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Meeting Title: Briefing on Status of Research Programs,
Performance, and Plans (Including Status
of Thermo-Hydraulics)

Meeting Date: 2/9/00

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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

Title: **BRIEFING**

OFFICE OF NUCLEAR REGULATORY RESEARCH

Location: **Rockville, Maryland**

Date: **Wednesday, February 9, 2000**

Pages: **1 - 76**

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1 UNITED STATES OF AMERICA
2 NUCLEAR REGULATORY COMMISSION
3 OFFICE OF THE SECRETARY

4 ***

5 BRIEFING
6 OFFICE OF NUCLEAR REGULATORY RESEARCH
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8 Nuclear Regulatory Commission
9 Commissioners' Conference Room
10 Building 1
11 One White Flint North
12 11555 Rockville Pike
13 Rockville, Maryland
14 Wednesday, February 9, 2000

15
16 The Commission met in open session, pursuant to
17 notice, at 10:00 a.m., the Honorable RICHARD MESERVE,
18 Chairman of the Commission, presiding.

19
20 COMMISSIONERS PRESENT:

21 RICHARD A. MESERVE, Chairman
22 GRETA J. DICUS, Commissioner
23 NILS J. DIAZ, Commissioner
24 EDWARD McGAFFIGAN, JR., Commissioner
25 JEFFREY S. MERRIFIELD, Commissioner

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1 STAFF AND PRESENTERS SEATED AT THE COMMISSION TABLE:

2 MICHAEL MAYFIELD, RES

3 THOMAS KING, RES

4 ASHOK THADANI, RES

5 WILLIAM TRAVERS, EDO

6 MARGARET FEDERLINE, RES

7 ERNIE ROSSI, RES

8 ANNETTE VIETTI-COOK, Secretary

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

2 [10:00 a.m.]

3 CHAIRMAN MESERUE: On behalf of the Commission, I
4 would like to welcome you to the briefing by the Office of
5 Nuclear Regulatory Research. That office, as I know all my
6 colleagues realize, plays a vital role in the support of the
7 agency's regulatory mission. It develops the technical
8 bases that underlie the Commissions's regulatory
9 requirements and develops the analytical tools that the NRC
10 staff uses to assess licensee compliance.

11 The office provides technical assistance to NRR
12 and NMSS, through its confirmatory research program, and,
13 also, conducts anticipatory research to help position the
14 NRC for the future. Decreases in the NRC's budget over the
15 last several years have hit the office particularly hard. I
16 know that the office has responded by seeking ways to
17 leverage its resources, to allow it to fulfill its very
18 important support mission. I look forward to hearing this
19 morning about both the past accomplishments of the office
20 and your aspirations for the future.

21 Let me turn to my colleagues and see if they have
22 opening remarks. And if not, why don't we proceed.

23 DR. TRAVERS: Thank you, Chairman, and good
24 morning. We are glad for the opportunity to brief the
25 Commission today on the research program. Joining me at the

1 table today are the Director and Deputy Director, Ashok
2 Thadani and Margaret Federline, and the senior management of
3 the research team, who Ashok will introduce in just a
4 minute. Behind me, let me quickly mention that we have a
5 number of senior managers, who are available to respond to
6 any questions or issues that arise. Included are Carl
7 Paperillo, who is the Deputy Executive Director for
8 Materials, Research, and State Programs; Frank Miraglia, who
9 is the Deputy Executive Director for the Reactor Program;
10 and major stakeholders, Sam Collins, from the Office of
11 Nuclear Reactor Regulation, and Marty Virgilio from the
12 Office of Nuclear Material Safety and Safeguard are, also,
13 here joining us today.

14 And with that, let me turn it over to Ashok, who
15 will begin the presentation by identifying his --

16 MR. THADANI: Thank you, Bill. Good morning. On
17 my right is Tom King. Tom King is the Director of Division
18 of Risk Analysis and Applications. To his right is Mike
19 Mayfield, who is the Acting Division Director of Engineering
20 Technology. To my far left is Ernie Rossi. He's the
21 Director of Division of Systems Analysis and Regulatory
22 Effectiveness. And sitting behind me is Charlie Ader, who
23 is the Director of Division of Project -- Program
24 Management.

25 May I have view graph number two, please.

1 CHAIRMAN MESERUE: You forgot Margaret.

2 MR. THADANI: Oh, Bill introduced Margaret.

3 Margaret -- Margaret and I are a team.

4 Let me first note that the fiscal year 1999 was
5 indeed a pretty significant year for us, in terms of change
6 and some of the challenges. We went through a major
7 reorganization, wherein some of the AEOD functions were
8 merged with the Office of Research. We went through
9 significant reductions in management positions. In fact, we
10 went from 23 SES positions to 13. We did conduct the self-
11 assessment, with the assistance of Arthur Andersen, and we
12 made a number of changes that you will hear about, as we go
13 through the briefing.

14 While it's been a challenging year, I believe we
15 have met our commitments. The briefing today will cover
16 quickly the role of research, in response to the June staff
17 requirements memorandum, and how we are leveraging our
18 resources and some examples of past accomplishments and
19 their value; and then get into the substance of the
20 discussion on our recent accomplishments and plans for
21 future, and what we see as some of our future challenges
22 would be.

23 May I have the next view graph, please? Now, as -
24 - in terms of the mission of research, there were certain
25 key elements that led us to identify the areas that were

1 provided to the Commission in SECY-99-281, December 9, 1999.
2 The elements were, first, to be sure that in the development
3 of technical basis for regulatory decisions, that we
4 maintain certain amount of independence. Independence
5 clearly does not mean isolation. And, in fact, we have a
6 number of cooperative programs you will hear about, both
7 with the industry, as well as the international community.

8 It was important to recognize that we should
9 develop sufficient technical basis to make realistic
10 decisions and if margins are to be added, they are to be
11 added at the end, so there's a good understanding of what
12 the margins might be in those decisions.

13 The third key element in developing our role was
14 to make sure that we were timely in providing the
15 information. That meant planning ahead, in many cases.

16 The fourth key piece was to make sure that we do
17 what we can to maintain the kind of technical expertise that
18 would be needed by the agency.

19 I'm not going to go through all the areas that are
20 identified here. I'll just maybe highlight a couple. It is
21 important for us to make sure that our research provides the
22 knowledge where knowledge is needed, particularly areas
23 which might be important to safety and where there might be
24 significant uncertainties and where agency decisions are
25 likely to be made at some future date.

1 I do want to touch on the anticipatory research
2 part. I think it is very important that we, as the office,
3 pay close attention to what is likely to come down the road.
4 We have had some criticism in the past and we want to make
5 sure we're responsive to that. That means we have to get
6 out more, interact more with organizations who are directly
7 responsible for new technology, new designs, and so on.

8 I, also, would like to make a note that we're
9 paying close attention to our new responsibility, the
10 function that came from AEOD, making sure that we're looking
11 at operational experience and making sure that the staff has
12 direct access to me, if there are issues of some
13 significance, as the Commission noted in its staff
14 requirements memorandum.

15 Two key elements that I want to highlight here are
16 making sure that we have actively engaged ourselves with the
17 stakeholders, both internal and external, and we'll share
18 with you later on some of the things we're doing. And I
19 think this is an area where we do need to improve. In terms
20 of our work, I think we've made the number of improvements.
21 I'd like to think that we're doing much better in leveraging
22 our resources and we're looking for additional opportunities
23 to see if more can be done, in terms of leveraging our
24 resources.

25 May I have the next view graph, please? We do

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1 have -- as you see here, we do have a number -- a
2 significant number of cooperative agreements, both with
3 domestic, as well as international organizations. Our
4 agreements cover most of the areas that we're involved in,
5 including fuels, thermal-hydraulics, severe accidents,
6 aging, seismic issues, health effects, structural issues,
7 and so on. In certain areas, we receive funds from Funds or
8 -- and/or information, where we take the lead. We have code
9 assessment and maintenance program on thermal-hydraulic
10 codes, 22 countries participating. We receive some funds
11 from them. Similarly, we have severe accident research
12 programs. We have the lead up to now. And a cooperative
13 program in risk analysis, a number of countries
14 participating and provide some resources to us.

15 We are, also, engaged in a number of international
16 activities where we provide resources to those countries.
17 They have the lead in some of these efforts. We're
18 contributing on the order of four million dollars in these
19 efforts and the total cost of that research is about \$60
20 million. More and more, we are going into support mode
21 rather than in a leadership role, and this is an issue that
22 we'll come back and touch upon later on.

23 May I have the next view graph, please? This is
24 an important piece. It is something that is of some concern
25 to us. That is, it really does take time to fully realize

1 value of research. In fact, if you look at some of the
2 benefits of our past research, I'll describe some examples
3 here, when we initiated these programs, we did not
4 anticipate some of the benefits of this research effort.
5 When we began our aging research program many years ago, it
6 was to really understand what the effects of aging might be
7 on component structures. We didn't realize that, at the
8 time, that kind of research information could be valuable in
9 some license renewal decisions that would have to be made,
10 that are being made now. In fact, some of this research was
11 used to develop the standard review plan for license renewal
12 activities, resolution of some other generic technical
13 issues that have been addressed, as part of our review
14 process.

15 Pressurized thermal shock is another example,
16 where some of the work in terms of understanding flaws and
17 embrittlement effects, in terms of lifetime for reactor
18 pressure vessel -- obviously, some of the research results
19 are showing that we could revise our regulation and it might
20 open up options for some additional pressurized water
21 reactors to pursue the option of license renewal.

22 Risk-informed activities is another major example.
23 March 1400 was published in 1975. It was pioneering work 25
24 years ago. And, of course, over the last many years, we
25 have used this technology, in making many decisions, in

1 terms of safety enhancement at operating reactors. Station
2 blackout rule, anticipated transients -- some of these rules
3 were based on using risk information to understand relative
4 importance, safety impact, along with Commission's policy
5 statement on safety rules, to know how far we should be
6 pursuing some of the safety issues. And I think you know
7 very well some of the recent activities that were engaged
8 in, both in terms of today's issues, oversight program, as
9 well as future issues, trying to risk-inform Part 50 of our
10 regulations.

11 Decommissioning area, we have developed tools, in
12 terms of screening, as well as survey techniques. And we
13 believe these tools are not only focusing attention on
14 what's important to safety, but, also, providing some
15 flexibility to the industry.

