAIR RYAN: You said your report is due  
11 in July.

12 MS. LUI: Correct.

13 CHAIR RYAN: So we're a little bit behind  
14 our own power curve if we would have to draft a  
15 letter. We will deal with it next month and you  
16 probably wouldn't get it until your report is due.

17 MS. LUI: With that said, it doesn't mean  
18 that your input cannot be incorporated into the  
19 thinking because like we have mentioned that this is  
20 a living document and also we always have the chance  
21 next year to restack the FY '09 priority, too.

22 CHAIR RYAN: I wonder if what we've  
23 discussed today is enough for you to deal with our  
24 endpoint on this go-around.

25 MS. LUI: That was a really great starting

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1 point.

2 CHAIR RYAN: And maybe -- I'm just  
3 throwing this out as an idea. I don't know that a  
4 letter would change anything that we've said or  
5 offered to you today except tell the Commission that  
6 the document you're now receiving includes some of  
7 this input. So I'm wondering if we -- I'm sure you'll  
8 recognize that you were here and presented to the  
9 Committee and we had a thorough discussion of your key  
10 issues and so forth and we gave you, I don't know,  
11 3,000 suggestions. But I throw that open for anybody  
12 to react to. Do we need a letter or not?

13 VICE CHAIR CROFF: Mike, my inclination --  
14 I agree with what you're saying. My inclination to  
15 wait until their proposed budget --

16 CHAIR RYAN: The draft is out.

17 VICE CHAIR CROFF: -- comes out in July.  
18 Then we can go through that and maybe hear a little  
19 bit more and comment on a piece of letter with some  
20 serious thought behind it.

21 CHAIR RYAN: How does that sound?

22 MS. LUI: There are -- We can work with  
23 the Committee anyway that meets your needs and your  
24 schedule.

25 CHAIR RYAN: You're giving the Commission

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1 a draft. Is that correct?

2 MS. LUI: We have already provided the  
3 current version to the Commission in April.

4 CHAIR RYAN: So we're way behind the  
5 curve.

6 MS. LUI: And we proposed -- I mean we  
7 want to provide the Commission the final draft for FUY  
8 '09 plan in July.

9 MR. WIDMAYER: Are they supposed to vote  
10 on it and approve it?

11 MS. LUI: No, we intended to send that out  
12 as an information document.

13 VICE CHAIR CROFF: What's the date in July  
14 that you have to do that?

15 MS. LUI: July 31<sup>st</sup>. It's due to the  
16 Commission July 31<sup>st</sup>.

17 DR. WEINER: So we would still have two  
18 meetings before.

19 CHAIR RYAN: I guess I would like Allen's  
20 idea. I mean I'd like to see the more advanced draft  
21 and then comment on that.

22 VICE CHAIR CROFF: Yes.

23 CHAIR RYAN: That's probably the right way  
24 to go.

25 DR. WEINER: So I'm not confused. What

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1 you are submitting in July is a paper but it will be  
2 a living document and there will more --

3 MS. LUI: Yes. There will be a FY '10  
4 version the next time around.

5 DR. WEINER: I see and that version would  
6 follow a similar sort of schedule where you would  
7 present a draft in March or April?

8 MS. LUI: This time around because we  
9 operate under a very compressed schedule we got the  
10 task at the end of November. So we really started in  
11 the month of December. You can see December and  
12 January, you can condense working months into just one  
13 working month. So we're on a very compressed schedule  
14 and as I've mentioned before that as we are developing  
15 this plan, we are also mapping out a more systematic  
16 process so that when we do the next round, it will be  
17 more in line with the schedule for FY '10 budget  
18 development and give us more up-front time for  
19 interaction with others.

20 DR. CLARKE: Coming back to the July  
21 deliverable, that is a draft.

22 PARTICIPANT: Draft final.

23 (Several say "Final.")

24 VICE CHAIR CROFF: So it would be fine if  
25 you guys just want to say that it would be getting to

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1 the Commission's hands just time their final is  
2 getting there and the Commission --

3 CHAIR RYAN: I just think we can look at  
4 that document and then comment to the Commission on it  
5 if we choose to do it even at that point.

6 DR. WEINER: Yes, I would think that since  
7 this is a continuing effort that comments we would  
8 make on that document would also have value to --

9 CHAIR RYAN: I mean you're going to take  
10 our input and you're going to integrate that and by  
11 the time we write a letter and work the letter out  
12 half the things that are going to be in our letter  
13 you're going to have already addressed. So let's get  
14 ahead of the power curve here. I don't want to write  
15 a letter that's out-of-date the day we stamp it and  
16 send it upstairs.

17 MR. TREGONING: And next year our draft  
18 for FY '10 is required in February of 2008.

19 CHAIR RYAN: One place I think we can  
20 address what we've talked about today is in our  
21 meeting summary notes. It does go up to the  
22 Commissioners. So what we can do is maybe write an  
23 extra paragraph in that meeting summary, Antonio, and  
24 just say we've discussed several options and ideas  
25 with the Research staff regarding their report which

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1 we understand will be in your offices in July and  
2 we'll write a full letter and comment on that draft  
3 final plan.

