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UNITED STATES NUCLEAR REGULATORY COMMISSION  
BRIEFING ON OFFICE OF RESEARCH (RES) PROGRAMS,  
PERFORMANCE, AND PLANS

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TUESDAY

APRIL 17, 2007

1:00 P.M.

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The Commission convened at 1:00 p.m., Dale E. Klein, Chairman presiding.

NUCLEAR REGULATORY COMMISSION

DALE E. KLEIN, CHAIRMAN

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GREGORY B. JACZKO, COMMISSIONER

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2 BRIAN SHERON, DIRECTOR, OFFICE OF NUCLEAR

3 REGULATORY RESEARCH

4 MARK CUNNINGHAM, DIRECTOR, DIVISION OF FUEL

5 ENGINEERING AND RADIOLOGICAL RESEARCH, RES

6 FAROUK ELTAWILA, DIRECTOR, DIVISION OF RISK

7 ASSESSMENT AND SPECIAL PROJECTS, RES

8 MABEL LEE, DIRECTOR, PROGRAM MANAGEMENT, POLICY

9 DEVELOPMENT AND ANALYSIS STAFF, RES

10 MICHAEL JOHNSON, ASSISTANT FOR OPERATIONS, OFFICE

11 OF THE EXECUTIVE DIRECTOR FOR OPERATIONS,

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

CHAIRMAN KLEIN: Obviously, Research is very near and dear to a lot of our hearts. Certainly having spent my academic life in a lot of research it's certainly something I have a personal interest in as well as regulatory aspects of it. Obviously, you have a great program, a lot of good things going on, also some challenges.

Probably the Digital I&C is one of the most pressing and also I noticed that the Research group like other groups has a challenge with changing personnel. A few people apparently want to retire now and then. So, obviously I think that faces all of us in terms of staffing. Any other comments on Research before we start?

COMMISSIONER McGAFFIGAN: I will only comment that I'm glad that Mabel is setting precedent being the first woman ever to appear at a Research briefing, at least in my memory in my 11 years at these sorts of meetings. I commend the Office Director for his perspicacity in that area.

COMMISSIONER MERRIFIELD: Mr. Chairman, two comments briefly. First, due to some scheduling issues I am not going to be here for the entirety of this particular briefing. I don't want anyone to take anything away from that other than that I have a conflict. It's not as if I feel any less about Research and other things. It's quite the contrary as Brian can probably tell you.

I would also want to make a note that Mike Johnson is joining us at the

1 table and that's the first time he has joined us in that position. He's the new  
2 Deputy Director of Office of Research and certainly want to congratulate him on  
3 what is a good move for us. Thank you.

4 CHAIRMAN KLEIN: Luis?

5 MR. REYES: Chairman and Commissioners, we want to brief the  
6 Commission on the program's performance and plans on the Office of Nuclear  
7 Regulatory Research. Last time we briefed you it was February of '06, so it's been  
8 a little over a year. We want to bring you up-to-date.

9 I want to recognize that Mike Johnson is at the table with the Office of  
10 Research. He still works for me in the other capacity. We won't let him go until he  
11 finishes a couple of projects tonight and tomorrow. We want to present the whole  
12 Executive Team to the Commission with Mike joining us at the table. Let me turn  
13 over the meeting to Brian.

14 MR. SHERON: Thank you. Good afternoon, Chairman and  
15 Commissioners. I'm pleased to be here today to make a presentation on the  
16 Office of Nuclear Regulatory Research Programs, Performance and Plans. Next  
17 slide, please.

18 I will give a brief overview of the role of the office and then you'll hear from  
19 each of the three Division Directors who will briefly describe the programs and  
20 accomplishments in their respective areas of their responsibility.

21 Next I will discuss the decisions that will be coming before the Commission  
22 in the near future and then make a few closing remarks. Commission has been

1 provided a book of backup information that provides more detailed descriptions of  
2 our Research programs then we can present here. Next slide.

3 The Office of Nuclear Regulatory Research is a technical support  
4 organization. As such, RES supplies the technical tools, analytical models and the  
5 experimental data needed to support the agency's regulatory responsibilities.  
6 Examples of the office's contributions include research to understand current  
7 regulatory issues such as the sump issue, participation in Committees to develop  
8 consensus codes and standards that the agency can endorse in lieu of developing  
9 its own requirements, a development of PRA methods and guidance to support  
10 risk informed regulation and thermo hydraulic codes to prepare for new reactor  
11 applications.

12 As a technical support organization, RES does not conduct or sponsor  
13 research for the primary purpose of developing improved technologies, a function  
14 that is more appropriately the responsibility of the nuclear industry.

15 Rather, we conduct research in support of the licensing and regulatory  
16 process to confirm the importance of potential issues and that the methods and  
17 data generated by the industry ensure that adequate safety is maintained.

18 The staff in RES is experienced and highly qualified. So in addition to  
19 conducting research, the office staff has often been called upon to support  
20 licensing and inspection activities such as providing technical input on specific  
21 regulatory issues.

22 Examples are analyzing indications in dissimilar metal butt welds at Wolf

1 Creek to provide the basis for NRC regulatory action, conducting safety culture  
2 inspections and assessing radioactive materials leakage. Next slide.

3 In addition to conducting confirmatory research as a technical support  
4 organization, RES has a role in beyond the horizon or forward looking research.  
5 To provide the technical basis for future regulatory decisions, RES looks to where  
6 the regulated industry is moving and conducts exploratory research as needed to  
7 prepare the agency to respond to industry requests and initiatives.

8 For example, the office updates its analytical codes to support new reactor  
9 licensing reviews. In addition, we developed a research plan that is currently  
10 under review by the licensing offices that identifies research needed to license  
11 advanced reactors such as gas cooled and liquid metal cooled reactors.

12 The office is also developing the technical basis for the NRC's review of  
13 digital I&C in safety significant applications.

14 Finally, in cooperation with our user offices we have prepared for  
15 Commission review a forward-looking research plan to prepare the agency for the  
16 future. This concludes my opening remarks and the next speaker is Mark  
17 Cunningham.

18 MR. CUNNINGHAM: May I have the next slide, please. The Division  
19 of Fuel Engineering and Radiological Research encompasses a wide variety of  
20 disciplines ranging from fuel behavior under accident conditions to seismology to  
21 health physics. In each of these disciplines we support the user offices by  
22 producing technical studies, methods and tools and regulatory guidance.

1           With respect to the latter, we produced 17 of the 29 Regulatory Guides that  
2 were recently updated on the fast track. In the material science area, we conduct  
3 both short and long term research to provide technical information to the Office of  
4 Nuclear Reactor Regulation for licensing actions and activities.

5           The research topics include materials degradation and performance,  
6 fracture mechanics and stress analysis, and reliability of non destructive  
7 evaluation to assess material conditions.

8           In the area of Digital Instrumentation and Control, we have the  
9 management or technical lead for four of the six technical areas being overseen by  
10 the NRC's Steering Committee.

11           In the area of fuel performance, we conduct research supporting decisions  
12 on reactivity initiated accidents and spent fuel storage and transportation.

13           In health physics, we work closely with the Office of Federal and State  
14 Materials and Environmental Management Programs and others to monitor and  
15 interpret changes in international standards of radiation protection and produce  
16 tools such as the radiological toolbox. May I have the next slide, please?

17           The division has had a number of notable accomplishments over the past  
18 year. I'll highlight a few of these now. First, in support of completing regulatory  
19 actions on Generic Letter 2004-02 regarding sump performance, we have  
20 completed publication of our studies which discuss issues such as chemical  
21 affects, coatings transport, and pressure drop correlations. Planned research is  
22 complete.

1           We will be working closely with NRR as they evaluate licensee's responses  
2 to the generic letter. We are also completing reactor fuel cladding tests to modify  
3 the embrittlement criteria in 10 CFR 50.46b

4           Our test program will provide NRR with data and recommendations for  
5 revising the oxidation criteria. In this work we benefit from international facilities  
6 and organizations, in particular the Halden Reactor in Norway provides important  
7 experimental data.