16 Source term: most of our requirements today are
17 based on 1968 understanding. The technical information
18 document that was published in 1968 on the regulations are
19 based on that. And after Three Mile Island accident,
20 considerable severe accident research has been done over the
21 '80s and early '90s. And, as you know, we have a much
22 better understanding of the source term, both in terms of
23 timing of release, as well as physical and chemical form.
24 And this information has been used by the Office of Research
25 to assist NRR in rebase lining, understanding what the

1 impact would be on offsite releases, control room doses, as
2 well as environmental qualification considerations.

3 We did four pilot studies and I think with proper
4 focus on safety, significant savings have been achieved by
5 these four pilot studies. One pilot plant told us that they
6 are saving somewhere on the order of about \$600,000 a year
7 from removal of leakage control system and that they thought
8 that the lifetime saving would be on the order of seven
9 million dollars. We anticipate a significant number of
10 license amendment applications over the next few years, to
11 take advantage of current research knowledge.

12 My point here simply is that many of these
13 programs were started a long time ago. They took a long
14 time, a lot of resources. They have not only related to
15 safety improvements, but they, also, relate to much better
16 decisions, in terms of what the resources should be focused.

17 May I have the next chart, please? I want to --
18 this is a complicated chart, I know, but all the research
19 work really focuses on safety, recognition, what's more
20 important safety and what's less important safety, so
21 decisions can be made. In the process for reassessment, we
22 developed these planned accomplishments early on. In
23 development of these planned accomplishments, we are, of
24 course, were focusing on what the agency's performance goals
25 were. For example, in terms of technical basis to address

1 safety issues, include things like tracking -- crack growth
2 rates, repairs that need to be made, and generic safety
3 issues, and things of that sort. Improving program process
4 efficiency considers things like adopting consensus
5 standards or consolidating some of our computer codes, to
6 make sure we're being more efficient and so on. Preparing
7 ourselves for future, things like mox fuel and so on, is
8 included under that category.

9 Developing technical basis to allow reductions to
10 unnecessary license burden: here, what we have are -- there
11 are two regulations that we have identified -- well, we know
12 they are conservatisms. I touched on pressurized thermo
13 shock and the emergency core cooling system requirements in
14 the 5046 is the other piece there. I think all of these, if
15 we do our job right, will influence public confidence. In
16 addition to that, we, also, have the water reactor safety
17 meeting, where we share results from the work we're doing.

18 I believe that these goals -- performance goals
19 are not mutually exclusive and that it's -- what we believe
20 what we're doing is, in relative terms, it influences each
21 of the goals, to a certain degree or other, but output from
22 what we're doing influences, by and large, all of these
23 goals. And as I said, we started with the performance
24 goals, developed these plan accomplishments. Under that, we
25 identified activities that would really influence these

1 accomplishments and we used the analytical hierarchy
2 approach to try and prioritize the work we do, and then go
3 back and see how it might impact the performance goal, in
4 terms of the work we do.

5 May I have the next chart, please? Chairman, as
6 you noted in your introduction, there's been a significant
7 long-term trend of declining resources for research. What I
8 have here are resources shown, in terms of on this chart,
9 program support dollars and the next chart, FTE staff
10 resources. These resources include both the research
11 function, as well as the AEOD function that was transferred
12 to the Office of Research. As you can see, there has been
13 significant reduction in program support from 1990 to fiscal
14 year 2000, approximately eight million dollars, going from
15 \$50 million to about \$42 million. And then it shows you
16 relative impact on various research programs, the reactors,
17 materials, and waste.

18 May I have the next chart, please. This is,
19 again, the same information. We are -- the FTE allocation
20 was reduce from '99, where it was about 200 FTEs to 180 FTEs
21 fiscal year 2000. And we have -- of course these reductions
22 have led -- lies our prioritization scheme, to see what
23 functions, activities we would not conduct, as a result of
24 these reductions.

25 With that as background, we'll start with Mike

1 Mayfield and try to go through some of the major examples or
2 accomplishments and what the future challenges are. Mike.

3 MR. MAYFIELD: Thank you. Can I have slide nine,
4 please?

5 The Division of Engineering and Technology is
6 responsible for a broad range of the traditional engineering
7 disciplines: mechanical; electrical; electronics, which
8 picks up the instrumentation and control function;
9 structural; civil engineering; earth sciences activities;
10 and the materials sciences, which bring in the
11 embrittlement, environmentally assisted cracking, non-
12 destructive examination. Because of this range of
13 disciplines, we find ourselves often involved in cross-
14 cutting issues that, also, pick up involvement with the
15 thermal-hydraulics activities and the probabilistic risk
16 assessment. The two issues I want to brief you on this
17 morning are, indeed, examples of such cross-cutting issues.

18 The first is assuring the integrity of the reactor
19 pressure vessel. The staff, both in research and NRR, has
20 and continues to focus considerable attention on assuring
21 the integrity of the reactor pressure vessel. The vessel
22 houses and supports the reactor core, channels flow through
23 the core, and it's the only pressure boundary component
24 whose design -- or whose failure was not accommodated in the
25 design of the engineer and safety features. Its failure has

1 always been treated as an incredible event and the staff's
2 efforts have been designed to make sure that that assumption
3 is, in fact, a valid one.

4 Our research over the last several years have led
5 to improvements and understanding of key factors that affect
6 reactor pressure vessel failure. This has permitted us to
7 make some improvements in operational flexibility,
8 particularly in the pressure temperature, when its for
9 reactor start up and shut down.

10 Maintaining a high level of safety for the reactor
11 pressure vessel continues to be our primary focus in this
12 program. However, owing to better understanding of some of
13 the issues and quantification of uncertainties, we've been
14 able to reduce some of the unnecessary burden in the earlier
15 regulation. In 1999, we initiated a program that's a very
16 thorough reevaluation of the technical basis for the
17 pressurized thermo shock rule, which is 10 CFR 50.61. This
18 program involves the thermal-hydraulics efforts,
19 probabilistic risk assessment, fracture mechanics, and the
20 materials behavior, particularly embrittlement. The
21 pressure thermo shock rule places effective limits on the
22 embrittlement imposed -- or embrittlement levels permitted
23 for the reactor pressure vessel and this has affected both
24 pressure vessel life and then facility life has, also,
25 affected some licensees license renewal decision.

1 We have been drawing on research results that have
2 made -- I think I have an echo here -- that have made major
3 improvements in some of the key areas, understanding the
4 flaw distributions, the fabrication flaw distributions from
5 the original vessel fabrication. We've looked and have made
6 major strides forward in the pressure vessel and
7 embrittlement estimates and in some of the fracture analysis
8 methods, as well.

9 Our program is drawing heavily on both the
10 thermal-hydraulics and probabilistic risk assessment
11 efforts. The thermal-hydraulics were not considered all
12 that seriously in the original formulation of the rule,
13 simply because the uncertainties in the other technical
14 areas, principally the flows and the embrittlement
15 estimates, were so large that the uncertainties in the
16 thermal-hydraulics calculations didn't figure in. As we
17 have reduced the level of uncertainty in those other areas,
18 the thermal-hydraulics efforts have taken on increased
19 significance.

20 The PTS rule is one of the agency's early attempts
21 at a risk inform performance based regulation and we're
22 revisiting the risk considerations down to the level of what
23 would be an acceptable level of risk for the reactor
24 pressure vessel failure. This project has been coordinated
25 extensively with NRR and with the industry, and we have a

1 very active industry participation through a parallel
2 effort, where they are investing resources and doing many
3 similar things and complementary activity. Our continuing
4 work in this area is expected to lead to the PTS
5 reevaluation and publication of a revised regulatory guide
6 on embrittlement estimates by the completion of calendar
7 year 2001.

8 The next slide, please. The second area I wanted
9 to describe is the long-term storage of spent fuel. Several
10 licensees have installed dry cask storage systems to permit
11 on-site storage of spent fuel. The original 20-year license
12 terms are nearing expiration for some of the early systems
13 and the first application for renewal is expected in the
14 2001 time frame. MSF has requested RES support in
15 developing the technical basis to support timely evaluation
16 of the renewal submittals.

17 We initiated a cooperative program with EPRI and
18 DOE in 1999, to evaluate the condition of casks and fuels
19 that were in a demonstration program at the Idaho National
20 Engineering Laboratory. We have examined the interior and
21 exterior of one of the cask designs and we've made some
22 visual examinations of fuel assemblies in that cask. We are
23 anticipating doing destructive evaluation of the fuel rods,
24 to look at the condition of the fuel, and we'll -- this
25 program will be providing the staff valuable data on the

1 continuing long-term integrity of the casks and the fuel
2 stored in them.

3 We plan to examine a second cask of a different
4 design, as part of this program. In that sense, we will,
5 also, be developing models for the nuclide inventories and
6 the source characteristics that are used in the overall
7 safety evaluations for the cask. We have had some
8 significant expressions of interest from the international
9 community in this program and we'll looking to expand the
10 program to capitalize on that interest.

11 With that, I turn to Tom King.

12 MR. KING: Thanks, Mike. I'm going to discuss the
13 next three slides, which, for the most part, cover the scope
14 of activities in my division. My division is primarily
15 associated with developing and applying risk insights and
16 covers support to NMSS and NRR. The three slides are pretty
17 much broken down according to the work in the three
18 branches, which are in the division.

19 If I can have slide 11, please? Slide 11
20 highlights activities associated with radio nuclide
21 transport in the environment, which includes development of
22 models and analytical codes. It can be used to assess some
23 clients with a license termination rule. It includes
24 activities associated with radiation protection, which
25 involves improvement of models and codes to analyze health

1 effects. And it involves developing the technical basis for
2 various regulatory activities; for example, the rulemaking
3 on clearance and assessing the feasibility of entombment as
4 a decommissioning option.

5 Work is primarily associated with the goals of
6 maintaining safety and ensuring realism in regulatory
7 decisions. Although it's possible, some reduction and
8 unnecessary burden could, also, result from this work. Some
9 of the significant accomplishments in FY99 have been
10 publishing a revision eight of NUREG 1307, which is really
11 an estimate -- updated estimate of waste disposal costs that
12 licensees can use, in estimating what they need for the
13 decommission funding. We intend to update that again this
14 fiscal year.

15 Participating with other federal agencies in
16 funding a study at the National Academy of Sciences, looking
17 at the effects of low level radiation. This is directed
18 toward assessing the realism of the linear no threshold
19 hypothesis, which is used in today's models that assess the
20 health effects from low level radiation.

21 And we completed a study on the feasibility of
22 entombment as a decommissioning option, provided a paper to
23 the Commission. We conducted a public workshop in December
24 on this and we're planning to come back to the Commission in
25 June with a recommendation as to whether we should proceed

1 with rulemaking in this area.