4 MS. LUI: Yes, and at the same time I just  
5 wanted to make this point one more time. In my  
6 opening slides, I have indicated that there are a lot  
7 of people watching how these activities are evolving.  
8 If this particular committee believes that this is a  
9 worthwhile effort, any kind of support and  
10 encouragement in any way you can express to -- in  
11 particular when you write the Commission also  
12 expressing your view to the public, if you do believe  
13 that is something that the Agency should focus on, I  
14 think your endorsement will certainly help the push in  
15 this effort, too.

16 DR. WEINER: Antonio.

17 MR. DIAS: Did we share with all the  
18 members the letter that ACRS wrote on the same topic?  
19 I know that Ruth has it.

20 DR. WEINER: You have to speak in the  
21 microphone, Antonio.

22 MR. DIAS: This is Antonio Dias from ASNW  
23 staff. Did we share the letter that the ACRS just  
24 wrote on the same topic with all the members? I know  
25 Ruth has it.

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1 DR. WEINER: Yes, I have it.

2 CHAIR RYAN: I don't.

3 DR. WEINER: I think we should.

4 DR. CLARKE: The answer is no.

5 MR. DIAS: That was the question and you  
6 gave the answer.

7 DR. WEINER: I think before we make a  
8 final --

9 MR. DIAS: It's a very interesting letter  
10 they wrote. They have --

11 CHAIR RYAN: Just to summarize, I think  
12 we're concluding we're not going to write a letter  
13 based on today's presentation. We're going to reflect  
14 in our meeting summary that we heard this  
15 presentation. We understand it's a very dynamic  
16 process at the moment. The staff is finalizing their  
17 report and we'll comment to the Commission after we  
18 review that final report.

19 Are all the members in agreement with that  
20 or not? I'm getting two nods, a third nod and a  
21 fourth nod. So that's where we are. Are there any  
22 objections to that from the staff?

23 MR. FLACK: I think that just even a very  
24 simple letter at this point in time supporting the  
25 research effort -- I think what Chris was mentioning

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1 would be a good idea and then you could get into a  
2 more detailed -- I know the ACRS letter was very  
3 detailed. It got into each of these subjects and  
4 discussed. But I think even a simple message to the  
5 Commission saying that what you're doing and what  
6 you'll be following up with is a good idea and that --

7 CHAIR RYAN: Well, John, when did the ACRS  
8 have their briefing? I mean we're behind the curve  
9 here.

10 MR. FLACK: Well, they --

11 CHAIR RYAN: This idea that we have to  
12 write a letter every 30 days every time we heard  
13 something has to stop.

14 (Several comments at once.)

15 MS. LUI: It was a few weeks ago.

16 CHAIR RYAN: God bless them. That's  
17 great.

18 DR. WEINER: We do have at least one more  
19 meeting before.

20 DR. WEINER: Ruth, you're the lead. If  
21 you want to write a letter and get it going, that's  
22 fine. I'll withdraw my suggestion.

23 DR. WEINER: Thank you. I think John's  
24 suggestion was very good and I look forward to working  
25 with you and Antonio on a brief letter reflecting a

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1 little bit of what we've heard. We won't go into the  
2 detail that ACRS went into.

3 DR. HINZE: I would hope you'd put some  
4 substance into it.

5 DR. WEINER: It will have substance.

6 DR. HINZE: Just a heading isn't going to  
7 do it.

8 DR. WEINER: We're not going to write a  
9 letter that says, "This was good. Thank you very  
10 much." I know that Christiana would never look at me  
11 again if we just said that.

12 MR. FLACK: You could put Bill's name on  
13 it. That would be --

14 DR. WEINER: There we go. We will come  
15 out with something and then have some --

16 CHAIR RYAN: Well you volunteered to write  
17 a letter overnight just like the ACRS. That's what I  
18 heard.

19 DR. WEINER: Yes. Well I won't be the  
20 first time.

21 CHAIR RYAN: That's true. Like I said,  
22 you have practice.

23 DR. WEINER: Thank you very much. Before  
24 we quit, there are other people here from the Research  
25 team.

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1 CHAIR RYAN: Ruth, we have other things we  
2 need to do.

3 DR. WEINER: Okay.

4 CHAIR RYAN: So we need to -- We're a half  
5 hour over time.

6 DR. WEINER: Thank you.

7 CHAIR RYAN: If you want to have private  
8 conversations or take a last round of comments, make  
9 it quick.

10 DR. WEINER: Is there anybody who would  
11 like to make a comment?

12 CHAIR RYAN: No, good.

13 DR. WEINER: Thank you. Just wanted to  
14 recognize them. Thank you very much.

15 CHAIR RYAN: Perfect. With that we'll  
16 adjourn the record for the day and we'll concluded.  
17 Off the record.

18 (Whereupon, at 2:26 p.m., the above-  
19 entitled matter was concluded.)