8           COMMISSIONER MERRIFIELD: Mark, just a clarification. You say  
9 you are working on providing that information. How soon do you believe you'll  
10 have that package?

11           MR. CUNNINGHAM: On 50.46b? I think we're waiting for one set of  
12 information.

13           MS. UHLE: I'm Jennifer Uhle, Deputy Director for Materials  
14 Engineering. A NUREG, we have actually a milestone due that will be in June, so  
15 we'll be sending a NUREG over with our technical basis.

16           We also are sending over Regulatory Information Letter or Research  
17 Information Letter, excuse me, to NRR that will then also try to take some of the  
18 details of the technical information which is this thick or so and try to boil it down  
19 into what we would recommend from a regulatory perspective. That is also  
20 currently scheduled for June.

21           There's a technical issue that has recently come up and we're working with  
22 NRR to evaluate when the rule will go over. Everything is in close coordination



1 with NRR. The rulemaking, the plan for 50.46b at this point in time is looking as  
2 January 2009 where the final rule would be put out for implementation. But that  
3 rulemaking schedule, of course, is somewhat flexible because of the priorities for  
4 the agency.

5 COMMISSIONER MERRIFIELD: Thank you.

6 MR. CUNNINGHAM: We are implementing our digital systems  
7 research program plan which defines the I&C research programs to support  
8 regulatory needs of the agency. As I noted earlier, we're heavily involved in four of  
9 the 6 I&C task work groups.

10 In addition, we are working closely with NRR on case specific topics such  
11 as the proposed Oconee Digital Reactor Protection System Engineered Safety  
12 Features Actuation System Application. May I please have the next slide?

13 In the past six months, we have held several public meetings on  
14 implementation of 10 CFR 20.1406, "Minimization of Contamination". We are  
15 drafting a regulatory guide that will provide guidance for design and operations  
16 that minimize contamination of the facility and the environment, reduce the  
17 generation of radioactive waste and facilitate decommissioning. We expect this  
18 Reg Guide to be issued for public comment in July of this year.

19 My staff interacts extensively with standard settings organizations. As one  
20 example, we have worked with the Electric Power Research Institute and the  
21 American Society for Mechanical Engineers to resolve issues raised by the NRC  
22 staff with respect to application of ASME Section 11, Appendix L, operating plant

1 fatigue assessment.

2 This research included evaluating available non destructive evaluation  
3 fatigue crack detection data and using that data to develop a calculational method  
4 for fatigue crack growth. The cooperative research has led to a revision to the  
5 ASME code.

6 The last accomplishment which I wish to highlight is that we have supported  
7 FSME in the review of the plan for use of bio remediation for the protection of  
8 groundwater as part of decommissioning of the Cimarron site. May I have the next  
9 slide, please?

10 COMMISSIONER MERRIFIELD: Just for clarification purposes. Did  
11 you come down for it or against it?

12 MR. CUNNINGHAM: The proposal that the licensees submitted we  
13 believe needs work. Next slide, please.

14 As Brian stated earlier, the office plans to conduct forward-looking research  
15 to anticipate the future needs of the agency. Our proactive materials degradation  
16 assessment, which we completed in 2006, identified materials and components  
17 where future degradation may occur in specific light water reactor environments.

18 The information contained in this report is a starting point for future  
19 research on degradation mechanisms, the effectiveness of non destructive  
20 evaluation techniques and continuous monitoring techniques and the  
21 accompanying mitigation and repair strategies.

22 NRC's requirements for license renewal contained in 10 CFR 54 do not

1 constrain the license period of operating reactors to 60 years. However, little  
2 research has been performed on technical issues that might arise if a nuclear  
3 power plant were to operate beyond this time frame.

4 We are planning to hold one or more public meetings to identify possible  
5 technical issues and use this information to define what research should  
6 undertake.

7 Digital technology continues to evolve very rapidly. I mentioned earlier our  
8 support to the digital instrumentation and control task group, but our work does not  
9 stop there. We also plan to extend our vision to even more advanced concepts  
10 and to a regulatory framework for how they might be used in the nuclear industry.

11 That completes my summary of our division's work. I will now turn over the  
12 presentation to Farouk Eltawila.

13 MR. ELTAWILA: The Division of Risk Assessment and Special  
14 Projects is responsible for developing methods, technical expertise and computer  
15 codes that are used by the agency to assess safety and regulatory issues for  
16 operating reactors as well as new and advanced reactor designs.

17 We also develop data needed to assess this code by conducting  
18 experiments at National laboratories, universities or in collaboration with  
19 international organizations. These efforts cover a wide range of disciplines  
20 including thermo hydraulics, reactor physics, criticality safety, severe accidents,  
21 source term and consequences.

22 In addition, the division developed the tools and data for probabilistic risk

1 assessment, human factors and reliability and fire research. We work closely with  
2 NRR and the region in the review and analysis of high risk events and we also  
3 manage and develop technical basis to resolve generic safety issues. Next slide,  
4 please.

5 In the area of new reactor, RES is continuing to support ESBWR  
6 certification activities. For example, we delivered to NRR and NRO the TRACE  
7 thermal hydraulic code to support the ESBWR review. In addition, we have  
8 completed computational fluid dynamics analysis and coupled thermal hydraulics  
9 neutronic calculations also to support NRO in the ESBWR review.

10 We're also supporting NRO in the pre-application review of the EPR design.  
11 Also in the area of support for NRO to support the COL applications, NRR and  
12 RES identified 63 Reg Guides that are needed to support new reactor licensing.

13 Of these, 29 were identified as high priority. On March 29 of this year all 29  
14 high priority Reg Guides were issued. We will continue to update the remaining  
15 Reg Guides with an expected completion date by the end of 2009.

16 The staff also completed effort on the technology neutral framework and  
17 expect to issue the final report in June 2007. The framework was designed to  
18 integrate the Commission's expectation expressed in various policy statements  
19 such as the PRA, Safety Goal, Severe Accident and Advanced Reactor into a  
20 coherent approach for licensing advanced reactors.

21 In the area of support for the next generation nuclear plants, as amended  
22 by the Energy Policy Act of 2005, a Memorandum of Understanding has been put

1 in place with the Department of Energy to jointly develop a next-generation nuclear  
2 power plant licensing approach.

3 In addition to identifying NRC technology infrastructure needs, we  
4 assembled a group of experts to identify and rank phenomena, system and  
5 processes that are important to assessing the safety of an NGNP design. We're  
6 on schedule to deliver the NGNP licensing strategy for submittal to Congress by  
7 August 2008.

8 COMMISSIONER McGAFFIGAN: Can I clarify? That entire effort is  
9 paid for by DOE, correct?

10 MR. ELTAWILA: That's correct, sir.

11 COMMISSIONER McGAFFIGAN: That's as it should be because our  
12 licensees don't have any expressed interest in that technology for at least the next  
13 decade.

14 MR. ELTAWILA: Actually, they are also paying most of the expert  
15 illustration process that's going on right now as we speak. They are paying for it  
16 completely. They provide us with expertise and facilities and things like that.

17 We are participating in many international programs to obtain data that  
18 would have otherwise required large expenditure of resources and taken a long  
19 time to generate. We are getting additional benefit from these agreements.

20 For example, last year when DOE was evaluating its need to purchase the  
21 rest of the French data on burn up credit, we were able to obtain critical  
22 information from our French partner, IRSN - my French is not that good so I'm not

1 going to pronounce the institute - to continue the development of the technical  
2 basis to allow fission product burnup credit. That data would provide technical  
3 basis to support full burn up credit in licensing of the spent fuel storage and  
4 transportation cask. Next slide, please.

5 COMMISSIONER MERRIFIELD: Did we get all the data we need on  
6 that project?

7 MR. ELTAWILA: We got the data. We will start evaluating it so  
8 DOE, based on this information, will go and get additional data. It's not complete  
9 data. What we got is criticality data, but we still are looking for the chemical data  
10 to complete the package to be able to give the full burnup credit.

11 COMMISSIONER MERRIFIELD: I'm presuming that would require  
12 an additional payment to IRSN.

13 MR. ELTAWILA: That's what DOE is going to pay for. In the area of  
14 PRA quality we continue to make significant progress in implementing the  
15 Commission's plan for a phased approach to PRA quality. A summary of progress  
16 and future direction were provided to Commission in SECY-07-0042 on March 7,  
17 2007.