2 Future activities, we continue to support
3 development at the technical basis for the clearance rule.
4 We've issued a draft report that put the individual doses
5 for recycling metals. We're continuing to work on assessing
6 collective doses and costs, not only for recycling metals,
7 but, also, concrete and soils.

8 We've issued a draft report that reassessed
9 materials exempt from licensing. We plan to finalize that
10 report in this fiscal year. It basically went back and
11 looked at where exemptions have been given in the past,
12 using updated information on the quantities and the life
13 cycle of those materials, assessed individual and collective
14 doses. We've provided that report. It's out for public
15 comment now. Ultimately, it will be used by NMSS to
16 reassess whether the exemptions are still valid or not.

17 . And, finally, we plan to complete work on two
18 upgrades to analytical tools that can be used for
19 decommissioning, very simplified code, which we call DandD.
20 It's basically a screening tool. All licensees need to have
21 is some idea of the contamination on their site and it can
22 be used to assess whether that site would comply with the
23 license termination rule. And then there's a more detailed
24 code that we're working on upgrading, called RESRAD, which -
25 - for sites, where you need to get into modeling more site

1 specific parameters. It's going to allow that to take
2 place.

3 We can have slide 12, please. Slide 12 deals with
4 operational data assessment. Work in this area, which
5 really represents work that was transferred in from -- to
6 research from AEOD back in January of 1999. The work
7 involves assessing reactor operating experience for generic,
8 as well as plant specific insights and contributes to the
9 agency goals of maintaining safety and ensuring public
10 confidence. Specific activities that we include -- do in
11 this area are: we assess operating events for the risk
12 significance, what we traditionally call the accident
13 sequence precursor program; we assess the reliability and
14 availability of selected components and safety systems; we
15 assess selected inspection findings for their risk
16 significance; and we do specific component or system
17 studies, where there appears to be problems occurring. To
18 do this work, we, also, need to develop tools and maintain
19 databases, which are, also, done in this work area.

20 Significant things we did in FY99 included: we
21 assessed the risk significance of the inspection findings
22 from D.C. Cook, for example; we issued seven reliability
23 studies on reactor safety systems and two reliability
24 studies on components; and we supported the plant oversight
25 process in areas such as helping to develop a guidance on

1 how you determine the risk significance from inspection
2 findings.

3 In addition to continuing the operating event and
4 the reliability study work, in the future, we are working on
5 developing a more comprehensive set of what we call risk-
6 based performance indicators that potentially could be used
7 in the plant oversight process, if they are shown to be
8 valid and useful. We are, also, working on expanding the
9 accident sequence precursor analytical tools to cover shut
10 down and external events.

11 Why do we do this work? What have we learned?
12 Basically, we've gotten insights as to what is causing
13 reliability and availability problems on systems and
14 components that we provided NRR and they are available for
15 licensees to use, to help focus their attention. We
16 generally found the system and component reliability are
17 improving with time. And the DRA results are generally
18 conservative, with respect to the system and component
19 reliabilities that they use, as well as initiating event
20 frequencies.

21 Reporting of this information, we have various
22 schedules today that this information is reported on. There
23 is an annual report on the accident sequence precursor
24 program. The reliability studies are issued, updated every
25 couple of years, although we're trying to get that on to an

1 annual basis. Other reports, like inspection findings, are
2 issued on an as needed or as requested basis. However, we
3 have stepped back and taken a look at maybe we should try
4 and -- or how can we try and better integrate these reports,
5 so that we have a more comprehensive look at what operating
6 experience is telling us, that would be issued on a more
7 periodic basis. So, that is something we've got under
8 assessment right now.

9 If you go to slide 13, risk-informing NRC
10 regulations and activities. This is certainly an activity
11 that has received a lot of visibility. It includes to risk
12 inform -- assess risk informing the technical requirements
13 of 10 CFR Part 50, as well as our work in maintaining and
14 improving the guidance for a risk-inform licensing actions.
15 This work is directed towards the agency's goals in
16 maintaining safety, while, at the same time, reducing
17 unnecessary burden. As you know, we've undertaken a study
18 of the technical requirements in 10 CFR Part 50, as
19 described in our SECY paper 99-264, recently approved by the
20 Commission in their February 3rd SRM.

21 The plan and approach described in that SECY were
22 developed with quite a bit of stakeholder input. We had a
23 number of public meetings. We had a public workshop before
24 that paper came to the Commission. We're planning another
25 public workshop later this month, to describe our progress

1 and the approach that's been developed and some of the
2 applications of that approach, on a trial basis, to a couple
3 of regulations. There will be a lot of -- we expect a lot
4 of stakeholder involvement in that workshop. We plan to
5 give the Commission a status report in March and the results
6 of the workshop and where we stand and that status report
7 will include any policy issues that we need to bring before
8 the Commission that we need their attention on before we
9 proceed and complete the study.

10 Key future activities: in addition to completing
11 the study of the technical requirements in Part 50, which
12 our schedules calls for completing in December of this year,
13 we plan to update the regulatory guides that are associated
14 with risk-inform licensing actions. That will begin later
15 this year. We expect to have Reg Guide 1174 hopefully
16 updated by the end of the year and the application specific
17 ones later on.

18 We're, also, developing what we call the agency
19 risk-inform regulation implementation plan, which was
20 described in the January 13th memo to you. This will be the
21 replacement for the PRA implementation plan. Hopefully, it
22 will be more comprehensive, in terms of laying out where the
23 agency wants to go and how it intends to get there in the
24 risk-informed activities.

25 We're, also, providing support to NMSS in selected

1 areas, such as performing a risk assessment on dry cask
2 storage.

3 Finally, I should note that the thermal-hydraulic
4 program provides valuable support to our risk-informed
5 activities. The thermal-hydraulic codes are essential for
6 analyzing various accident scenarios, assessing the degree
7 of realism, and the current requirements and the
8 implications of proposed changes, including the effect on
9 safety margins. In effect, the thermal-hydraulic codes
10 provide information on accident consequences, which
11 basically are 50 percent of the risk equation, since risk
12 equals probability times consequences.

13 With that, I'll turn it over to Ernie.

14 MR. ROSSI: My division is the Division of Systems
15 Analysis and Regulatory Effectiveness, and the division has
16 the program for generic safety issues, regulatory
17 effectiveness. It has some work in the area of operational
18 experience review. It has the work on human performance.
19 The division, also, has the thermal-hydraulics program, the
20 program for experimental work in analysis on fuels, and it
21 has the severe accident program.

22 Slide 14 will talk about managing and resolving
23 generic safety issues. About two years ago, there was a
24 concern from both the ACRS and Congress on the number and
25 age of generic safety issues. And since that time, the

1 office has performed a self-assessment, improved the
2 process, and there has been considerable management emphasis
3 on resolving issues.

4 The generic safety issue program is the agency's
5 program for feeding in new problems that arise into the
6 regulatory process. So, we look at those problems and see
7 if anything needs to be put into the regulatory process.
8 The program, also, takes potential generic safety issues and
9 analyzes them and, in a number of cases, determines that no
10 further generic actions are warranted, and it does a good
11 analysis and documentation of that.

12 In fiscal year '99, one generic safety issue was
13 reprioritized based on updated information, and five were
14 resolved with no new or revised requirements for licensees.
15 As a result of the self-assessment that we did, we developed
16 a new management directive that focuses the up-front work on
17 generic safety issues much better, to determine whether they
18 should or should not be worked on and it, also, streamlines
19 the process. What we have done in a generic safety issue in
20 the past year or year-and-a-half is primarily focused
21 considerably more attention on resolution of generic safety
22 issues. This process is one where we get new items, from
23 time to time, as we close out the old one. So, we do have
24 three new generic safety issues that have been identified
25 for prioritization next year. And we, also, have three

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1 generic safety issues that are scheduled to be completed
2 between now and the end of the calendar year.

3 In resolving the generic safety issues, one of the
4 things that we have done is we've tried to make considerable
5 use of a number of other research products that have been
6 completed since these generic issues were originally
7 identified. We've taken a hard look at information from
8 probabilistic risk assessment studies, information from
9 individual plant examinations, and, also, we've looked at
10 operating experience. I'd like to further note that
11 prioritization of generic issues is an area where we will
12 use NRC staff to perform considerable amount of the work
13 that's been performed by contractors in the past.

14 If you go to slide 15, now, slide 15 talks about
15 our work in providing support for burnup credit to reduce
16 regulatory burden in areas that involve spent fuel. Until
17 recently, the NRC has required criticality analyses for
18 spent fuel in transport and storage casks to be based on the
19 assumption of fresh fuel without burnable poison. Burnup
20 credit refers to performing criticality analyses using more
21 realistic assumptions, based on the fact that the reactivity
22 of the fuel has been reduced, as a result of the fuel having
23 been used to produce power.

24 There are a number of uncertainties in looking at
25 burnup credit. I'll mention a few of those. Uncertainties

1 include things like the actual isotopic content of the spent
2 fuel. Axial and horizontal burnup profiles are important in
3 providing burnup credit, and end effects and burnable
4 absorbers.

5 The outcome of this effort is there's both a
6 safety benefit and a cost benefit of this work, because
7 fewer casks will be used for shipment and storage of spent
8 fuel. The safety benefit is if you're casks have to be
9 transported, the personnels are reduced and, obviously, the
10 fewer casks that are needed will reduce the cost for the
11 industry.

12 In fiscal year '99, research supported NMSS in
13 issuing interim staff guidance for assessment of residual
14 burnup credit margins for actinides. We have recently
15 finalized an agreement with Belgonucleaire for collaboration
16 to do interval criticality tests on burnup credit. And our
17 future activities include assessment of residual burnup
18 credit margins for fission products and for looking at fuel
19 burnups altitudes of 62 gigawatt days per metric ton. We
20 are, also, going to look hard at the -- or look at the
21 credit that can be given for fission products, over and
22 above what we've already provided, interim step guidance on
23 for the actinides. And so, we are obtaining fission product
24 test data to validate codes that are used for burnup credit.
25 This is an area where we know we are very conservative and

1 what we are trying to do is to do the research, to set the
2 technical basis in a rigorous way, for being able to provide
3 the burnup credit and still ensure that we have maintained
4 appropriate safety.

5 The next four view graphs will discuss the
6 research activities in areas of thermal-hydraulics, fuel
7 behavior, and severe accidents. These research areas are
8 designed to establish and maintain the agency capability to
9 assess the behavior of the fuel cladding, reactor pressure
10 boundary, and the containment, the three fundamental
11 barriers to the release of fission products to the
12 environment. And we will do this by looking at -- being
13 able to look at a variety of accident and transient
14 conditions that may challenge the fission product
15 boundaries.