20

21

22

23

24

25

**NEAL R. GROSS**

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CERTIFICATE

This is to certify that the attached proceedings before the United States Nuclear Regulatory Commission in the matter of:

Name of Proceeding: Advisory Committee on  
Nuclear Waste  
179<sup>th</sup> Meeting

Docket Number: n/a

Location: Rockville, MD

were held as herein appears, and that this is the original transcript thereof for the file of the United States Nuclear Regulatory Commission taken by me and, thereafter reduced to typewriting by me or under the direction of the court reporting company, and that the transcript is a true and accurate record of the foregoing proceedings.



Charles Morrison  
Official Reporter  
Neal R. Gross & Co., Inc.



## Agency Long-Term Research Plan Development

Presentation to ACNW&M

Christiana Lui, Don Helton, Nathan Siu, Rob Tregoning  
Office of Nuclear Regulatory Research

May 17, 2007



## Objectives

- Agency-wide long-term regulatory research plan focusing on
  - possible new program areas
  - emerging technologies that may have future nuclear applications
- Planning and communication tool
  - High-level description of research activities
- Living document that will be updated periodically



## Scope

- Focus is on anticipated future needs which are not currently identified in other NRC planning document
- Does not address currently planned activities some of which may be long-running
- Does not duplicate research activities described in other stand alone research plans (e.g., Advanced Reactor Research Plan)

3



## Plan Development Considerations

- Plan development timeline supports FY 2009 budget formulation
- Mapping out a process while developing the initial version
- Living document => topic areas and focus within areas can be revised as new information emerges
- Success of the current effort will likely stimulate further participation

4



## Summary of Proposed Activities\*

- DOE Global Nuclear Energy Partnership
- Reactor License Renewal Beyond 60 Years
- Test Facilities
  - Integrated Digital I&C and Human Machine Interface Research Facility
  - Integral Effects Test Facilities for Advanced non-LWRs
- Cross-Cutting and Emergent Technologies
  - Advanced Analytical Capabilities
    - Advanced Computational Methods
    - Multiphase Computational Fluid Dynamics Capability
    - Advanced Modeling Techniques for Level 2/3 PRA
    - **Advanced Offsite Consequence Code**

\*Bold text indicates topics to be discussed in more detail

5



## Summary of Proposed Activities (Cont.)

- Cross-Cutting & Emergent Technologies (cont.)
  - Advanced Fabrication Techniques
  - **Extended In-Situ and Real-Time Inspection & Monitoring Techniques**
  - Offsite Mitigation Strategies
  - Nanotechnology for Nuclear Power Applications
  - Fire Effects on Fiber-Optic Cables
  - Risk Assessment for Adv. Reactor/Fuel Cycle Facilities
    - Empirical Data for Risk Assessment
    - HRA Methods for Advanced Facilities
    - **Advanced Quantitative Risk Assessment Methods**
  - Formal Decision Analysis Methods

6



## **Selected Candidate Activity Descriptions**



### **GNEP**

- Objective
  - Develop regulatory infrastructure needs associated with DOE's GNEP program
- Technical Background
  - NRC already interacting with DOE on this issue
  - Staff is evaluating licensing options, including any necessary rulemakings
  - Depending on technology selection, will likely involve technologies such as:
    - Chemical separation for reprocessing
      - fission products, transuranics, Uranium
    - Fast reactor (LMR) transuranic transmutation



## GNEP

- Uses
  - Technical bases development for licensing a
    - consolidated fuel treatment center and
    - an advanced burner reactor
  - Associated risk strategies and acceptance criteria
- FY09 Activities
  - Specific activities depend on DOE's selection of technologies (June 2008)

9



## Advanced Offsite Consequence Code

- Objective
  - Development of a next-generation offsite consequence code
- Technical Background
  - Current codes (MACCS2, RASCAL) utilize simplified transport models (Gaussian plume/puff)
  - Code architecture limits the ability to evolve
- Uses
  - Offsite consequence calculations for postulated fission product releases
- FY09 Activities
  - Evaluate currently available models
  - Investigate implementation issues and potential benefits in effectiveness/realism
  - Develop a code development plan (if justified)

10



## **Extended In-Situ and Real-time Inspection & Monitoring Capabilities**

- Objectives
  - Expand monitoring capabilities
  - Improve evaluation of critical nuclear systems and components both during normal and accident conditions
- Technical Background
  - Development of miniaturized, cost-effective, and advanced sensors capable of performing real-time monitoring
  - Wide-spread use in automotive, chemical processing, aerospace, and other commercial industries
  - Commercial nuclear and material facilities often use older technologies.
  - DOE's Nuclear Energy Research Initiative has investigated a number of these new sensors and techniques.