18 We worked very closely with the American Nuclear Society and American  
19 Society of Mechanical Engineers in the development and endorsement of various  
20 consensus standards which define an acceptable level of quality for PRA. The  
21 staff recently revised Reg Guide 1.200 on PRA quality to endorse Addendum B to  
22 the ASME full power internal initiating events standard.

1           Interactions with the American Nuclear Society and American Society of  
2           Mechanical Engineer continued to finalize the fire, external events, and low power  
3           shutdown standards.

4           The staff expects that these standards will be issued this year and the staff  
5           will endorse them with any necessary exception and clarification in Reg Guide  
6           1.200 at the end of 2008 as requested by the Commission.

7           In the area of human factors we continue to provide expertise and  
8           assistance to program offices and Regions in assessment of safety culture and  
9           safety conscious work environment.

10          In particular, RES is assisting NRR in the development and revision of  
11          several reactor oversight process inspection procedures and manual chapters  
12          providing staff to conduct safety culture inspections with Regional staff as well as  
13          providing support to the Office of Enforcement on the Safety Culture working  
14          Group.

15          We recently informed the Commission in SECY-07-0022 of our plan to  
16          improve the generic issue program to ensure timely resolution of generic issues.  
17          The improved generic issue program will focus on those issues that have  
18          significant generic risk and security implications that cannot more effectively be  
19          handled by other regulatory programs or processes.

20          We have also revised the accident sequence precursor program to use the  
21          significant determination process and Management Directive 8.3 results, instead of  
22          performing separate ASP analysis. This will minimize the duplication of work and

1 achieve a better coordination with these other programs. Next slide, please.

2 In February 2007, we issued NUREG report to characterize current industry  
3 average performance for component and initiating events at U.S. nuclear power  
4 plants which is used as input to Standardize Plant Analysis Risk models and is an  
5 important step in maintaining up-to-date risk models.

6 In the area of fire, we have completed a number of major projects. First we  
7 continue to support NRR with the transition of licensee to NFPA 805. The  
8 methodology for performing fire PRA was developed by RES in collaboration with  
9 the Electric Power Research Institute.

10 We have also completed the CAROLFIRE testing to address cable  
11 configuration dealing with spurious actuation and multiple hot shorts and provides  
12 the data to develop a model to be used in fire analysis. The two volume  
13 CAROLFIRE NUREG report will be released in May 2007 for public comments.  
14 Also in May, we are planning to issue the fire model verification and validation  
15 reports. Next slide, please.

16 With regard to issues and paths forward, we identified enhancement to the  
17 risk informed regulation implementation plan to ensure achievement of the  
18 Commission's goal of holistic, risk informed and performance based regulatory  
19 structure.

20 A SECY Paper containing the new plan is in the final concurrence stage  
21 and will be forwarded to the Commission soon.

22 We continue to develop the standardized plant analysis risk model for



1 external events. The objective is to provide NRC risk analysts with a tool to  
2 estimate risk importance of plant events and conditions related to fire, seismic,  
3 external and internal flooding and high winds.

4 With regard to all emerging work, as you are aware, the industry and DOE  
5 planning for new advanced reactors is an area of recent growth and rapid change.  
6 There are a growing number of advanced reactor design applications that may be  
7 submitted for NRC review and approval.

8 This includes very high-temperature reactor, super safe, small and secure  
9 fast liquid metal reactor, the Pebble Bed modular reactor and advanced burner  
10 reactor for fuel recycling and a high temperature teaching and test reactor.

11 These anticipated activities will add to the work the staff is already  
12 performing to support licensing and certification activities for new light water  
13 reactors such as ESBWR, EPR and eventually US APWR.

14 COMMISSIONER McGAFFIGAN: Could you repeat that last  
15 sentence. Work on this stuff could slow the other stuff?

16 MR. ELTAWILA: No. It's just going to add to the burden of the staff.  
17 The priority will be assigned. New reactors definitely will have high priority.

18 Finally, we are assessing the need for non light water reactor PRA data and  
19 methods to develop regulatory guidance for implementing a probabilistic approach  
20 for the identification and selection of licensing basis event and system structure  
21 and component safety classification for non light water reactor such as the  
22 high-temperature gas cooled reactor.

1           This completes my remarks. I will now turn the presentation to Mabel Lee.

2                       MS. LEE: Good afternoon, Chairman Klein and Commissioners. I  
3 appreciate this opportunity to discuss Research's accomplishments in the area  
4 Human Capital Management. Research makes a concerted effort to address our  
5 critical human capital needs in a systematic and measurable way.

6           In 2006, Research hired 49 new employees, 30 were recruited from outside  
7 the agency and 19 were internal agency transfers. Although this increase was  
8 significant, it was offset by our loss of 38 staff applying to other NRC offices and  
9 retirements and 6 were separations from the agency. Research currently has 238  
10 staff on board.

11           RES staff continues to reflect diversity in degrees, demographics and  
12 technical disciplines. For example, of the 238 on board staff, 31% hold PhD's,  
13 35% holds a Master's Degree and 26% holds a Bachelor's Degree. Research  
14 staff reflects a wide range of engineering and scientific disciplines, including  
15 expertise in nuclear materials, human factors, health physics, fire protection, and  
16 PRA.

17           It is this diversity and highly technical specialized disciplines that allows  
18 Research to support the licensing offices as they carry out their licensing and  
19 regulatory tasks.

20           Most recently Research has hired a significant number of new and  
21 entry-level recruits. We are ensuring that these new recruits are effectively  
22 integrated into Research activities by teaming them with senior staff on meaningful

1 projects.

2 We are ensuring that they receive adequate training in both the critical  
3 technical specialties as well as the critical business processes, such as contract  
4 management.

5 Research continues to apply a systematic approach to identifying skill gaps  
6 and filling these gaps through hiring and training. Research management meets  
7 at least annually to review critical skill needs based on the technical nature of our  
8 projected workload.

9 We compare our needs against our on-board expertise to identify skill gaps.  
10 We capture this assessment in an action plan which we periodically review to track  
11 our progress for filling our critical skill needs. Next slide, please.

12 COMMISSIONER MERRIFIELD: Can I stop you there for a second?  
13 Are there any particular specialties for which we've identified difficulty in obtaining  
14 individuals to fill those slots? If so, what are they?

15 MR. SHERON: I'll jump in. Digital I&C is one. We have several staff.  
16 I think one has just recently left the office and we've had some postings up which  
17 we have been unable to fill with qualified people. I have been discussing with Luis  
18 some other options for possibly trying to find qualified individuals in that area.

19 MS. LEE: Okay. Next slide, please. To your point, Commissioner  
20 Merrifield, knowledge management and knowledge transfer is high on our list of  
21 priorities. The retention of technical knowledge and expertise is a major focus of  
22 our human capital efforts.

1           In that regard, we have pursued a number of activities to capture and  
2           preserve the knowledge and expertise of our senior staff and to transfer it to our  
3           newer staff. For example, Research has piloted a web-based community of  
4           practice approach to collecting, preserving and sharing knowledge and expertise  
5           related to gas cooled reactors.

6           Experts in this area have identified key reports and documents which are  
7           annotated, cataloged and shared among the community participants. This  
8           web-based approach supports an online dialogue among participants where  
9           questions are raised and discussed within the community to foster the sharing of  
10          technical ideas and positions.

11          Research was encouraged by the Office of Human Resources to share our  
12          experience with this community of practice as a model for other offices. We have  
13          also had a campaign to capture documents currently residing on desktops,  
14          bookshelves, and cabinets of Research staff.

15          The point is to get these documents into ADAMS for preservation and  
16          knowledge sharing. In addition to getting these documents into ADAMS, we asked  
17          our technical experts to develop simplified categorization for disciplines within the  
18          ADAMS folder structure so we can provide an easy to use system for document  
19          collection and to make it user-friendly for less experienced staff to locate key  
20          information.