16 In the 1970s, the NRC maintained an extensive
17 research activities in fuel behavior and thermo-hydraulic
18 areas. In the 1980s, our support for these areas declined
19 significantly. The reasons were that fuel vendors were not
20 pursuing changes to the fuel or cladding, and the belief was
21 that the data available at that time would be sufficient to
22 addressing the issues in the fuel area. The thermo-
23 hydraulic codes were believed to be adequate for predicting
24 plant behavior for design basis accidents.

25 Resources were, also, shifted to address severe

1 accident uncertainties after the Three Mile Island accident.
2 Other countries, particularly France and Japan, continued to
3 conduct thermo-hydraulics and fuel research. And in the
4 early 1990s, the AP600 certification work and some results
5 from the Capri facility in France indicated the need for
6 more emphasis on thermo-hydraulics and fuel research in the
7 U.S.

8 Slide 16, please. The thermo-hydraulic codes are
9 essential for calculating temperatures, pressures, flows,
10 and reactor core parameters during postulated transients and
11 accidents. And this information is fundamental in the
12 analyses of the fuel and its cladding, and for a number of
13 the phenomena, one of them being pressured thermo shock that
14 you heard discussed previously, involving the reactor
15 coolant system boundary. This program will support an
16 independent capability within the NRC, to assess and audit
17 vendor licensee analyses.

18 One of the accomplishments of this program was
19 that during the AP600 review, the NRC identified a problem
20 with the automatic depressurization system sizing by
21 performing our own analysis. That was a very important
22 result, because the safety systems for AP600 are passive and
23 dependant on gravity feed, and, therefore, the
24 depressurization system was essential for mitigation of
25 accidents.

1 We are, also, using our codes to identify the
2 problem with licensee analysis of Electro-sleeves or steam
3 generator tubes, under severe accident conditions, and that
4 was with respect to what I think you know was the Calloway
5 Amendment. The codes are used for a number of other things
6 that I've listed here: assessing operating events. Tom
7 King mentioned the need for all of this work to support
8 risk-inform regulatory activities. Risk-informing the
9 regulatory activities will require parametrics analyses to
10 get realistic results, identify the uncertainties in those
11 results, and to reduce excess margins.

12 There's a number of other areas here, where we
13 intend to use the thermo-hydraulic codes, and I will mention
14 one of them that we're undertaking and that is that we're
15 going to undertake work to look at the decay heat
16 assumptions that are used in transients and analyses where
17 we believe there is a lot of conservatism. And, again, this
18 will be looked at to provide a technical basis for using a
19 more realistic decay heat curve.

20 Slide 17 talks about analysis infrastructure in
21 the area of thermo-hydraulics, fuel behavior, and severe
22 accidents. I'd like to point out that the infrastructure
23 that's talked about includes computer codes, which are user
24 friendly and can be used by the staff; maintaining NRC staff
25 expertise to use these codes; and, also, having appropriate

1 experimental facilities for assessing the models in the
2 codes; and, also, for looking at specific issues.

3 And the outcomes are listed here as more accurate
4 codes to be used by the agency. And, again, I will stress
5 the need for this work in development of a risk-informed
6 Part 50. We have been doing considerable work in code
7 consolidation, which I'll talk about on the last two slides,
8 which will both improve our computer code capability, make
9 them more user friendly, and, also, reduce costs. And the
10 accomplishments for fiscal year '99 are listed here and they
11 have to do with the consolidation of the code effort and
12 developing more user friendly codes that can be used for
13 parametric studies.

14 Slide 18 talks about the recent -- key future
15 activities and recent activities in the thermo-hydraulic
16 code area. Actually, this one covers recent ones -- or the
17 future ones. In fiscal year 2001, we will be supporting two
18 thermo-hydraulic codes, TRAC-M and RELAP-5. By fiscal year
19 2003, the original four codes that we had in the thermo-
20 hydraulics area will be replaced by one single consolidated
21 code. And, also, we are carrying on a number of
22 experimental programs in this area, to assess and improve
23 the codes and considerable -- most of that major work will
24 be done by fiscal year 2003.

25 In the fuel behavior area, in fiscal year 2001, we

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1 will complete a peer review and release an improved FRAPTRAN
2 code, which will be used for analysis of high burnup fuel
3 and we'll, also, include information on material properties
4 of cladding that we have obtained from various experimental
5 programs.

6 The last slide, slide 19, indicates similar
7 information on the activities that we have planned for
8 consolidating codes in the severe accident area. I would
9 like to point out that we intend to do in-house analyses for
10 alternative source term applications, as well as the other
11 work that's listed there on severe accidents.

12 I, also, want to make a point that the
13 consolidated codes that we are finishing will be continually
14 maintained; to ensure maintaining the expertise; to run the
15 code within the NRC; to ensure that the codes are made
16 compatible with involving computer technology; and to
17 improve and correct code models, where necessary, to address
18 new issues or correct problems that we find.

19 And that completes my discussion. Margaret.

20 MR. THADANI: Margaret?

21 MS. FEDERLINE: Good morning. One of the most
22 difficult challenges that we face in the Research Office is
23 balancing short-term and long-term needs. Environmental
24 factors, as well as the need for -- the need for additional
25 information underlying phenomonological understanding sort

1 of drives us to look to the future and understand what our
2 needs will be. As you are all well aware, the industry's
3 look for opportunities for efficiencies has raised the
4 importance of understanding the margins in our regulations.
5 So, many of our future needs are driven by these
6 perspectives. Because of the time, I'll talk about just a
7 few of these and then I can answer any questions that you
8 might have on others.

9 Industry has indicated a move to high burnup fuel.
10 One of the challenges that we deal with is that our
11 regulatory criteria were developed much earlier and were
12 based on a time when high burnup was thought to occur at 40
13 gigawatt days per metric ton. International data have
14 raised some questions about the rate of cladding corrosion,
15 as well as reactivity initiated events. We need to confirm
16 the adequacy of our regulatory criteria in these areas, up
17 to the 62 gigawatt per metric ton limit that we're currently
18 using.

19 It's, also, important to prepare the agency for
20 the future, as obsolescence of components occurs in the
21 nuclear industry, as well as the introduction of new digital
22 technology. It's important for us to convey to the industry
23 exactly what information we'll need to review and what the
24 acceptance criteria in many of these areas will be.
25 Industry has indicated the desire to use more off-the-shelf

1 software and we need to be prepared to understand what the
2 implications of introduction of this technology will be for
3 the operating reactor.

4 We, also, need to be prepared to support projects
5 that are in the national interest, as well aware the
6 decisions related to non-proliferation and the use of MOX in
7 commercial reactors has posed some challenges. We developed
8 a Commission paper, which identified the technical issues
9 that we face in this regard and we've recently put together
10 a research plan to address these.

11 A number of other issues, one of them on the
12 horizon, industry is looking at different decommissioning
13 approaches, looking at rubblization and perhaps more
14 reliance on entombment. There will be additional work that
15 needs to be done in this area, to understand the contaminant
16 pathways, as these are brought to bear.

17 Also, DOE is looking at future waste technologies.
18 Accelerated transmutation, they have a five-year feasibility
19 study, which assesses regulatory implications, as well as
20 their Generation IV program for new designs, and it would be
21 really desirable if NRC could follow those programs, to try
22 and understand what the new and novel challenges are in
23 these areas.

24 Turning to slide 21, as Ashok mentioned, we've
25 been involved in a self-assessment effort now for about a

1 year-and-a-half and we're going to continue that through
2 2000. And one of the key findings from that self-assessment
3 was the need for enhanced interaction with both internal and
4 external stakeholders. We have several objectives with our
5 internal stakeholders. We want to improve our coordination
6 during the planning and conduct of our work and we're
7 working hard, on an arena basis, with NRR and NMSS to define
8 goals and metrics. We're, also, having regular counterpart
9 meetings at all levels within the office and working very
10 closely on products, such as GALL, which affect regulatory
11 outcomes. We want to urge the program offices to seek our
12 input on licensing decisions, where complex issues or our
13 work can be brought to bear, and we've worked closely with
14 NRR, in that regard, on the Electro-sleeve issue.

15 We, also, -- one of our key objective is ensuring
16 the quality and timeliness of our work, as well as the tie
17 to agency goals. We have a research effectiveness review
18 board, that you're aware of, and we're working hard in an
19 interactive way with the office directors, to ensure the
20 effectiveness of our program. We, also, have a pilot
21 program going on, where we actually link our operating plans
22 with NMSS and NRR, putting reciprocal milestones in each
23 other's operating plan, so that we can track from a
24 management perspective. As Ernie said, we've improved the
25 focus of a generic safety issue process and we're, also,

1 trying to improve the communications with regions, to make
2 sure that we understand more directly the needs of their
3 programs for information.

4 We, also, want to involve the research staff in a
5 two-way dialogue, to facilitate cultural change within the
6 office. The staff has been actively involved in the self-
7 assessment process in the prioritization, as well as in the
8 development of the vision statement. And one true benefit
9 that we've seen in going to an outcome-based budget has been
10 the improved integration among the disciplines. As both
11 Mike and Tom touched on, we need to bring various
12 disciplines to bear and they need to understand the
13 relationship of the disciplines and how the schedules will
14 impact the outcomes of our work.

15 Turning to slide 22, we we've conducted our self-
16 assessment, our dialogue with external stakeholders has
17 indicated that some people don't understand the value of our
18 research program. And we want to make sure that we're
19 looking for opportunities for meaningful direct interaction
20 with our stakeholders, to ensure a better understanding of
21 our program. For example, during the last year, we've had
22 29 workshops, expert panels, dialogues on the work that we
23 have going on, and we think this is extremely important for
24 shaping our work. We, also, have regular office level
25 meetings with DOE and EPRI.

1 Now, a couple of objectives that we want to
2 achieve in interacting with our external stakeholders, we
3 want to be more proactive in defining our research needs and
4 our MOUs with the Department of Energy and EPRI will help us
5 in that regard. We, also, want to work more closely with
6 universities and our foreign colleagues and industries, to
7 identify not only the emerging safety issues, but, also, the
8 emerging technologies and how industry plans to use them and
9 on what time frame. I participated in a meeting in November
10 at Penn State, where brought together utility executives and
11 DOE and EPRI, to focus on future research needs. It was
12 amazing to me what a good agreement there was on the topics
13 of future research needs.

14 We, also, want to communicate and optimize
15 coordination and minimize duplication. We're initiating
16 regular program coordination meetings with EPRI. We believe
17 that, although the two organizations have different roles,
18 it will be very helpful for us to understand their programs
19 and how they impact on ours.