11



## **Extended In-Situ and Real-time Inspection & Monitoring Capabilities**

- Uses
  - Monitor real-time material degradation
  - Characterize residual stress
  - Assess radionuclides/chemical species in ground water and soil
  - Characterize fuel properties
  - Monitor severe accident conditions
- FY-09 Activities
  - Select promising sensor candidates for industry use
  - Evaluate regulatory and safety considerations to verify reliability, accuracy, and acceptability for nuclear service.
  - Develop research plan, culminating in regulatory approval, for viable candidates

12



## **Advanced Quantitative Risk Assessment Methods (Advanced Reactors and Fuel Cycle Facilities)**

- **Objective**
  - Evaluate potentially promising advanced quantitative methods
- **Background**
  - Improved methods have been developed
    - Numerical solution of logic-based models
    - Explicit representation of deterministic and probabilistic relationships
  - Some applications to current systems
  - Potential value in addressing advanced systems
- **FY09 Activities**
  - Scoping studies to assess the state, costs, and benefits of selected methods:
    - Binary Decision Diagrams
    - Bayesian Belief Nets
    - Simulation-based risk assessment approaches

13



## **Summary**

- Staff has developed an initial Long-Term Research Plan for FY 2009
  - Discussed a sample of proposed activities in the initial plan
- The final proposed FY 2009 Long-Term Research Plan to the Commission by July 2007
- ACNW&M recommendations will be addressed as the staff move forward in finalizing the FY 2009 plan and future updates

14



## Backup Slides

15



## Reactor License Renewal Beyond 60 Years

- Objective
  - Evaluate and update, as necessary, the technical basis for supporting evaluation of possible requests for license renewal beyond 60 years
- Technical Background
  - Modifications of safety-related systems, structures, and components may increase impetus for license renewal.
  - No regulatory limit which precludes additional life renewal beyond 60 years.
  - Informal DOE inquiry about possibility of renewal beyond 60 years, but no formal letter of intent received.
  - Earliest renewal application is assumed between 2014 – 2019.
  - Current technical bases are the GALL and GEIS reports:

16



## Reactor License Renewal Beyond 60 Years

- Uses
  - Support GALL and GEIS modifications, as necessary, to extend technical bases beyond 60 years.
  - Technical information for updating related SRPs (NUREG-1800 & NUREG-1555, Supplement 1) and Regulatory Guides (1.188 and 4.2)
- FY-09 Activities
  - Identify possible supporting extended in-situ and real time instrumentation and monitoring techniques
  - Conduct scoping study to assess and prioritize technical issues
    - Aging of critical passive structures, systems, and components
    - Aging of electrical and instrumentation systems
  - Develop research plan

17



## Integrated Digital I&C and Human Machine Interfaces Research Facility

- Objectives
  - Develop facility for digital I&C systems which is integrated with a full-scale, reconfigurable simulator to improve the realism, applicability, and efficiency of planned research
- Technical Background
  - Research is currently performed at several different national laboratories, universities and international research facilities.
  - NRC is acquiring several digital safety systems that are being used (or proposed for use) in the industry for evaluation at these different facilities.
  - Use of multiple facilities is inefficient and does not allow for realistic simulation of the various representative digital I&C and human machine interfaces

18



## **Integrated Digital I&C and Human Machine Interfaces Research Facility**

- **Uses**
  - Single, integrated test facility would provide capability to independently confirm analyses of proposed I&C systems.
  - Facility would also provide data to validate digital system risk and reliability models currently being developed.
  - Modular, reconfigurable human factors simulator would permit evaluation of all expected plant control room and HMI designs.
- **FY-09 Activities**
  - Prepare detailed options paper (early FY 2008)
  - Pending Commission approval of paper
    - NRC and industry will jointly establish facility requirements and initiate development.
    - Staff will complete detailed facility development and operations plan.

19



## **Integral Effects Test Facilities for Advanced non-LWRs**

- **Objective**
  - Availability of facilities for regulatory activities associated with advanced non-LWRs
- **Technical Background**
  - Early LWR experience demonstrates the need for these facilities (technical bases to support licensing decisions)
- **Uses**
  - Ensuring adequacy of safety criteria
  - Ensuring adequacy of licensees' analytical tools
  - Development and validation of the agency's tools
- **FY09 Activities**
  - Scoping and prioritizing regulatory research needs for a wide range of technical disciplines

20



## Advanced Computational Methods

- Objective
  - Identify / evaluate external developments:
    - problems relevant to a broad range of applications
    - improved integrated cross-disciplinary analysis capabilities
- Technical Background
  - Prompted by improvements in the internal and external computational environment
  - Increased importance due to “best estimate + uncertainty”
- Uses
  - Sensitivity analysis for multi-parameter problems
  - Quantitative uncertainty analysis
  - Direct system simulation
- FY09 Activities
  - Scoping level assessment to identify, evaluate and recommend needed research activities (generic and/or application-specific)

21



## Multiphase Computational Fluid Dynamics

- Objective
  - Extend NRC’s single-phase CFD capability to multi-phase
- Technical Background
  - Used in other industries
  - More applications being seen in the nuclear industry (especially in other countries)
- Uses
  - Two-phase issues in current and new reactors (e.g., DNB)
  - Two-phase / two-fluid issues in advanced reactors
- FY09 Activities
  - Evaluate domestic/international collaboration opportunities
  - Examine existing commercial/research tools
  - Benchmark versus simple, well-characterized experiments

22



## Advanced Modeling Techniques for Level 2/3 PRA

- Objective
  - Provide integral, quantitative, predictive capability to directly support Level 2/3 PRA (alternative to the APET approach)
- Technical Background
  - Important phenomena-based insights incorporated in to the agency's severe accident computer code
  - Current Level 2 treatment relies on a simplified logic-based approach and static approximations of behavior