21          A noteworthy example of the success of this effort is the Fuels Library. The  
22          Fuels Library was developed by teaming junior staff with senior staff who, working

1 together, developed the categorization of fuel information that was both technically  
2 adequate to the expert and transparent to the novice.

3 And finally, a third example of Research's knowledge management transfer  
4 activities is our seminar program. During 2006, Research sponsored numerous  
5 agency wide seminars covering a broad range of technical subjects such as  
6 MELCORE severe accident code and application, Chernobyl 20 years later, the  
7 BIER-VII Report, the integration of risk and safety margins, modeling of human  
8 behavior and HTGR technologies.

9 These seminars have been well attended by staff throughout the agency.  
10 Next slide, please.

11 COMMISSIONER MERRIFIELD: Before you go there, last time I  
12 went through Research it struck me that Research had more than its fair share of  
13 pack rats in terms of the amount of documents at some people's cubicles. Do you  
14 have as a measure of success of your document capture preservation and sharing  
15 the reduction in the amounts of volume that some of the staff members are having  
16 at their work stations?

17 MS. LEE: In terms of a particular measure of success, we do not  
18 have that. That has been a focus and you're very observant in that regard. There  
19 is very good information on the floors of these staffers and we made a gargantuan  
20 effort in getting it into ADAMS, cataloging the information, but your point about a  
21 measure is a good one. Perhaps we need to talk about that.

22 MR. REYES: We've going to have to move the office twice. You

1 either go to another medium or your back is going to break because you can't  
2 carry all that with you.

3 COMMISSIONER MERRIFIELD: I'm sure there some members of  
4 our staff who that would not dissuade them. I'm sure there will be shopping carts  
5 in the neighboring area.

6 MR. REYES: It's a simple approach, Commissioner.

7 MR. SHERON: I would like to point out that right before Chairman  
8 Klein came over and visited the RES office space, we went through and I had a  
9 couple of my more aggressive staff and Mabel's put the fear of God into some of  
10 my staff about cleaning up. I think we did a fairly good job of reducing the holdings  
11 of a lot of staff. There's a few outliers and we continually work with them, but I  
12 think we're a lot better.

13 CHAIRMAN KLEIN: Clearly, I need to schedule frequent trips.

14 COMMISSIONER MERRIFIELD: You said the same thing before I  
15 came, too. The frequency of more Commissioner visits makes sense. You laugh  
16 at it. The fact of the matter is if it's sitting on the floor of their cubicle, it means that  
17 other people in Research and other people in the agency aren't getting access to  
18 that information. That's a bad thing.

19 MR. REYES: It's a medium issue.

20 COMMISSIONER JACZKO: I just hope the Chairman doesn't come to my office.

21 CHAIRMAN KLEIN: We've identified another pack rat.

22 MS. LEE: Very good point and we'll continue our efforts in that

1 regard. Next slide, please.

2 I've just discussed our efforts to address two primary human capital  
3 challenges confronting Research, namely maintaining the level of technical  
4 expertise across a broad spectrum of technical disciplines to support the  
5 regulatory and licensing needs of the agency, and identifying, capturing,  
6 preserving and transferring the knowledge gained through years of experience as  
7 senior staff retires and new staff join the agency in ever-increasing numbers.

8 Research must continue to address both these challenges to ensure that  
9 we can support the agency's mission effectively and efficiently.

10 Now I would like to turn it over to Brian to discuss upcoming Commission  
11 decisions.

12 MR. SHERON: Thank you. There are a number of ongoing RES  
13 activities which are expected to raise policy issues to the Commission for its  
14 decision.

15 As required by the Energy Policy Act of 2005 we have been working since  
16 January 2006 with the National Academies on the industrial, research and  
17 commercial uses of radiation sources and their potential replacement.

18 National Academy Study Committee is currently preparing the report and  
19 the Commission is scheduled to submit the final report to Congress in  
20 August 2007. Although I'll add that I just learned today that it may be about a  
21 month delayed now. We got that information from the Academy staff.

22 As mentioned previously by Dr. Eltawila, the staff in NRR, NRO and RES

1 are planning to provide the Commission with a recommendation in May of 2007 on  
2 how to proceed with the Part 53 advance notice of proposed rulemaking. This  
3 paper will also discuss the role of the technology neutral framework and any  
4 follow-up efforts associated with advanced reactors.

5 Research initiated the development of an integrated long-range research  
6 plan for the agency and developed with the concurrence of the program offices a  
7 draft report identifying candidate long-term research activities to be initiated in  
8 fiscal year 2009. The plan was sent to the Commission on April 6.

9 Staff is implementing the state of the art consequence analysis project  
10 consistent with the Commission's direction. We are proceeding with the  
11 consequence analysis for the first two plants in order to work through any issues  
12 associated with integration of methods and/or simulation of plant systems and  
13 procedures.

14 We will inform the Commissioners of the results of the analysis for the first  
15 two plants. We're working very closely with the staff from the NRC Office of Public  
16 Affairs and EDO in development of the Communication Plan and look forward to  
17 substantial interaction with our stakeholders on this project. Next slide, please.

18 In summary, I hope we've shown the Commission today that the Office of  
19 Nuclear Regulatory Research provides technical methods, tools, data and  
20 expertise that support the agency's licensing and regulatory activities. And further  
21 that the office conducts its business in an efficient and effective manner. This  
22 concludes our presentation.



1                   COMMISSIONER MERRIFIELD: Just a quick clarification on the  
2   NAS study. When do we believe our revised date for the Commission to receive  
3   that?

4                   MR. SHERON: We were scheduled to receive it two weeks before it  
5   was supposed to be sent to the Congress, which I think was August 8<sup>th</sup>. So it  
6   would be two weeks then before September 8<sup>th</sup> would be my best guess. That's a  
7   draft for just a security review.

8                   MR. REYES: Chairman and Commissioners that concludes our  
9   prepared remarks. We are ready for questions.

10                  CHAIRMAN KLEIN: Thank you for a very informed presentation. We  
11   will begin with Commissioner Jaczko.

12                  COMMISSIONER JACZKO: Thank you. A quick question going  
13   back to one of the issues that you had talked about, I think, about the 50.46b  
14   study. I'm wondering if you can just categorize what preliminarily you found for  
15   results from that. There was one, I think, there's one issue that you're discussing  
16   with NRR. If you can highlight what that issue is.

17                  MR. CUNNINGHAM: With respect to 50.46b, the issues are really  
18   the mechanical properties of fuel and the interactions with the cladding as to go to  
19   very high burnups. That's where we start to see several phenomena occurring  
20   depending on whether you're interested in a loss of coolant accident or reactivity  
21   initiated accident.

22                  Where you are seeing phenomena that were not occurring at the lower

1 burnups that causes a concern about whether or not the acceptance criteria are  
2 still okay. That's basically it.

3 COMMISSIONER JACZKO: Is there one acceptance criteria in  
4 particular that's problematic?

5 MR. CUNNINGHAM: This is related to the embrittlement criteria in  
6 50.46b.

7 MS. UHLE: That pretty much sums it up.

8 COMMISSIONER JACZKO: Thank you. The next question I had, I  
9 think the Chairman in particular has emphasized the need to have research that's  
10 forward-looking and looks at issues a little bit further down the road.

11 I'm wondering if some of the issues that we're seeing right now with cracks  
12 and crack growth propagation, if we have research right now that's looking at that  
13 or if there's a plan to initiate some research to perhaps look at some of  
14 unexpected cracking issues.

15 MR. CUNNINGHAM: There's two elements to it. First we have an  
16 extensive program looking at the phenomena that we're encountering today, so  
17 there's a great deal of work in the U.S. and working internationally on issues of  
18 stress corrosion cracking and that sort of thing.

19 The second part of it is what we call the proactive materials degradation  
20 assessment. That was intended purposely to look for next decade issues and  
21 things like that to try and use the expert's knowledge from today to say 10 years  
22 from now we might have this type of issue arise.

1           We're working with Electric Power Research Institute and others to try and  
2           look at that longer term vision and to identify where the industry might do research  
3           and where we might do research.

4                    COMMISSIONER JACZKO: The kinds of cracks in the growth and  
5           propagation that we're seeing today were those things that had been expected  
6           from the research or some of these a little bit outside of the expected  
7           phenomenon?