20 Mike Mayfield is our agency codes and standards
21 executive, following John Craig in that position, and
22 they've both been working hard to see how codes and
23 standards can help our efficiency and effectiveness in the
24 agency.

25 We, also, want to more clearly communicate our

1 research results to our external stakeholders. Our water
2 reactor safety meeting was redirected to focus on issue and
3 outcomes and to bring together different perspectives, so
4 that we could identify what the differing needs were for
5 research. We've, also, made significant improvements to our
6 Web page. We've documented all of our activities on the Web
7 page, in terms of outcomes, so that anyone who goes to the
8 Web page can understand the context in which our work is
9 being performed.

10 Let me turn on page 23, slide 23, to challenges
11 for the future. There will be many challenges that have to
12 do with the aging of plants, the economic pressures, and the
13 storage of waste. We'll, also, face challenges that have to
14 do with implementing new technology and the need for more
15 realistic regulatory approaches. On this slide, I've
16 attempted to highlight a couple of the challenges that we
17 feel are going to be of great concern to us.

18 Current plants are operating with a mix of
19 technologies, some that's over 25 years old. And as I
20 alluded to in my previous remarks, we've got to be prepared
21 for obsolescence, to approve alternative components, to
22 allow utilities to use off-the-shelf software. And we can
23 learn a lot from our foreign partners; the French, with
24 their advanced control rooms. We need to learn what lessons
25 we can from our foreign partners.

1 Infrastructure is a major concern for us. U.S.
2 experimental facilities, over the last three years, have
3 been increasingly closing. This presents a problem, not
4 only from the perspective of obtaining important data, but,
5 also, as training facilities for the talent that we need for
6 the future. And that dovetails with the next bullet that
7 I've listed: competitive market exists for replacement of
8 nuclear skills knowledge, and this is not only for the NRC,
9 but for the industry as a whole. There was a study that was
10 conducted by the American Society for Engineering and
11 Education and supported by DOE, that indicated over the next
12 several years, there are only going to be -- five times more
13 nuclear engineers were going to be needed than were planning
14 to be graduated from universities. So, this is a severe
15 problem.

16 One thing that we are trying to do to address this
17 problem is directing our developmental resources more
18 towards the universities, because a key for universities is
19 having interesting work that attracts key talent to come
20 into the program. And we're trying to structure our
21 program, so that we can be a help in that effort.

22 Also, the U.S. influence in the world nuclear
23 research agenda has declined in key areas. Tom King has
24 been participating in a NEA and CSIS study, that tries to
25 identify where the declining infrastructure and talent is

1 going to impact the world agenda and trying to put together
2 some recommendations, like international centers of
3 expertise, as well as shared databases, so that information
4 exchanges is easier.

5 But, influence is not just for influence sake.
6 It's very important that we maintain this influence, because
7 people participate with us in our research programs, because
8 we have something to contribute, that we have meaningful
9 contributions. It's, also, important for us that we be able
10 to leverage our resources and that we actually are able to
11 influence the world agenda, to make sure that the work that
12 we need is the work that's being worked on; and, also,
13 emphasizing the role of public confidence. If there's a
14 general agreement worldwide on what's important, it can be
15 very important to the public in reenforcing their
16 confidence.

17 So, in summary, I just wanted to reenforce that we
18 are very aware of the Commission's interest of our need to
19 tie our research activities to goals and become outcome
20 oriented. We've taken some initial steps, but there's more
21 to do in that regard. We, also, believe that we have an
22 important role in maintaining a center of technical
23 expertise in many areas. The important role here is
24 leveraging expertise from our domestic and international
25 partners. We feel that this is really a vital connection to

1 the world. And as Ashok emphasized, it's more important
2 than ever to remember that it takes a long time to conduct
3 the research and we're currently reaping benefits from past
4 research that we've conducted. But, if we don't invest in
5 the future now, that information will not be available when
6 we need it in the future. And one thing we can be sure of
7 is that additional challenges remain.

8 MR. THADANI: Thank you, very much. We are ready
9 for questions.

10 CHAIRMAN MESERUE: I'd like to thank you all for a
11 very informative and helpful briefing. I'd like to ask a
12 question about the very last subject area, that Margaret had
13 mentioned and as Ashok had said at the beginning, that there
14 are a large number of areas where past NRC research has
15 proven to be enormously important in our current activities
16 and I think no doubt in ways that were not anticipated at
17 the time that the research was conducted. And it seems to
18 me that one of the great challenges for you is -- as you've
19 indicated, is to try to sort out what things you should be
20 doing now that are over the horizon and to determine how to
21 allocate, prioritize among the variety of things on the
22 menu.

23 You've listed a number things on slide 20 that you
24 see as important issues for the future. And I'd be
25 interested as to your thoughts about how you would

1 internally prioritize among those various elements; whether
2 you think you're putting enough effort into them; what kind
3 of a process you go through to try to determine the menu of
4 things that you should be doing now, to lay the foundations
5 for the future.

6 MR. THADANI: Let me give you my thoughts and
7 encourage others, as well, to join in. We've briefly
8 touched on the process we use for prioritization. We've
9 gone to what I would call a more top-down approach last
10 year, than we had done in the past. I think this will allow
11 us an opportunity to better focus on what sort of these
12 longer term challenges would be.

13 The prioritization scheme that we have today, I
14 think, is somewhat limited, in that it looks at what the
15 overall impact on safety might be from an issue. It looks
16 at potential number of licensees or plants that could be
17 impacted. It looks at timeliness. It looks at -- and
18 emphasizes areas where we have requests from either NRR or
19 NMSS and so on.

20 What I believe we need to do is to take it a step
21 further, which we haven't done as yet. In order to take
22 this a step further, we have to get together with the
23 industry and other stakeholders first. This is an area, as
24 I said, we, as an office, need to improve upon. We have not
25 done as well.

1 Industry, by and large, is the most knowledgeable
2 organization about its future needs and demands. We
3 recognize that with deregulation, there's going to be a
4 desire to use new technology, smart sensors, things of that
5 sort. We need to do more with the industry, to identify
6 those areas, so we can fold them into our scheme to
7 prioritize, to say where should we be focusing our
8 resources. Similarly, we need to do more with the
9 Department of Energy. Bill Magrit has offered us an
10 opportunity to make sure that -- he's certainly supportive -
11 - we are working with him, to see what the Department of
12 Energy is looking at, in terms of future role of nuclear
13 power, types of designs that may be pursued.

14 It's an area where we need to do more and we --
15 the best way it seems to me would be for us to get an
16 understanding of what the expectations are. There's a
17 little bit of a constraint in the way we -- we do have a bit
18 of a constraint, in that it's hard for us to take our
19 resources and say we will spend any of those resources on
20 things like new generation designs, for example, because we
21 have a lot on our plates right now. And so, there is some
22 boundaries that are sometimes difficult to penetrate for us.

23 On the other hand, if one were to take a step back
24 look, it may be appropriate to put some resources in these
25 areas, because, as we've said, sometimes you don't

1 anticipate what the benefits are going to be for some
2 involvement. Clearly, if there are issues like that, we
3 have to be sensitive in terms of how much resources we'll
4 put into those areas. But, I'd certainly like for others to
5 chime in. Margaret?

6 MS. FEDERLINE: No, I have nothing.

7 CHAIRMAN MESERUE: We've indicated that this is an
8 area where you need to do some more, to think about how you
9 look at these future areas. Is there anything that the
10 Commission can do that would help in that?

11 MR. THADANI: I think -- yes, indeed, I think the
12 Commission could in some areas. It would be -- it would be
13 very helpful, certainly for the office, if the Commission
14 were to indicate its views, in terms of whether the agency
15 should be getting involved in activities of the nature I
16 described. We -- I am somewhat resistant -- resistant is
17 not the right word -- sensitive, because we are a hundred
18 percent peer recovery agency, we do need to be careful about
19 where we spend our resources. So, there's a tendency on my
20 part to not support areas that I think are not going to
21 directly benefit the -- in terms of safety or costs, the
22 industry. And there are some areas like that, which I
23 personally believe we should be involved in, but it's
24 difficult for me to support. It seems to me it would be
25 helpful if the Commission were to indicate its views in

1 areas of that nature.

2 CHAIRMAN MESERUE: Good. Commissioner Dicus?

3 COMMISSIONER DICUS: Okay. Thank you, Mr.

4 Chairman. I'm going to follow a bit on the Chairman's
5 questions regarding prioritization of research, etc. And
6 taking it in the direction that you do get feedback from
7 ACNW, as well as ACRS, they provide their point of view on
8 prioritization and their insights on what -- where they
9 think research should go, let me ask the general question -
10 - and this may be somewhat unfair, because this a brand new
11 document. It's dated two days ago, which you may not have
12 had the opportunity to review very much. But, do you find
13 that input from advisory committees to be useful, to be
14 helpful?

15 MR. THADANI: The plain and simple answer is yes.
16 I really commend -- I commend the ACRS. Grant Wallace and
17 other staff -- other ACRS members, I think, have done
18 considerable thinking of the role and value of research, and
19 I don't know of any other organization that has looked at us
20 as thoroughly as the advisory committee -- the two advisory
21 committees have. I have read the report -- the draft. By
22 and large, I think it's an exceptional document. It seems
23 to highlight areas and issues of significance, brings to --
24 brings those issues to the attention of the Commission, as
25 well as the AEOD and others.

1 I agree with much of what they say in that report.
2 Their fundamental message, it seems to me, is not much
3 different than the message from Center for Strategic and
4 International Studies. There's deep reservation about the
5 direction. And I think it's important that they provide
6 that perspective.

7 In terms of the areas that they have identified, I
8 don't disagree with them. We have some -- maybe in detail,
9 we might disagree on an issue here and there; but, in terms
10 of direction of areas and so on, it seems to me that the
11 report is very well focused.

12 COMMISSIONER DICUS: Okay. If I could, I'd like
13 to go into a second area very quickly. And I recognize it's
14 somewhat sensitive, but some concerns have been raised about
15 the staff's PRA understandings and capabilities, relative to
16 the industry's, and I know that's one of the areas of
17 research that you're involved in. And I wonder if you would
18 like to comment on that.

19 MR. THADANI: Let me ask Tom. He's closest. And
20 then, I'd be happy to jump in.

21 MR. KING: I'm aware of the concerns you're
22 talking about. I think, clearly, there are truly world
23 class PRA experts on the staff, both in NRR and in research,
24 and I think they can pretty much address any difficult PRA
25 questions or issues that come down the road.