23



## Advanced Modeling Techniques for Level 2/3 PRA

- Uses
  - Eliminate reliance on simplified LERF in favor of quantified Level 3 or discrete release categories
  - Capability of considering alternate risk metrics
- FY09 Activities
  - MELCOR developments specific to this application
  - Investigation of fast-running MELCOR incorporation into Level 2 PRA framework

24



## Advanced Fabrication Techniques

- Objectives
  - Evaluate the performance of new construction, fabrication, and manufacturing techniques for nuclear applications
  - Assess use of performance-based specifications
- Technical Background
  - New techniques are being considered for new and next generation nuclear systems, structures, and components.
  - Many techniques may greatly decrease the construction schedule and relative cost of new plants, while simultaneously improving quality.
  - Industries are moving from prescriptive to performance-based specifications.
  - It's unknown if nuclear applications present unique performance challenges.

25



## Advanced Fabrication Techniques

- Uses
  - Support staff review and development of updated guidance for new nuclear power plants construction
- FY-09 Activities
  - Coordinate with DOE and industry to identify viable construction and component manufacturing techniques (FY 2007- 2008)
  - Identify preliminary technical and regulatory issues (FY 2007 – 2008)
  - Conduct systematic scoping study to fully identify and prioritize technical issues that may have adverse nuclear safety ramifications
  - Evaluate existing laboratory and service performance of techniques and assess the use of performance-based specifications
  - Develop detailed research plan

26



## Offsite Mitigation Strategies

- Objective
  - Monitor developments in the area of capture and cleanup of radioactive materials
- Technical Background
  - Other entities are performing research for airborne scavenging technologies
- Uses
  - Identification of potentially beneficial mitigation technologies
- FY09 Activities
  - Monitor external activities in this area, including:
    - Airborne mitigation systems
    - Non-airborne on-site delivery systems

27



## Nanotechnology for Nuclear Power Applications

- Objectives
  - Identify candidate nuclear applications of nanotechnology
  - Develop plans to support regulatory use of identified technologies
- Technical Background
  - NRC is partner in National Nanotechnology Initiative (NNI), a nanotechnology research and development program among 25 Federal agencies.
  - One NNI objective is to identify the applied research and development needed to transition scientific discoveries into commercial applications.

28



## Nanotechnology for Nuclear Power Applications

- Uses
  - Condition-based sensing for early potential fault detection
  - Security of information technology systems
  - Nonvolatile, radiation-hard, low-power, high-density, random access memory
  - Enhancement of containment or reactor coolant system heat transfer during accident conditions
- FY-09 Activities
  - Continue participation in NNI to monitor scientific developments
  - Identify, with industry, viable nuclear applications
  - Develop research plans to assess the potential regulatory applications of these technologies and develop acceptance criteria for their use

29



## Fire Effects on Fiber Optic Cables

- Objective
  - Develop and validate fire models for fiber optic cables
- Background
  - Substantial work on conventional cables (e.g., CAROLFIRE)
  - Potential questions with introduction of fiber optics cables
    - Fragility (cables as targets)
    - Combustibility (cables as intermediate fire sources)
- Potential Uses
  - Assessments of acceptability
  - Risk-informed applications (e.g., fire protection)
- FY09 Activities
  - Initiate development (including literature search, model framework development, identification of empirical data needs and sources)

30



## **Empirical Data for Risk Assessment (Advanced Reactors and Fuel Cycle Facilities)**

- **Objective**
  - Improve empirical basis for PRA models in key areas (e.g., HRA, passive systems)
- **Background**
  - Failure event data: sparse, of limited relevance, or non-existent
  - Non-nuclear sources may be relevant, but need to address quality, applicability, and availability
- **FY 09 Activities**
  - Initiate pilot project
    - Identify, collect, and analyze non-nuclear data relevant to human performance during accidents
    - Derive qualitative failure mechanism information and associated risk assessment implications
    - Assess ability of data to support quantitative risk assessment

31



## **HRA Methods for Advanced Facilities**

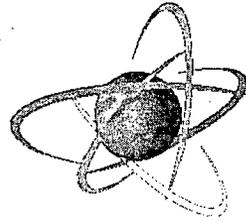
- **Objective**
  - Extend current HRA capabilities to advanced reactor and fuel cycle facilities
- **Background**
  - Current frameworks are general
  - Application work to date focuses on operating facilities
  - Ongoing benchmarking study may provide information relevant to extensions
- **FY09 Activities**
  - Perform scoping study
    - Identify key HRA issues for advanced facilities
    - Evaluate ability of current HRA methods and data to support risk assessments for these facilities

32



## **Formal Decision Analysis Methods**

- **Objective**
  - Identify and evaluate barriers preventing more widespread use of formal methods
- **Background**
  - Successfully used in other fields
  - Limited use within agency
- **FY09 Activities**
  - Pilot study
    - Identify key implementation issues
    - Develop recommendations for follow-on work