8                    MR. CUNNINGHAM: I don't think there's anything really unexpected  
9           at this point.

10                   COMMISSIONER JACZKO: This is perhaps a more detailed  
11          question and if the staff wants to get back to me on it that's fine to. I think Farouk  
12          you talked a little bit about the review of the performance indicators and the paper  
13          we got. I noticed going through that and I think this is the same paper, the reactor  
14          coolant activity. The average values for reactor coolant activities were higher in  
15          '06 than in previous years. I don't know if there's any simple explanation for that  
16          and again if this is something you want to get back to me on.

17                   MR. REYES: It's directly related with the fuel failure performance and  
18          the fuel failure there's a slightly up-tick.

19                   COMMISSIONER JACZKO: Was there any plant in particular?

20                   MR. REYES: No. It includes all the vendors. It includes all the  
21          users. It's not a significant change but it was an upward change. There's a direct  
22          relationship with that. I can tell you that it's highlighted in INPO plans for

1 excellence because that is the only indicator in INPO's plan that right now you  
2 cannot predict it will meet their 2010 goal. But there was a slight increase.

3 MS. UHLE: This is Jennifer Uhle, Deputy Director from Materials  
4 Engineering. To put this in perspective, the types of fuel reliability has greatly  
5 improved over the course of years so to say that there is a slight up tick is when  
6 you're talking very, very, very low frequency of fuel failures and they are typically  
7 very pinhole leaks, very small in fact.

8 There's some leak detection techniques that rely on the detection of the  
9 activity in the coolant and we're having to take a look at that as being perhaps not  
10 as effective as it had been in the past because of the lower levels of activity in the  
11 coolant. I don't want you to have the idea that this is a safety issue.

12 COMMISSIONER JACZKO: Thank you. I think perhaps the last  
13 question I have time for. You touched a little bit on CAROLFIRE which I think has  
14 been a good program for fire research. I think it's good for a lot of reasons. The  
15 information we're getting is important and I think it has also demonstrated a good  
16 collaboration with the University of Maryland.

17 I think where we've been able to involve graduate students in some of the  
18 research. I think that's a good program and one we may want to look at other  
19 areas of where we can follow a similar kind of model because I think it's important  
20 we continue to have particulars.

21 We've given new authority for grants and fellowships and other kinds of  
22 graduate assistants that we can look in areas where we can have a real impact on

1 our research and on our regulatory programs.

2 I'm wondering if you could just provide a brief update perhaps on the results  
3 you're finding from that particular multiple spurious actuation?

4 MR. ELTAWILA: Commissioner, as you are aware when EPRI and  
5 NEI completed their test program, we put all the activity into cable that is  
6 susceptible for spurious actuation and another group that did not require any  
7 action because there is a very low likelihood they would experience that and then  
8 a group in the middle that required additional research.

9 That's what NRC undertook in that research program and before that we  
10 had workshop and involved, as you indicated, NIST, EPRI and the University of  
11 Maryland in defining the testing metrics.

12 In general, the conclusion from this test program is that we cannot preclude  
13 spurious actuation from that group of cables so we have seen that you will find that  
14 spurious actuation can occur in this cable configuration.

15 In addition to that we concluded, or the test program suggests, that you  
16 cannot determine how many cables can be involved in a spurious hot short and  
17 things like that. This is in a nutshell the conclusion from this test program. If you  
18 need any more information Mark is here and he can provide additional information.

19 COMMISSIONER JACZKO: No, I think that's helpful. I was just  
20 looking for a summary. I guess you're putting that out for public comment. I look  
21 forward to seeing the final report.

22 Just briefly then, the last question I would ask. I have not yet seen the

1 finalized ICRP recommendations and wondering if Research has gotten a copy of  
2 those yet.

3 MR. CUNNINGHAM: We have what you have, basically, so the ICRP  
4 is going to be finishing that up sometime this year, but we don't have a specific  
5 schedule for that as yet.

6 COMMISSIONER JACZKO: Thank you.

7 COMMISSIONER McGAFFIGAN: It's like having an affirmations  
8 session and giving the results six months later.

9 CHAIRMAN KLEIN: Commissioner Lyons?

10 COMMISSIONER LYONS: While the Chairman mentioned his strong  
11 interest in the research area and as Brian and all of you are well aware, I very,  
12 very much share that common interest and common background with the  
13 Chairman. I do appreciate the briefing and you're certainly talking about subjects  
14 that are near and dear to my heart.

15 My questions were going to focus on the forward-looking research, but  
16 before I get to that just one comment. Mark, you mentioned health physics in your  
17 discussion of program areas. I just wanted to make the comment that I think the  
18 next year or two may be a fairly interesting time with new developments coming  
19 out in health physics area that I hope as an agency we can be looking at.

20 I was at the NCRP meeting on Sunday and I understand that in the Monday  
21 presentations there was discussions about the new evaluation that NCRP has  
22 done about the effect of the average dose across America due to medical

1 procedures is being re-evaluated and is going to be dramatically higher than the  
2 60 millirems that we've used in the past.

3 It's clear that that's going to lead to a major change in average dose across  
4 the country and I think this could be a very important opportunity for increased  
5 educational activities perhaps on the part of the Commission in discussing  
6 radiation effects.

7 In addition, the DOE's program, while there certainly are differences of  
8 opinion on it, the DOE's program on low dose effects is also providing interesting,  
9 sometimes new data, which I hope we can study in the next year.

10 On the forward-looking research, I'm mostly going to be using the document  
11 which was provided to the Commission, but I think I'll do it in ways where it will still  
12 be understandable even though you didn't discuss it in detail.

13 You talk in there as you look and evaluate forward-looking research about  
14 the difficulty that you have in prioritizing forward-looking research from a funding  
15 perspective using, if you will, the standard ways in which we prioritize or develop  
16 budget priorities.

17 I was just curious, Brian, if you or any of your colleagues could share some  
18 of your thoughts as to alternative approaches to prioritizing the forward looking  
19 research which I personally agree is very, very important.

20 MR. SHERON: There's a couple of options that we've been thinking  
21 about. Obviously, one is to come up with different criteria or an additional criterion  
22 that could be used such that this type of research would not automatically fall to

1 the lowest bin, you might say.

2 The other, which I think the Chairman has mentioned, is to perhaps find a  
3 way to remove it from the fee base, in which case then from the standpoint of  
4 looking at the work that we're doing and how it relates to operating reactors and so  
5 forth, it wouldn't factor in. That would be another option. Those are two that we're  
6 looking at. There may be some others.

7 MR. REYES: You could actually take a portion of the research  
8 budget and remove it from our regular ranking process and just allocate it to  
9 forward-looking research and then deal with it as a separate priority, if you want to  
10 call it.

11 When you throw it in with our regular process where we rank everything  
12 else from new computers, to fixing the parking, et cetera, et cetera, there's a  
13 difficulty there.

14 COMMISSIONER LYONS: I appreciate that you're looking at that. I  
15 think this could well be a very interesting discussion involving the Commission in  
16 the future. Certainly from my own perspective, forward-looking research is  
17 absolutely vital.

18 The list of subjects that you folks have talked about today in terms of  
19 emphasis for forward-looking research I think are absolutely vital. In my mind, we  
20 need to be very sure that they don't suffer from any anomalies in our current  
21 prioritization scheme.

22 One specific area that you're very well aware that I am very, very interested



1 in is the digital I&C and there is discussion in this paper about the plan to develop  
2 an options paper perhaps in early 2008 for the Commission in this area.

3 There's also been a recent SRM that was going to be developing a  
4 workshop in this area. I was just curious if you anticipated that that workshop  
5 would be conducted in time to inform that paper in early 2008?

6 MR. SHERON: Yes. As a matter of fact we just had a meeting on it  
7 yesterday and the plan right now, although it is still tentative, because we still have  
8 to get a contractor in place and the like, but the plan would try to hold the  
9 workshop in August and then we would provide a plan to the Commission,  
10 hopefully by November which would identify basically what the issues are that  
11 would have to be worked through before we can come forward and really make a  
12 solid recommendation one way or the other.