1 I think the real issue is getting the day-to-day
2 activities risk informed and the day-to-day staff to start
3 thinking in a risk-informed mentality, and I think we've got
4 some additional training, some education, some buy-in to
5 accomplish. One of the things we want to put together is a
6 -- call it a communications plan, but it will have an
7 element of training and discussion and so forth in there, to
8 try to bring the bulk of the staff along. That will be, you
9 know, the research staff, the NRR staff. It will probably
10 involve maybe regional folks, as well. That's one of the
11 things we're going to be talking about in this risk-informed
12 implementation plan document that we hope to get you a first
13 version of the end of this month.

14 So, I think there is some -- you know, some work
15 to be done to deal with the issue that was raised by ACRS,
16 but I think, you know, we do have the right people that can
17 deal with any issue. If we do get into a situation where we
18 need to call upon experts, we've got them on the staff.

19 COMMISSIONER MERRIFIELD: Just a refinement, I
20 think the quote was that we were outgunned; this agency was
21 outgunned. Would you disagree with that conclusion, that
22 we're outgunned by industry?

23 MR. KING: Yeah, I would disagree with that.

24 MR. THADANI: I do think -- if I may just add, I
25 think in a broader sense, if you look down the road and if

1 this infrastructure is going to be changed in a very
2 significant way to make it risk-informed, I do think it's a
3 very big issue, as a country, do we have enough of the right
4 resources, not just for us as are regulatory agency, but for
5 others, as well. I think that's -- that deserves attention
6 from all quarters.

7 COMMISSIONER DICUS: Thank you.

8 CHAIRMAN MESERUE: Commissioner Diaz?

9 COMMISSIONER DIAZ: Let's see, let me just start
10 with a couple of comments, since I just spent a little bit
11 of time in doing research. And I think we all know that
12 research is always between hard and rock place -- a rock and
13 a hard place. And, you know, it's almost like doing a tight
14 rope, high-wire balancing act, because everybody that is
15 producing something that is on the line always can justify
16 what they do. Well, research has that extra responsibility
17 of justifying what is the usefulness of what they are going
18 to do, that will result in years afterwards. And we
19 appreciate the fact that this needs to be balanced and it
20 has to be a balance between present day and day after
21 tomorrow and next year, and that is something that is very
22 important to do. And I know that you are in the processes
23 or realigning, you know, your resources, to take care of
24 both areas, which both needs to be taken care of.

25 Having said that, I am going to say back to you

1 some of the things you just say; I'm just going to say it in
2 my own words. It is obvious that research has specific
3 responsibilities for making sure that realistic technical
4 scenarios are used for the analysis of safety and for
5 establishing regulatory requirements, to make sure that that
6 safety is taking place. That essentially puts almost a
7 shall, not a should, but a shall, that research must have
8 state-of-the-art know how, okay, that maybe transcends what
9 the normal staff should have. You have a -- shall have or
10 should have a repository of technical competence that
11 exceeds the day-to-day issues, and that's part of your main
12 contribution to this agency, is the ability to address
13 something that just came out or the ability to foresee what
14 is going to come out. That's a major issue.

15 But, I want to emphasize, and it was used by you,
16 the word "realistic," and that's something that keeps
17 comments about. This demand for technical competence, okay,
18 is an everyday issue; but, it's more important for research
19 than anybody else and it transcends everything you do. I am
20 pleased to hear that we now are going to allow spent fuel to
21 be a spent fuel and not be new fuel, and that's certainly
22 nice. However, you know, I am concerned that it took so
23 long for us to recognize that it was spent fuel. And in
24 that sense, I think you have a responsibility to identify
25 any other issues where super conservatism has been

1 established and just being carried out year and after year
2 just because it's there. And it is time that you use your
3 technical expertise to sort out these issues, in a manner
4 that serves this country, serves this Commission, serves the
5 issue of safety.

6 Now, let me focus on the area of thermo-
7 hydraulics, and I know you made an attempt to cover some of
8 these areas in here, especially page, I think, 16 and 17.
9 However, I'd like to say that, you know, when we
10 specifically asked to have thermo-hydraulics covered, I had
11 a different view of what really, you know, would be the
12 emphasis.

13 In 1996, research proposed a five-year thermo-
14 hydraulic plan; that it was approved in, I think, it was
15 June of 1997. It was a major resource undertaking, okay,
16 which have very clear, you know, specification from the
17 Commission. And it just requires that we come up with a new
18 architecture, you know, that will actually do away with, you
19 know, the -- they say that it's very time consuming. It
20 requires that we have a very competent staff in-house that
21 will be able to do with these issues. It will be able to
22 address and merge issues. It will be able to look at things
23 that are in the future.

24 And I'm still not satisfied that we are not
25 seeing, you know, what the Commission asked, put in terms of

1 where we are. If I read this, it looks like now we're going
2 to be a year late in getting these codes where they should
3 be. That's the way I read it. So, my question on thermo-
4 hydraulics is: there is an SRM, there are requirements for
5 the Commission, and many times we forget what those are. I
6 want to emphasize that I can see the thermo-hydraulics the
7 most important single, you know, technical area of -- that
8 impacts on everything that we do on safety. There will be
9 radiological consequences if the thermo-hydraulics are right
10 in 90 percent of the cases. So, it is a prime area, okay,
11 in which the agency needs to have updated, you know, stuff.
12 And I am concerned that we are not hearing where exactly we
13 are.

14 Have we met our requirements in this area? Have
15 everything that needs to be done has been done? Have the
16 two-phase flows been taken -- each has been taken care of or
17 will be taken care of in the year 2002, not 2003? Where are
18 we? Are we now satisfied that those elements of that plan
19 have progressed according to the Commission requirements?

20 MR. ROSSI: Let me address that. With respect to
21 the code consolidation portion of this, we believe we are on
22 track, according to the plan. And as you indicated, it
23 started in June of 1997. As part of the code consolidation
24 effort, the TRAC-P has been modernized and the coding
25 language has been updated and it's been made into a more

1 modular design. In fiscal year 2000, we will have completed
2 the consolidation of TRAC-B -- TRAC-B and the three-D
3 neutronics capability of the Ramona code. And by the end of
4 fiscal year 2000, the assessment of TRAC-M -- that's the one
5 that we're consolidating TRAC-P, Ramona, and TRAC-B into --
6 that assessment of TRAC-M will be completed.

7 COMMISSIONER DIAZ: When will it be useful -- I'm
8 sorry, when will you be able to put it to use? When will it
9 be used? Not when it be consolidated, not when you change
10 things, when will it be used?

11 MR. ROSSI: I believe as we're going along, and we
12 do have Faruq El Tavala here, if you want to get into the
13 details of exactly the use of them, my understanding is that
14 as we're consolidating them, we are maintaining either the
15 ones we're consolidating into the other one for use or we
16 can use portions of the new one. It's now year 2000, so
17 we're approaching three years out of the five-year plan.

18 COMMISSIONER DIAZ: Four years, sir; four years.

19 MR. ROSSI: FY97 --

20 COMMISSIONER DIAZ: It's June of '97.

21 MR. ROSSI: June of '97, '98 --

22 COMMISSIONER DIAZ: It is four years.

23 MR. ROSSI: -- '99 -- it's '97 -- June of '97 --
24 '98 --

25 COMMISSIONER DIAZ: I'm sorry.

1 MR. ROSSI: -- '99 and 2000, so it's three years.

2 COMMISSIONER DIAZ: It's three years.

3 MR. ROSSI: Yes, 60 percent are through. And so,
4 we do believe that in the code area, we're on track. The
5 degree to which we can use something that's consolidated, I
6 don't have that information here right now.

7 COMMISSIONER DIAZ: Will you be able to use it at
8 the end of the five years?

9 MR. ROSSI: We believe we will be able to use the
10 consolidated code at the end of the five years.

11 Now, in the area of some of the tests information
12 that we wanted to collect and improve the models, there, we,
13 indeed, are somewhat behind, because of the resources that
14 we had to do the work on the five-year plan were not the
15 ones that we originally said that we needed. And we've,
16 also, had some staff leave and we have recently hired two
17 new thermo-hydraulics people to replace those staff. So,
18 with respect to the model improvements, we had hoped to
19 complete the tests and start using the data to improve the
20 models during the five years. But, because of the resource
21 limitations, the program is being stretched to cover a
22 longer period and we expect to finish some of the tests by
23 the end of FY2000 and all the separate effect tests by 2003.

24 So, your concern is right in the area of some of
25 tests to support the model development; but, in terms of

1 where we are in consolidating the codes, we believe we're on
2 track --

3 COMMISSIONER DIAZ: I don't --

4 MR. ROSSI: -- at this time.

5 COMMISSIONER DIAZ: I don't remember that we cut
6 resources. It was a contract issue of -- my memory might
7 fail me, it was \$5.7 million to consolidate the codes. We
8 allocated a series of resources. And, again, I'm concerned,
9 you know, that we might not be providing the checks on a
10 Commission-established requirement that says this is going
11 to be done. The -- I mean, one of the key issues -- one of
12 the key underlying issues in the thermo-hydraulics was the
13 fact that we were going to have the capabilities, in the
14 staff, to determine which way to go. I hear now that there
15 is some problems with the staff. I don't --

16 MR. ROSSI: Well, we did have some problems with
17 the staff members and we have recently hired two people that
18 do have experience in the area to offset losses.

19 COMMISSIONER DIAZ: Let me tell you where I'm
20 going now. Research every place always have, you know, an
21 issue of credibility. That credibility always comes on
22 extending the time to complete something and always is
23 addressing the issue of whether resources were right or not.
24 I do believe that we established a series of resources. We
25 established a plan. And in this most important area

1 regarding, you know, safety, especially of reactors, you
2 know, that the accountability for this is basic to the
3 credibility of research, from my perspective. There is a
4 series of requirements. There is money allocated. There
5 has to be a plan and there has to be, you know, a schedule,
6 and we need to be able to live up to that.

7 MR. THADANI: Commissioner, first of all, I
8 completely agree with you, that thermo-hydraulics is the
9 core of safety and we need -- we need to recognize that, and
10 we do. Second, I would say this is a well managed program,
11 as a matter of fact. We have had some challenges, Ernie
12 talked about them; two in particular. One, there's been
13 some adjustment on resources for a variety of reasons.
14 There's been some adjustment. Probably the more important
15 challenge we faced was when we lost two very key people.
16 These people are in great demand. They have tremendous
17 talent. They both left for, I'm sure, a variety of reasons,
18 but one of which was higher salary. I talked to each one of
19 the two before they left, to try and understand. And by and
20 large, that was one of the factors that caused them to
21 leave. In one case, there was some personal issues.