**U.S. NRC**  
UNITED STATES NUCLEAR REGULATORY COMMISSION  
*Protecting People and the Environment*

**Draft Interim Staff Guidance  
HLWRS-ISG-04  
Preclosure Safety Analysis –  
Human Reliability Analysis**

*Presenter: Tina Ghosh, Ph.D.*

*Division of High-Level Waste Repository Safety (HLWRS)*

*Office of Nuclear Material Safety and Safeguards*

*U.S. Nuclear Regulatory Commission*

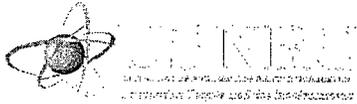
*Briefing to the Advisory Committee on Nuclear Waste*

*May 17, 2007*



# Outline

- Purpose
- Motivation
- Regulatory requirements
- Technical guidance
- Recommended changes to Yucca Mountain Review Plan
- Hypothetical example in appendix
- Summary



# Purpose of HLWRS-ISG-04

---

- To update and supplement the Yucca Mountain Review Plan (NUREG-1804, Rev. 2) for staff review of human reliability analysis (HRA)
  - References additional recently published NRC guidance document to aid HRA review
  - Provides additional considerations in areas of license application review potentially affected by HRA



# Motivation

---

- Operating experience shows that human errors:
  - Contribute to majority of operational events during spent-fuel handling
  - May dominate the failure modes for some equipment and systems (e.g., crane load drops)
- Human performance highly dependent on context
- Assessing human reliability qualitatively different than assessing hardware reliability



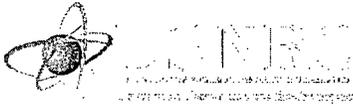
# Key Regulatory Requirements

- The preclosure safety analysis (PCSA) of the geologic repository operations area (GROA) must include:
  - An identification and systematic analysis of naturally occurring and human-induced hazards at the GROA, including a comprehensive identification of potential event sequences [63.112(b)]
  - An analysis of the performance of the structures, systems, and components (SSCs) to identify those that are important to safety. This analysis identifies and describes the controls that are relied on to limit or prevent potential event sequences or mitigate their consequences [63.112(e)]



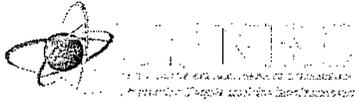
# Other Regulatory Requirements

- The safety analysis report (SAR) must include information about personnel qualifications and training requirements [63.21(c)(22)(iii)]
- SAR “must include an identification and justification for the selection of those variables, conditions, or other items that are determined to be probable subjects of license specifications” [63.21(c)(18)]



# Technical Guidance

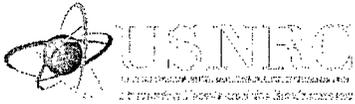
- Qualitative HRA analyses (i.e., conceptual understanding of human performance in planned operations) are important
  - Staff should verify that LA contains sufficient information to review qualitative HRA analyses
- HRA approaches in different parts of PCSA should be commensurate with associated risk significance
- HRA should be appropriately integrated with other aspects of the PCSA



## Technical Guidance (continued)

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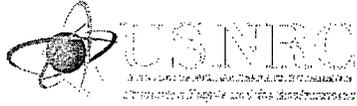
- Staff should verify that HRA is consistent with NRC's expectations for quality of safety assessment
- NUREG-1792, *Good Practices for Implementing Human Reliability Analysis* (2005) and NUREG-1842, *Evaluation of Human Reliability Analysis Methods Against Good Practice* (2006) provide good general guidance



## Technical Guidance (continued)

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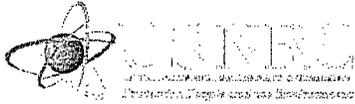
- HRA approaches and data based on commercial nuclear power applications should be justified in LA in terms of applicability specifically to GROA operations
- HRA and related programs (e.g., personnel training) should be intimately linked



# Recommended Changes to YMRP

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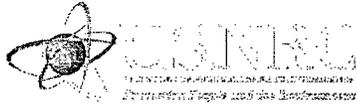
- Add HRA references NUREG-1792 and NUREG-1842 and delete reference NUREG-1278
- Add human factors references NUREG-0700 and NUREG-0711
- Address consideration of human performance in review of preclosure safety analysis
- Address relationship between human actions and design features that must work together for safety controls
- Add “human factors engineering” as expected expertise on design and planning review teams



## Hypothetical Example in Appendix

---

- Builds on crane example from Appendix A in HLWRS-ISG-02
- Supposes that a load drop from a crane is an initiating event for a risk-significant event sequence in the PCSA, and that the LA uses empirical data to estimate crane reliability
- Provides an example of a set of questions staff could ask in the review to help assess supporting technical basis with respect to human reliability



# Summary

- Draft HLWRS-ISG-04 updates and supplements Yucca Mountain Review Plan (NUREG-1804, Revision 2), providing guidance for staff in reviewing human reliability analysis supporting the preclosure safety analysis
- Public comments solicited through June 4, 2007.
- Federal register notice for draft HLWRS-ISG-04 (72 FR 19729):  
<http://a257.g.akamaitech.net/7/257/2422/01jan20071800/edocket.access.gpo.gov/2007/pdf/E7-7466.pdf>