13 It would really be to kind of flush out the issues and bring those to the  
14 Commission and let you know how we intend to proceed with evaluating them.

15 COMMISSIONER LYONS: I appreciate that. I appreciate the  
16 general focus that was evident throughout in digital I&C. The issue is certainly not  
17 going to go away for decades to come. I think it's essential that the NRC be on  
18 top of that issue because I think we're going to continue to be challenged by it.

19 MR. REYES: For us it's going to be compounded. They mentioned  
20 the digital reactor protection system in Oconee. You've got 104 fleet making the  
21 replacement from analog to digital and then you have the new potential fleet, all  
22 digital. So for us this is growing.

1                   COMMISSIONER LYONS: Absolutely. You have those two factors  
2 and you also have a continuing evolution in the digital technologies and the  
3 operating systems all of which is going to lead to a continuing series of challenges  
4 for probably decades.

5                   CHAIRMAN KLEIN: Thank you. We'll go a little bit out of phase  
6 since Commissioner Merrifield has to depart soon. I think you want to make a  
7 couple of comments?

8                   COMMISSIONER MERRIFIELD: Yes and I'm not even going to take  
9 a full round. Just as a follow-up to Commissioner Lyons' comments. I think -  
10 we're all going to say the same thing - but I think the dual track approach is very  
11 appropriate. There's obviously long-lasting and long-lead issues that will require  
12 appropriate work on the Office of Research to get up to speed and keep up to  
13 speed in terms of how this is developing.

14                   We have a practical consequence that we're going to be getting  
15 applications in the fall for real reactors with proposals for real systems. Obviously,  
16 we need to deal with those in a timely way and we don't want to get the obvious  
17 needs to do the former to overshadow too much of the latter.

18                   Ultimately we've got to make regulatory decisions through all of this.

19                   The other comment I would make is my appreciation. There is included in  
20 the presentation this afternoon and in your plans to begin the work necessary to  
21 think about what would happen if we were to think about licensing reactors beyond  
22 60 years.

1 I think now is the time for us to be involved in those activities and I certainly  
2 want to leave my appreciation with the Office of Research putting in place a plan  
3 that would integrate that into our research efforts long-lead so that if in fact we had  
4 to receive such applications down the road we would be in a position to do so.  
5 Thank you, Mr. Chairman.

6 CHAIRMAN KLEIN: Thank you. A couple of questions. Obviously, I  
7 think doing a long-lead research is really important because if we don't understand  
8 issues it's hard to have good regulations. I think the research that we do is very  
9 important because it's much better to make regulations based on sound science  
10 then unsound science.

11 But that leads to a little bit of a concern on areas as you move forward both  
12 in the gas reactors and liquid metal reactors; that's the facilities for which you have  
13 to do research. Would you like to comment on the lack of or the concern of  
14 facilities?

15 MR. SHERON: We've actually thought about this. I've raised it with  
16 the Department of Energy in a previous meeting we had with them from the  
17 standpoint that if there are going to come forward with a gas cooled design for  
18 example, have they assessed the need for an integral facility, particularly for gas  
19 cooled?

20 I kind of worry about a liquid metal just because it's inherently much more  
21 difficult, I think, to operate and use. We've already done a survey of facilities that  
22 are available worldwide that might be used for any kind of testing and the like.

1           We would obviously pursue that if we knew a little bit better where DOE  
2 was coming from in terms of their schedule. We're also interacting with the  
3 European Union. They have a program called Raphael, which is made up of both  
4 the regulators as well as the industry and they're off identifying across the board  
5 what are the needs for these advanced reactors.

6           We've sat in on one of their meetings right now and we're trying to monitor  
7 that and decide to what extent we might get involved in that effort.

8           In addition, I have started pushing toward having CSNI work in this area to  
9 identify needs down the road because I think the global economy now with nuclear  
10 - any vendor that comes in it will probably be an international type of consortium or  
11 something.

12           Therefore, I think the Europeans and other countries are going to have the  
13 same needs we are and therefore it may be worthwhile to look toward some sort of  
14 a facility that could be used by international partners. We're looking into it.

15           We're trying to get better information from DOE on what kind of reactor -  
16 they still haven't nailed down for a gas cooled reactor whether it's a prismatic or  
17 whether it's the Pebble Bed. That could affect what kind of facility we would want  
18 to build. Farouk, I don't know if you want to add anything?

19           MR. ELTAWILA: We have, as part of our interaction with DOE, we  
20 formed a group of expert international and national experts that are meeting right  
21 now actually in the Rockville area. One of their responsibilities is to try to identify  
22 the important phenomena that's needed to assess a design like a gas cooled

1 reactor design; try to identify the processes, the code and the data and for each  
2 one of these phenomena we ask them also to identify an available facility that  
3 would have this information. What is the state of knowledge

4 The result of that will help us formulate our decision about what will go  
5 further. DOE is part of that and they are going to take this information into  
6 consideration about their decision about what facility or what program they need to  
7 support and provide the data for licensing NNGP.

8 CHAIRMAN KLEIN: Mark, I've got a question on Slide Six. You  
9 talked about the digital system research program plan. I know other  
10 Commissioners have traveled around and I just returned from Japan where I saw  
11 a lot of digital controls in actual operation. These aren't plans; these are actual  
12 systems they are using. I guess when I sort of look at where we are it looks like  
13 we're a little bit behind the curve. Can you comment on that?

14 MR. CUNNINGHAM: Just to be clear, on the plan itself, the plan  
15 incorporates a great deal of trying to learn from others who are really ahead of us  
16 in a number of technologies and in a number of countries, if you will.

17 Part of it is inherent and what we're doing is we are learning from what they  
18 already know. We've got one of our guys is going to be off to France and Finland  
19 very shortly or this week perhaps to gather what they know about that specific to  
20 advanced reactors. We recognize that we have some catching up to do.

21 CHAIRMAN KLEIN: I was surprised; when you go through some of  
22 these facilities and you see where they are actually in operational mode, it says

1 that we've got a little ways to go.

2 MR. CUNNINGHAM: Agreed. We've got a long ways to go, actually.

3 CHAIRMAN KLEIN: One question, Brian that I have for you and part  
4 of this is from my former life in another building that I spent a lot of time in and  
5 that's security. Researchers tend to like to communicate and pass a lot of  
6 knowledge. What systems do you have in place to make sure there's no dual use  
7 or we don't compromise source codes and things of that nature in the research  
8 that we do?

9 MR. SHERON: I guess I'm interpreting your question to mean that  
10 our codes and stuff don't fall into wrong hands. We have a number of protections  
11 that we put in place. It's not foolproof.

12 But, for example, in order to obtain our hydraulic and severe accident  
13 codes, we normally require countries to join in either the CSARP or CAMP  
14 program which we have. In doing that they sign an agreement that says they will  
15 not distribute the code further without our express consent nor will they use it to  
16 design plants and bid against U.S. bidders, U.S. companies and the like. Those  
17 are the principal protections that we have.

18 CHAIRMAN KLEIN: How do you monitor that?

19 MR. SHERON: Farouk?

20 MR. ELTAWILA: Our agreements are with government agencies so  
21 we don't give it to anybody that requests it. Our international agreement with  
22 government agencies has to be cleared by the State Department and by the

1 Department of Energy for export control.

2           Once we get this clearance from these other agencies, we deal with them  
3 and we, as part of our interaction with them and things like that, we know who has  
4 the code and by monitoring what's going on in the open literature, there are older  
5 versions of the codes that some people have.

6           What we are doing right now, we are trying to, for example, in the  
7 MELCORE code, we do not release the source code. We might implement the  
8 same processes in a code like the TRACE code by controlling the source code  
9 and giving to some of the countries an executable version of the code that will  
10 provide additional protection of the codes.

11                   CHAIRMAN KLEIN: Thank you. Commissioner McGaffigan?

12                   COMMISSIONER McGAFFIGAN: Thank you, Mr. Chairman. Two  
13 years ago you guys were toting an upcoming rulemaking based on your research  
14 efforts with regard to pressurized thermal shock. I did not hear those words today.