22 Now, we are monitoring this program, as you well
23 know, and we identify, when we go to our budget process, if
24 there is going to be an impact, what that impact would be
25 for reductions. And there have been some reductions in

1 resources. On the positive side, we said we're catching up;
2 we're making up for some of the impacts. As Ernie said,
3 we've now got, I think, enough in-house resource to make
4 sure we don't lose too much ground.

5 But, I will tell you, I believe this is a well
6 managed program. It really is.

7 COMMISSIONER DIAZ: I am not arguing about how
8 well managed it is. Is it - is it managed to Commission
9 requirements is what my -- is my question.

10 MR. THADANI: It's managed to the schedules that
11 we've identified; and if there is an adjustment to be made,
12 we will identify that.

13 COMMISSIONER DIAZ: Okay, thank you.

14 CHAIRMAN MESERUE: Commissioner McGaffigan?

15 COMMISSIONER MCGAFFIGAN: Let me try to put in
16 some perspective the big issue you started with, which is
17 resources, and ask a question or two. Clearly, we've been a
18 resource constrain agency, as a whole, recently, and
19 research has been constrained, as well, and probably more
20 so. But, the EC and the Commission faces these choices
21 between additional research and making sure license renewal
22 goes well. We handle license transfers, as well; that we're
23 on top of waste issue, etc. And we, perhaps, artificially
24 constrain ourselves, but we constrain ourselves to some sort
25 of top line. This year it was about 3.7 percent increase,

1 which was basically salary. So, there was no growth in the
2 agency in the budget we just submitted.

3 And then, we face these tradeoffs about research,
4 and research, as you say, tends to lose. You know, compared
5 to -- we don't get questions when we go up to Capitol Hill
6 about how well we're doing on research. We hear the
7 questions about license renewal, license transfers, the new
8 oversight process, etc., etc., to which you contribute and
9 have contributed in the past.

10 My question goes back to history. Maybe somebody
11 in the audience -- maybe Ashok will know. Part of our new
12 budget we've just submitted is that 10 percent of the
13 budget, for fairness and equity reasons, will, over the next
14 five years, if Congress approves, get off the fee base. But
15 when we did the original report back in '93, I believe,
16 under Chairman Selin, to the Congress, we did not identify
17 research as a fairness and an equity category. We had
18 agreements states and we had international programs and we
19 had -- you know, the six -- the big six or whatever programs
20 that we identify each year to Congress that really do
21 clearly raise fairness and equity issues. But, research is
22 sort of a public good and, you know, you can say the group -
23 - the industry benefits from your program and perhaps it's
24 fair. But, has any thought ever been given or was there any
25 internal argument in the agency back in the '93-94 time

1 frame, as to whether this, also, should have been identified
2 as a fairness and equity category, where the public, because
3 this is a public good, should be paying for it out of the
4 general fund, rather than taxing licensees?

5 MR. THADANI: I don't know the answer.?

6 COMMISSIONER MCGAFFIGAN: Well, if Jesse is going
7 to comment, this came up out in the CSIS report. John
8 Ahearne did berate us, publicly and privately, about the
9 research program. But, he said, why the heck isn't this
10 stuff off the fee base, and I didn't have an answer. And
11 so, it will be interesting to hear.

12 MR. FUNCHES: I think if you go back just before
13 the hundred percent, we were hard to get like 33 and 45
14 percent of the budget from fees and during those times,
15 research -- most of the research was not being collected as
16 part of the fees. And when they increased it to hundred
17 percent, what they did was the concept was to look at
18 everything you were doing to carry out a program for, say,
19 reactors, whatever. When we looked at the fairness and
20 equity issues back in the -- I guess the early '90s, we were
21 looking at the question of whether -- for what purpose was
22 the work being performed and whether or not those people are
23 then required to pay fees for the purpose for which the work
24 was done. We did not address the issue of public good.

25 The question of public good, I think, came up

1 during the first fee rule, in terms of -- one of the
2 comments came back relative to the question of whether the
3 public good here for the nuclear industry was any different
4 than it was for the coal industry, in terms of the
5 regulatory oversight. But, the intent of that study was not
6 to look at the question of whether the activity that the
7 agency would perform was a public good, say, similar to
8 defense or some other public good, in an economic sense. We
9 did look at the issue in a narrow way, when we looked at the
10 non-profit education; but, we did not address that issue.

11 COMMISSIONER MCGAFFIGAN: We may well be
12 constrained by definitions and statute and whatever. But, I
13 think this was big idea that's been out there. The ACRS has
14 talked to me about it. John Ahearne has talked to me about
15 it. And it may sound to Congress that -- they may gag at
16 our 10 percent of the fee base, may not; that putting
17 another 10 percent off the fee base someday, because
18 research really should be not funded that way. We may sound
19 like, you know, we're two-timing them or whatever.

20 But, I think, at some point, the only way
21 research, given the pressures I see -- when you look
22 forward, the operational pressures on this agency are not
23 going to let up. We're going to have more license renewals.
24 We're going to have license transfers. There's going to be
25 more industry restructuring. Yes, we may get more effective

1 and efficient and save some resources in NMSS or NRR. I
2 don't want to bank on that; we might. But, the pressure
3 will be there on research eternally, unless the top line
4 gets changed or unless research somehow gets treated
5 differently in the process.

6 That said, let me just mention the Chairman's --
7 you know, the question to Ashok about priorities on
8 anticipatory research or longer term research. On the page
9 20 chart, I see real differences between some of those, you
10 know, like, you know, digital instrumentation and control is
11 shorter term; mixed oxide fuel, we're going to have an
12 application from DOE shortly. Those are things that are
13 anticipatory, but not very far anticipatory, and I imagine
14 significant resources need to go into dealing with them.
15 The new designs, and Margaret mentioned accelerated
16 transportation of waste. I think the DOE plan is a 100-
17 year plan there, and so we might get an application in the
18 22nd century. But, I would think that that would not be a
19 place where, at least in terms of short-term resources, we'd
20 be spending very much.

21 But, my final question -- I thank Commissioner
22 Dicus, I had not seen this ACRS draft report. I'm going to
23 sort of put the EDO on the spot a bit, because it suggests,
24 on page seven of this draft report, that perhaps the EDO
25 needs to be more involved in at least two of these tasks.

1 It says, "NRC needs effective agency-wide methods for
2 identifying, formulating, and expressing its needs for
3 additional information methods," etc., and the third one is
4 "evaluating the effectiveness of its research; redirecting
5 efforts, if appropriate, and determining whether the
6 resulting products adequately satisfy." And it says in here
7 that we recommend the EDO be more actively involved.

8 From talking to Dr. Wallace, he's raised the
9 issue, at least informally, as to whether you or somebody on
10 your staff should chair the Research Effectiveness Review
11 Board, as opposed to Ashok, given that it involves competing
12 views of different offices and whatever. If you haven't
13 looked at it, I won't ask you about --

14 DR. TRAVERS: I haven't read the report, but I was
15 privy to some of the discussions that indicated that this
16 recommendation may come out of it. So, I think it's a fair
17 one. In fact, I think some of what we've already done in
18 the rearrangement of the deputies and their involvement has
19 -- is speaking to that today. But, it's something we're
20 actively looking at and pursuing and I think you're going to
21 see quite a lot more involvement from our shop. We think
22 not only research and NRR and NMSS need to be the starting
23 point to these things, but we clearly play a role,
24 particularly when we're trying to make judgments between
25 competing priorities, as the offices see them in the various

1 arenas, that are primarily managed out of the offices.

2 COMMISSIONER MCGAFFIGAN: My sense is, and the
3 Chairman hasn't gone through one of these detailed budget
4 processes, we need better sense, when we're cutting our
5 research program, as to what the impact is somewhere else.
6 You know, if cutting sort of almost below the Commission
7 level funding for thermo-hydraulics is going to have an
8 impact on time lines or if cutting funding for high burnout
9 fuel is going to have an impact on something that's going to
10 need to be done in the quite foreseeable future, we need to
11 understand those impacts. I think we understand better the
12 impacts at the moment.

13 Sam can tell us, and he has since the NRR meeting
14 with me, if -- you know, here's where we stand on licensing
15 actions and here's how we're going to fix licensing actions
16 and here, if you cut resources, what the effect might be on
17 licensing actions or license transfers or license renewals.
18 And he can quantify that in a way that helps us relate to
19 it.

20 And at the moment, I've seen a lot of our comments
21 from research, SSDC, over the years, and they don't sing.
22 So, maybe you need a better writer; but, you, also, need to
23 somehow connect it to a program that -- you know, an outcome
24 that we're trying to get in one of our regulatory programs.

25 CHAIRMAN MESERUE: Do you want to comment?

1 MR. THADANI: Just a quick comment. The way we
2 work the budget process, we don't -- we don't allocate in
3 the Office of Research. We don't allocate any resources or
4 contingencies. And by very nature, when issues develop,
5 whether they're from NMSS or NRR, we do get requests and we
6 do recognize sometimes that those issues need quicker
7 attention.

8 What we have to do, then, is a number of things.
9 One option, of course, is to see what it is we're working
10 on; can we deobligate some resources -- if we have to do
11 that, that's not an efficient process; or can we delay some
12 work. I think this is an issue that is not well recognized,
13 I don't think, of the challenges we face because of these
14 lack of any contingency resources. We need to highlight
15 this a little bit better. And I think in the end, it may
16 address some of the concerns that have been raised here
17 today.

18 DR. TRAVERS: I think that's a common problem. I
19 agree that's a problem in research. But, that's true
20 throughout the agency and one of the things that PBPM model
21 is trying to -- at least I think it will be effective in
22 doing is establishing a process that gives us some insight
23 into making those decisions. We've been awfully good over
24 the years, in sort of slicing a little off of this program,
25 a little off of that program. We're getting very, very

1 close, in my view, to making hard decisions about programs,
2 perhaps some major programs, that may need to be cut, as we
3 face continuing fiscal constraints. But, I think PBPM puts
4 us in a good position to have a better insight against
5 agency outcomes that we're trying to achieve and I think
6 that's one of the major benefits for resource strategy.

7 COMMISSIONER MCGAFFIGAN: And my only comment
8 would be I think just as we, I think, said to Sam on -- you
9 know, he said he could adjust his schedules and he could --
10 it's the transparency of what gets dropped, in order to
11 accommodate a contingent need, that, you know, we -- I think
12 it may be transparent to the EC; it isn't always transparent
13 to the Commission and understanding that finding a mechanism
14 without inviting -- I don't want to be second guessing every
15 \$10,000 decision you make. But, significant changes in
16 schedule affecting outcomes, whether it's an NRR, an NMSS,
17 or research, would probably be useful for us to just
18 understand. We had to do this, because x, y, z, is clearly
19 more --

20 DR. TRAVERS: I think we ought to keep you
21 apprised. If we're not doing that well enough, we ought to.
22 But, the place for that sort of demonstration is in the
23 operating plan, investments that take place after the
24 decisions are made. But, we'll certainly strive to keep the
25 Commission informed.