# **ACNW Briefing**

**Update on Revision  
of  
Standard Review Plan (NUREG-0800)  
Chapter 11.5  
Process and Effluent Radiological Monitoring  
Instrumentation and Sampling Systems  
(PERMISS)**

**May 17, 2007  
Jean-Claude Dehmel  
(NRO/DCIP/CHPB)**



# Overview of Presentation

- **Purpose and scope of SRP Chapter 11.5**
- **Approach applied in revising SRP Chapter 11.5**
- **Types and extent of revisions**
- **Important revisions**
- **Changes in primary and secondary review responsibilities**
- **Conclusions**



# Purpose & Scope of SRP Chapter 11.5

- **Hardware, Instrumentation, and Operational Programs**
- **Typical Process and Effluent Streams:**
  - **Waste gas holdup, condenser evacuation, steam jet air ejectors, etc.**
  - **Liquid wastes, including mobile systems**
  - **Solid wastes, including mobile systems**
  - **Building vents, exhausts, & plant stacks**
  - **Subsystems to collect process and effluent samples**
- **Key Operational Programs: ODCM, RET/SREC, & REMP**



## Purpose & Scope, cont'd

- **PERMISS relies on permanently installed and skid-mounted equipment:**
  - **Sampling lines, including conditioning and purging**
  - **Radiation monitors, on and off-line detectors**
  - **Diverts or terminates process or effluent streams, initiated on alarm/trip set-points**
  - **Control panels located in control rooms, with local annunciation panels for alarms and system actions**
  - **Design specs on instrumentation sensitivity, dynamic response ranges, instrumentation failure, data display and reduction, etc.**
  - **Electronic and radiological calibrations, self diagnosis, etc.**
  - **Operation & maintenance, such as on and off-line repairs, etc.**

# Purpose & Scope, cont'd



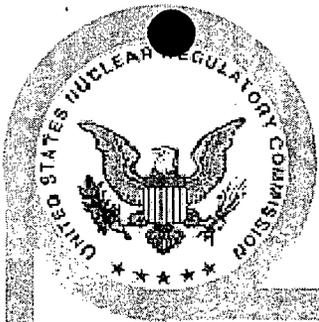
- **Key Operational Programs and Requirements**
  - **Offsite Dose Calculation Manual (ODCM):** Describes methods for controlling releases (RETS/SREC), and estimating doses to public
  - **Radiological Environmental Monitoring Program (REMP):** Describes environmental samples and analyses used to assess radioactivity and radiation levels in unrestricted areas
  - **Program development guidance:**
    - **NUREG-1301(PWR) and NUREG-1302 (PWR)**
    - **NUREG-0133 (PWR and BWR)**
    - **NRC Generic Letter 89-01**
    - **NRC 1979 BTP on radiological assessment**
  - **Annual Radiological Environmental Operating Report**
  - **Annual Radioactive Effluent Release Report**
  - **Notification criteria & recordkeeping requirements**
    - **Part 20 (Subpart M), Part 50.72, Part 50.73, and Part 50.75(g)**

# Purpose & Scope, cont'd



- **Key acceptance criteria cited in SRP Chapter 11.5**
- **Part 20 Requirements**
  - **Appendix B, Table 2, effluent concentration limits**
  - **Part 20.1302, dose limits for the public**
  - **Part 20.1301(e), doses to the public and 40 CFR Part 190**
  - **10 CFR Part 20.1406, minimization of contamination**
- **Part 50.34a, equipment to control releases of radioactivity**
- **Part 50.36a, operating procedures to control releases of radioactivity**
- **Part 50.34(f)(2), TMI-related requirements**
- **Part 50, Appendix A, GDC 60, 63, and 64**
- **Part 50, Appendix I, ALARA dose objectives for all effluents**
- **Parts 52.47 and 52.97, ITAAC as they relate to DCD and COL**

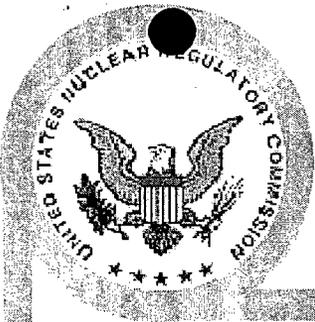
# Purpose & Scope, cont'd



## ➤ Key Regulatory Guidance Cited in SRP Chapter 11.5

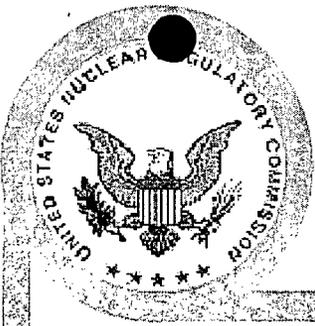
- RG 1.70 and 1.206, format and content of applications
- RG 1.21, measuring, evaluating and, reporting effluents
- RG 1.33, operational QA programs
- RG 1.97, instrumentation to assess conditions during accidents
- RG 4.1, programs for monitoring radioactivity
- RG 4.8, environmental technical specifications
- RG 4.15, quality assurance for radiation monitoring programs
- ANSI/HPS N13.1-1999, sampling and monitoring from ducts and stacks
- ANSI N42.18-2004, performance of instrumentation