15           I remember the discussion I had with Commissioner Lyons and  
16 Commissioner Jaczko within two months of being new to the Commission and  
17 Diaz has made the mistake of not being here, so I was chairing the meeting.

18           My recollection was the staff used realistic analysis and had come to the  
19 conclusion that pressure vessels might be good for 300 years if they had taken  
20 conservative steps backward and gotten it down to 60 to 80 years. But it was  
21 enough to support license renewal for the existing fleet of PWRs. I haven't heard  
22 "boo" about pressurized thermal shock rules since then. Can you tell me were that

1 all stands?

2 MR. CUNNINGHAM: At this point, our part of it is principally done.  
3 The research is done. It's in the process of being published and that sort of thing.  
4 There is a rulemaking effort that's under way that NRR has the lead for that we're  
5 supporting. I don't offhand recall the date for when the proposed rule is supposed  
6 be.

7 MR. REYES: It's in the near term. We owe you the date, but we  
8 didn't forget it. It's on schedule. It's on high priority.

9 COMMISSIONER McGAFFIGAN: So, Research finished its work. It  
10 was given very high marks by a lot of stakeholders, including ACRS.

11 MR. REYES: We're moving forward with the rule and rulemaking is  
12 being scheduled pretty high and let us get back to you with the date. It's on the  
13 top of the list because it has an impact for 60 Plus.

14 COMMISSIONER McGAFFIGAN: Right. It has a big impact for 60  
15 Plus and it answers Commissioner Merrifield's question.

16 MS. UHLE: There's a Commission paper that's currently being  
17 written about a rulemaking plan and the proposed rule. It hasn't been just  
18 languishing with the technical basis. After we sent over the technical basis there  
19 was activity to put into rulemaking language and you will be seeing that.

20 COMMISSIONER McGAFFIGAN: They didn't waive the need for  
21 rulemaking plan in NRR as we gave them permission to do and just go to the  
22 proposed rule stage?



1 MS. UHLE: The rulemaking plan as well as the language itself and  
2 what it would entail is in the package that will be coming up to the Commission  
3 shortly.

4 COMMISSIONER McGAFFIGAN: Okay. Let me switch to other  
5 issues that haven't been discussed. Farouk, you talked about streamlining the  
6 accident sequence precursor assessments by building off of the ROP process.

7 MR. ELTAWILA: Significance determination process.

8 COMMISSIONER McGAFFIGAN: Significance determination  
9 process. My recollection is that you all in the past in accident sequence precursor  
10 did - I know it could be regarded as duplicative analysis but you had different  
11 methodologies from what would come out of the ROP. In the streamlining, have  
12 we lost anything?

13 MR. ELTAWILA: No, we have not lost anything. I think we're working  
14 very closely with the Regions when we do the significance determination process.  
15 We review this analysis and we will concur with the analysis. The ASP, accident  
16 precursor analysis, is going to continue to be done for the high risk event or for  
17 event that does not have any significant deterioration in the system or  
18 performance.

19 COMMISSIONER McGAFFIGAN: You'll use the old methodology if  
20 it's a significant precursor or close to a significant precursor?

21 MR. ELTAWILA: That's correct.

22 COMMISSIONER McGAFFIGAN: On SPAR models, I want to put in

1 a plug. I'm glad that you are expanding to external events in the SPAR models. I  
2 saw a summary of a meeting in probably one of the trade press journals not long  
3 ago. NEI was basically saying quit your SPAR program and rely on our PRAs. I'm  
4 certainly not ready for that at this time. I'm speaking as one Commissioner.

5 I think we need to have an independent tool and we need to be engaged in  
6 the sort of activities like bringing it to external events. We oftentimes lead if there  
7 isn't an external event; ASMI or ANS process at the current time that we've  
8 endorsed. I just want to put in a plug.

9 I think the SPAR program has been useful, its had its ups and downs, but I  
10 think we really have a good product today. I think we should continue to rely on it.  
11 Not that I don't want to look at the reactors licensees PRAs and get whatever  
12 insights they want to give to us from them. It's the independence of the regulator, I  
13 think.

14 MR. REYES: We use it in that way. We find out what assumptions  
15 they made et cetera, et cetera. It's a tool to do that kind of diagnostic.

16 MR. ELTAWILA: NRR is taking the lead to interact with the industry  
17 about the role of PRA versus the SPAR model and will comment on the amount of  
18 resources we're going to spend in order to be able for the inspector, for example,  
19 to be trained on every PRA model that would be resource intensive for the agency.  
20 So having a single model that's being used by all our inspectors and things like  
21 that is an added benefit.

22 COMMISSIONER McGAFFIGAN: I know you're committed to having

1 better fidelity in the SPAR models, but I think they have achieved better fidelity  
2 over the last few years. Is there going to be a second round? I'll shut up.

3 COMMISSIONER JACZKO: I have one question. I think one of the  
4 areas we talked about reactor issue but one area is particularly important on the  
5 material side is human reliability. I think one of the briefings you talked a little bit  
6 about things that you're doing in human performance and human reliability  
7 particularly in the materials area. If you could expand on some of those things.

8 It's always important to remember that these are the areas, not on a daily  
9 basis but on a real-time basis, people are getting injured and getting doses that  
10 are significant sometimes.

11 MR. ELTAWILA: We have been working with the FSME program and  
12 we'll develop a toolkit for them that can be used by the staff here, by the inspector  
13 and even can be used by the medical establishment and things like that.

14 What are the issues of human reliability that can affect for example  
15 misdiagnoses or misadministration and things like that? That toolkit right now is  
16 available to FSME for training the staff that do inspections and is available for  
17 everybody. That's the activity we have right now to support.

18 COMMISSIONER JACZKO: You said that toolkit is something that  
19 could be useful to licensees as well?

20 MR. ELTAWILA: It's available. If licensees want to have that tool,  
21 they can have it without any problem.

22 COMMISSIONER JACZKO: Do we know or have any way to track if

1 anyone is using it and finds it to be beneficial?

2 MR. ELTAWILA: I don't know the answer right now, but I will  
3 definitely get back to you on that one.

4 COMMISSIONER JACZKO: Thank you.

5 CHAIRMAN KLEIN: Commissioner Lyons?

6 COMMISSIONER LYONS: Just a couple of questions on some of  
7 the areas of crosscutting research that are in the paper that you provided to us.  
8 I'm not sure how much you can discuss either one of these.

9 One of the subjects is offsite mitigation strategies and another would be  
10 advanced computational tools. I was just curious if there's any comments you  
11 could provide on either of those. Both are subjects of great interest to me.

12 MR. ELTAWILA: In the first area of extended mitigating strategy, we  
13 have a program at Sandia National Laboratory to run analysis to look at the  
14 effectiveness of external spray, for example, and if there is any benefit that will be  
15 gained out of that external spray and all the requirements of a system like that.

16 They should be coming back to us and provide us with detailed research  
17 and test plan to show the effectiveness of the spray system. They're doing the  
18 analysis right now. I have not seen anything out of Sandia. I will be happy to get  
19 back to you if they have made any progress in this area.

20 COMMISSIONER LYONS: I've seen some of the very preliminary  
21 work at Sandia and it looked extremely interesting. I'm very happy to hear that  
22 you're pursuing it.

1 MR. ELTAWILA: We are pursuing this on the direction we got from  
2 the Commission, but I not seen the results yet.

3 In the area of advanced computation, I think the activities - we a lot of  
4 activities in the office, for example. The development of the TRACE code is really  
5 intended to prepare the agency for the future. It's a modern architecture and we  
6 are going to subject it to peer review and we are improving the documentation.  
7 That's going to continue to be the work horse of the agency for a very long time.

8 We also have computation of fluid dynamic capability in the office and we're  
9 doing very extensive analysis, for example, to support the ESBWR certification  
10 work. We're also doing the same analysis using CFD for the steam generator tube  
11 project. We have the capability in-house to perform this sophisticated analysis.

12 What's missing in the CFD is the two-phased formulation because the CFD  
13 we are relying on commercial code. The two-phase formulation is an area that we  
14 are spending nominal resources to develop the model that can be incorporated in  
15 CFD. Then we are working with NSIR and also at Sandia to try to come up with a  
16 tool for the incident response center, we call it for lack of a better term, faster than  
17 real time computational tool.

18 This is going to try and take advantage of all the research that we have  
19 conducted over the past 25 years in severe accidents and we'll try to use this  
20 information to come up with the predictive tool to answer the "what if" questions for  
21 training and for actual events.

22 COMMISSIONER LYONS: I think all of those will be very important.

1 Perhaps one small question. As you talk about working toward modern  
2 architectures on these codes, does that imply that the codes are now in a form  
3 where they would be sufficiently portable, that they can move as hardware  
4 systems evolve in the future?

5 MR. ELTAWILA: That's our hope. We still have hardware  
6 dependency compiler and we'll try to eliminate this as we assess the code and  
7 develop it. But there are still some of these issues.

8 COMMISSIONER LYONS: To whatever extent you can work toward  
9 the full portability, I think that will be very important so that the codes - so that we  
10 don't have to continue to update the codes as platforms change. Thank you,  
11 Farouk.

12 CHAIRMAN KLEIN: A question about fuel performance. I attended a  
13 session at INPO several months ago and Tim Ellis commented on the fact that on  
14 the fuel failures he thought that there was many failures that were operationally  
15 caused as manufacturing. Could you all comment on that aspect? What  
16 operational characteristics are causing these failures?

17 MR. REYES: There's several things. What you have is a small  
18 number of failures so it's a problem to come up with a Ph.D. study of what the  
19 answer is. Some of the operationals are related to debris in the reactor coolant  
20 system.

21 Then you have some of the design issues with the threading from the  
22 support from the fuel. The problem they are having is a small number of failures

1 and a relatively broad spread of the causes. Then there's a small number of  
2 manufacturing. Maybe Jennifer wants to add to this.

3 MS. UHLE: That's a good answer.

4 MR. REYES: It's a difficult issue because you don't have them all  
5 clumped into one cause. If you go back in history, there used to be a lot of issues  
6 with operational failures due to debris and earlier than that there were a lot of them  
7 having to do with the manufacturing, a lot of welding at the top of the fuel when  
8 you finish a manufacturing process.

9 Now what you have is a very small number of each kind and so putting your  
10 hands around it to drive it - they want to drive it to zero. We're talking small  
11 numbers. It's a little bit harder proposition. I don't know if I answered your  
12 question.

13 CHAIRMAN KLEIN: I'd like to follow up on the comment that  
14 Commissioner Jaczko made about the program at the University of Maryland. As  
15 you look at your staffing needs, one of the things I think you need to look at is  
16 having a relationship with universities. If you want to attract graduate students to  
17 help in your research area; you have to have relationships with universities.

18 As you look your research modes, when you have a choice of private  
19 industry or universities, if you could look at the dual purpose that you get out of the  
20 universities where you develop a relationship and you can have a pipeline of  
21 students, I wouldn't forget that option.

22 MR. SHERON: Okay. I think - with a few universities we have that

1 relationship; the University of Maryland, also Penn State University. There's  
2 another one where we have that symbiotic relationship. Mark?

3 MR. CUNNINGHAM: I would just add that in the area of digital  
4 technology and things, we have cooperative arrangements with Ohio State and  
5 with the University of Virginia, in part to get at what you mentioned.

6 CHAIRMAN KLEIN: Thanks. Commissioner McGaffigan?

7 COMMISSIONER McGAFFIGAN: I'm going to address the area of  
8 long-term, long-range research. You did give us a plan that's going to be  
9 considered in the 2009 budget process for initiating an effort. I looked at that with  
10 some trepidation because there is a large number of cats and dogs and for a  
11 significant amount of money in my mind; you're going to look at these areas and  
12 perhaps come up with the program; the program presumably being significantly a  
13 large multiple of these things.

14 For instance, in the digital instrumentation and control human materials  
15 interface whatever facility, which I go dangerously close to DITCHMIT as the  
16 acronym, and that's how I remember it. You guys are proposing a fraction of an  
17 FTE and over \$100,000 to think about a program.

18 When I read Commissioner Lyons' COM, I hold my pocketbook real tight  
19 because even if we're a minor member of the facility of that size, we probably are  
20 contributing millions per year. I multiplied that through all the things there and I get  
21 worried. I frankly get worried as to whether we can possibly sustain that in the  
22 budget.



1           It's a little bit out of character of us, at least in the last 15 or so years. It  
2           may go back to where we were in the early '80s when we did have a lot of budget  
3           resources and were a major funder of the National labs compared to today.

4           But if we're going to make a change of all the options and really build up  
5           this program, I sense that all three colleagues who remain here are fairly  
6           enthusiastic about it. With all the options discussed, getting it off the fee base is  
7           the only one that would be very attractive to me.

8           We may need to do some long-term research, although we've survived for a  
9           while without sort of playing off of everyone else. I think every research staffer is  
10          responsible for keeping up with, as part of their job, the literature in their area.

11          Part of the time they have - I don't know in your office where people work  
12          2,000 hours a year or whatever; maybe a little bit less, but we only bill for about  
13          1300 of it in NRR.

14          I would hope that some of that time is being used to keep abreast of the  
15          field and that may be enough. Just mark me down unlike my colleagues, who  
16          worked at universities, and National labs and may be recent graduates. For  
17          somebody that hasn't done research in 30-odd years, I have my doubts.

18                    COMMISSIONER JACZKO: I wish I was a recent graduate.

19                    MR. SHERON: I would just comment on that. The intent was not  
20          that this was the tip of the iceberg and that there was this huge research program  
21          that we were advocating. It was more that we felt that we needed to look into a  
22          whole host of areas that we identified to determine if there is, let me call it a seed

1 there, that we need to pursue.

2 I would imagine that after we finish some of these, a lot of them we would  
3 just say no, there is nothing further that we really need to investigate at this time.  
4 We, for example, raised the issue of nanotechnology. I couldn't even tell you  
5 where the industry may go with that, but we felt it was worthwhile to at least poke  
6 and probe and see where that might lead.

7 You may want to put out a small contract say with a university or  
8 something, to just explore.

9 COMMISSIONER McGAFFIGAN: Is there any evidence of any  
10 interest in the industry in nanotechnology?

11 MR. SHERON: There may not be, but we're trying to look and see  
12 where this technology will be in 10 or 15 years and is something that might be  
13 applicable. We may come up empty-handed, in which case we'll say there's  
14 nothing more to do and we'll table it at this time.

15 But there may be some where there is a seed that says yes, this is  
16 something the industry may move toward. I don't know. Maybe there's some new  
17 materials.

18 COMMISSIONER McGAFFIGAN: This reminds me of the interest of  
19 some in research a few years ago, probably five now, in keeping abreast of the  
20 DOE 200-year program to do transmutation using accelerators.

21 I didn't think that was a high priority at the time and you guys assured me  
22 that although it appeared on a piece of paper, you weren't really going to spend

1 much money on keeping abreast of the DOE 200-year transmutation program.

2 COMMISSIONER LYONS: Now that program is GNEP.

3 COMMISSIONER McGAFFIGAN: I didn't want to spend a lot of  
4 money and that, either. In the old days it was accelerator driven and it was pretty  
5 wild.

6 MR. REYES: It really transmuted to GNEP.

7 CHAIRMAN KLEIN: I think on the nanotechnology side, that is a very  
8 dynamic area. There will be applications that will impact us; areas of flow,  
9 materials, material compatibility, aging issues. A lot of that area will be something  
10 we'll have to look at some point in time.

11 Mike was awfully quiet today, so I think he's probably still thinking about  
12 finishing up those tasks in the EDO's office before he can move over to the  
13 Research side. We look forward to having you on the Research team.

14 Any final comments? Thank you for a very good presentation. We're all  
15 excited about the nuclear renaissance and forward-leaning research, but at the  
16 same time we have to make sure this existing fleet operates in a safe, reliable  
17 manner. We have to look both somewhat near term as well as long term to make  
18 sure we operate the reactors both current and planned in a safe mode. So, thank  
19 you. The meeting is adjourned.

20