# Structure of SRP Chapter 11.5



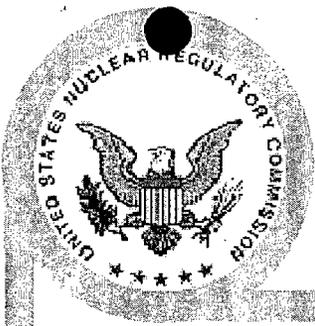
- **Structure of Chapter 11.5, still as:**
  - **Review responsibilities (primary/secondary)**
  - **Areas of review**
  - **Review interface**
  - **Acceptance criteria**
  - **Technical rationale**
  - **Review procedures**
  - **Evaluation findings**
  - **Implementation**
  - **References**
  - **Appendix 11-5-A, design guidance on systems terminating flow or effluent releases**
  - **Secondary responsibilities: I&C and BOP**

# Changes to SRP Chapter 11.5

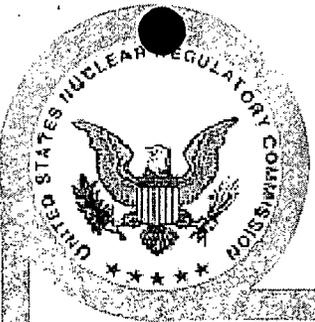


- **Focus on Part 20.1406, minimization of contamination**
  - **D&D lessons-learned FSME memo (Part 20.1406)**
  - **Liquid release lessons-learned NRR task force (tritium leaks)**
  - **NUREG/CR-3587, evaluation of D&D techniques**
  - **NRC bulletins and circulars, as examples of issues:**
    - **IE Bulletin 80-10, contamination of non-rad systems**
    - **IE Circular 81-09, liquid effluent bypass of monitor**
  - **Above items are interim guidance to be superseded by:**
    - **rulemaking on revision to Part 20.1406,**
    - **issuance of a supporting regulatory guide, and**
    - **implementation of Tritium Taskforce recommendations**

# Changes to SRP Chapter 11.5



- **Supplemental guidance on meeting Part 20.1301(e) and EPA dose standards of 40 CFR Part 190**
- **Considerations of all potential sources of radioactivity and radiation**
  - **Potential internal exposures, inhalation and ingestion**
  - **External radiation exposures, onsite contained sources of radioactivity, and offsite deposited radioactivity**
  - **Doses due to the entire site, all units, buildings, and facilities**
- **Dose receptor is a “real member” of the public**
- **Integration of all exposures and pathways in assessing “total dose”**
- **Confirmation of compliance demonstrated in ODCM and REMP**
- **Dose from external radiation is dealt in SRP Chapter 12.3-12.4**



# Changes to SRP Chapter 11.5

➤ **Miscellaneous changes and updates**

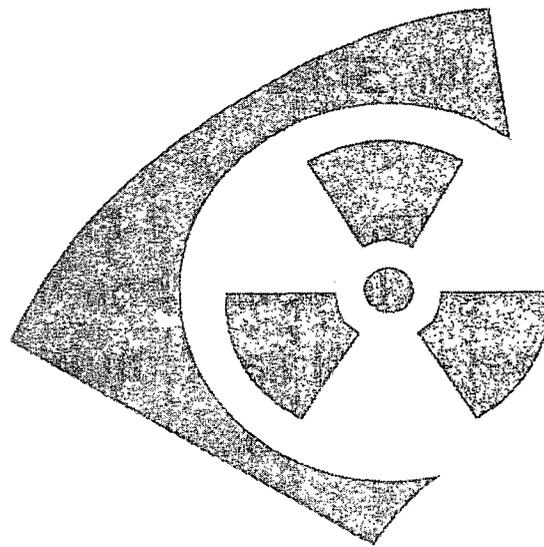
- **Clarifications on ITAACs for COL and DCD applications, as they relate to SRP Section 14.3**
- **Clarifications on COL action items, and certification requirements and restrictions**
- **Update of internal cross-references, within each subsection and with SRP Chapters 11.2 to 11.4**
- **Update of review interfaces with other SRP chapters**
- **Changes in assignment of review responsibilities**
- **Addition of citations to Part 20.1406 and Part 52**
- **Addition to and update of cited references**
- **Editorial updates, as clarifications, corrections, etc.**



# Conclusions

- **Minor updates, with chapter structure remaining unchanged**
- **Provides more detailed guidance to staff and applicants on specific topics**
- **Includes requirements and interim guidance on Part 20.1406**
- **Incorporates information from recent staff studies:**
  - **ground water contamination lessons-learned task force report into the review of new reactors (NRR, ML062650312)**
  - **D&D lessons-learned report (FSME, ML0619201830)**
- **Next updates (long-term):**
  - **Update SRP Chapters 11.2 to 11.5 after issuance of Regulatory Guide on Part 20.1406 and Rulemaking on Part 20.1406**
  - **Implementation of Tritium Task Force recommendations**
  - **Update of related computer codes and regulatory guides**

**Any questions?**



**Thank you for your attention**