1 CHAIRMAN MESERUE: Mr. Merrifield?

2 COMMISSIONER MERRIFIELD: Thank you, very much,
3 Mr. Chairman. A couple of comments I want to start off with
4 and then go into some questions, which follow along the line
5 of questions my fellow Commissions have already.

6 The first couple of comments: I want to say, you
7 know, I've had some very pleasant walk-arounds with Ashok,
8 particularly over in White Flint II, and I would say that I
9 had an opportunity to meet a number of employees in
10 research, who, I think, are very committed folks, who have
11 really demonstrated record of achievement, and I just want
12 to recognize that I think we've got a very good staff in
13 research. I didn't want to let that one go by.

14 Recently, I had the opportunity to speak at the
15 Water Reactor Safety meeting, and I -- the speech that I
16 gave there, I've gotten a lot of criticism -- I've gotten
17 some criticism for it. Some of the public -- from former
18 chairman, John Ahearne, in which I think many misunderstood
19 what I meant. In that speech, I focused on a notion that
20 one of the things that research needs to do better -- a
21 better job of is explaining why it is conducting various
22 levels of research and why that fits into the overall agency
23 goals and where we need to go. And I think part of the PBPM
24 process will help bring that out.

25 From my standpoint, it certainly only reflects my

1 views as a Commissioner, I think as we look at research
2 issues and as I evaluate decisions and budgetary issues, I
3 sort of look at what I would call a four-factor test. Does
4 the research make sense? Is it something that we ought to
5 be engaging in? Is it a value added product, not just a
6 make work project? Is it adequately justified? Can we
7 really go down on paper and explain what we're doing? And
8 as a related issue, is it defendable? And I think those are
9 the things that we all ought to think about, as we're going
10 through the program and understanding what's important for
11 us to be working on and things that are not as important for
12 us to be working on.

13 As far as questions, Chairman -- Commissioner
14 Dicus has already opened the door, relative to the ACRS
15 draft report. One of the things that they talked about was
16 the integration in communication with internal stakeholders.
17 Now, on page of that report -- I'm going to read just a
18 brief excerpt. The report states that the "line
19 organizations of NRC must have more stake in, appreciation
20 for, and confidence in research efforts. They must
21 understand and play a role in defining the return on
22 investment from products of research. Research in isolation
23 cannot realistically anticipate, justify, evaluate, and
24 prioritize its activities."

25 I think the implication from this is that the

1 integration between research and the other offices isn't
2 where it should be. I think that was along the lines of
3 what Commissioner McGaffigan, also, focused in on. What are
4 your further thoughts on that, as it relates to this
5 particular quote?

6 MR. THADANI: I think, first of all, we need to do
7 better, there's no question about it, in terms of
8 integration, and we're working on that. Margaret actually
9 touched on some of the things we're doing. I want to assure
10 you that when we are starting research programs, we work
11 very hard, in the last year-and-a-half, to make sure we are
12 outcome oriented and not output oriented. We are not
13 interested in research for the sake of research. We want to
14 make sure that we are able to identify, not necessary to
15 everyone's satisfaction, the value of conducting certain
16 research. I mentioned earlier, we have a tool. We've used
17 a prioritization tool, which factors in a number of
18 elements. The tool needs -- it ought to be better. It's
19 perhaps a little bit narrow and focused, and we're going to
20 -- we're working on that and I hope we will come up with a
21 better way to go about it.

22 It is essential to -- for us to be well integrated
23 with NRR and NMSS and, to a certain extent, I think with the
24 field and the regions, as well. I -- as you know, I went to
25 the Office of Research after many years in NRR. One of the

1 things I pushed very hard was to make sure that the office
2 works on not just issues that have many years of effort
3 involved, but rather we should be involved in more day-to-
4 day efforts, as well. We initiated a number of activities
5 to do that and I think you're well familiar with the plant
6 oversight process, the various regulatory guides to support
7 license amendment reviews, and so on, developing criteria.

8 We need to know what's happening, to be able to
9 plan well for the future, and that means we've got to be
10 integrated. And I do admit we have some work to do in that
11 area.

12 COMMISSIONER MERRIFIELD: I appreciate that and I
13 know you're working very hard on that. I didn't want to --
14 I didn't want to let that one slip.

15 The EDO mentioned the issue of PBPM. When I
16 reviewed your revised slides, I was somewhat disappointed.
17 You had originally, in an earlier version, had a slide on
18 issues associated with the research self-assessment
19 associated with the implementation of the PBPM process.
20 And, obviously, there are time constraints and that may have
21 been one that fell off the table. But, one of the
22 challenges that surfaced during the most recent budget
23 process was how research goes about implementing PBPM and,
24 specifically, an ability to clearly link its research
25 initiatives with those strategic and performance goals,

1 getting that integrated as we follow up on. That, also, was
2 touched on in the ACRS draft report. And so, through that
3 PBPM process, how are you further enhancing those particular
4 goals?

5 MR. THADANI: Well, again, and I'll say a little
6 bit; but, then, I'd like for Margaret, also, to comment on
7 that. She's been very active in this area, personally.

8 We started out from, as I said, more of a top-
9 down approach last year, which had not been done in the
10 past. But, we laid out what are the agency -- what's called
11 for under strategic plan; what's called for under the
12 performance goals for the agency; and looking at those
13 performance goals, how can we most influence those goals.
14 We identified, as I said, the planned accomplishments and
15 then we said, okay, even within those accomplishment major
16 issues areas, what is go in to have the most impact. And
17 that's when you get down to the activity level. And we used
18 the kind of criteria that I talked about, to make sure that
19 these efforts, in fact, lead to either improvement in safety
20 or making sure they lead to maintaining safety, making
21 better decisions, that the technical basis is developed for
22 that.

23 Now, where it's harder to show, I think, is in
24 quantitative terms, as to how much will safety really
25 improve by. When Tom talked about we do reliability

1 studies, we look at operational experience, we need to
2 integrate that information and we need to not just do it for
3 ourselves. I think the public ought to know what we're
4 doing and they need to understand how this work helps the
5 agency understand the safety out there.

6 Now, I saw that -- when I read the draft report, I
7 saw that comment as an area where we need to talk some more
8 to the ACRS and, perhaps, directed more towards our
9 inability today to quantify. That's my view, but Margaret,
10 you have --

11 MS. FEDERLINE: Yes. Just let me add, having been
12 involved in the strategic planning process, one thing that
13 occurred to me after we had gone through it, and I think
14 ACRS recognized it in their report, the goals are at a very
15 high level. And I think the more transparency we can
16 introduce in this strategic plan, in terms of strategies and
17 metrics, to really key in on what is the contribution that
18 research makes to each of these goals, I think that will
19 help us be more definitive. I think, right now, we have
20 high-level goals and the strategies are somewhat rolled up,
21 so it's difficult to see, you know, exactly what the
22 research contribution is. But once there is more
23 transparency, I think we can more directly relate our goals
24 against -- our activities against those.

25 COMMISSIONER MERRIFIELD: I think that's a very

1 good point. I think transparency is very important.
2 Ultimately, in the end, the Chairman and the other
3 Commissioners are the ones who are going to have to defend
4 this budget in front of Congress. In an age of diminishing
5 resources, we've got to be able to do that, clearly and
6 articulately. And if we don't have the background from you
7 all to make that happen, we're not going to be successful in
8 formulating our agenda for pushing the collective view of
9 the Commission forward.

10 A quick comment and then one final question. The
11 comment is on burnup credit. You know, I personally think
12 this is an important issue, certainly would hope that you
13 would notify the Commission promptly if there are any
14 problems that you run into that are going to delay any key
15 future milestones.

16 On a separate issues, we haven't touched on this
17 today, is the issue of the competitive market for the
18 replacement of nuclear skills. And you mentioned how the
19 fact is that it is -- that market has changed dramatically
20 over the last few years. We have some key managers right
21 now handling some very high priority issues in this agency.
22 Do you have a development -- well, I presume you have a
23 development effort underway and if you could just touch on
24 it briefly, as to how you're going to deal with a successful
25 transition in the future, at the point where these key

1 managers leave us.

2 MR. THADANI: There are some things that we can
3 do. There others, as I said earlier, that it's a national
4 issue for future, in terms of having the right type of
5 capability. Some of the things we're doing are within the
6 constraints of FTE and so on, which we, of course, have to
7 be careful about, but what we're doing is to make sure that
8 in key technical areas where there are critical needs, that
9 we go out and try to get people today. We stay fairly close
10 with universities. We -- Margaret mentioned she was at Penn
11 State. I keep in touch with various people at the
12 universities, to see which of the people may be graduating,
13 their capabilities, and so on, and what our needs would be,
14 so we can maybe get ahead of the line, so to speak,
15 ourselves.

16 We, also, are doing our part in engaging
17 universities in some of the research that we do. A lot of
18 the model development work, our separated effects testing,
19 and so on, by and large, we try to go to universities,
20 because that's probably the most effective way to get
21 results, as well as that trains a lot of people. In the
22 long run, that would help us. We are currently -- we have
23 an activity underway, we're hoping by the end of March, to
24 have laid out a very explicit plan on what are strength is,
25 in some areas, and what sort of losses we might anticipate

1 in the Office of Research, and to target those people in
2 those areas, universities.

3 I have mentioned to you before about my concern.
4 It's a very serious concern about what's happening. As
5 we're losing declining resources, we've been forced to not
6 support a number of facilities -- experiment facilities.
7 Some of them have been shut down. I think there are some
8 that are at risk of being shut down in the near future.
9 I'll mention some: we have a group at University of
10 Maryland; we effort at Purdue University; we have effort
11 underway at Oregon State. I think some of these facilities
12 we may have difficulty maintaining, unless others come to
13 the table and share costs and so on. We're working on that.
14 We're trying -- as you heard, Tom is actively engaged with
15 other organizations, to see if they can't come and support
16 us.

17 But, it is -- it is a much broader issue, in my
18 view, for the nature, and Office of Research is a piece of
19 that here.

20 COMMISSIONER MERRIFIELD: Do you -- I'm sorry, do
21 you feel confident in your succession plans, at this point?

22 MR. THADANI: Do I have what?

23 COMMISSIONER MERRIFIELD: Do you feel confident in
24 your succession plan, at this point?

25 MR. THADANI: I would be more comfortable

1 answering that in April than today. We have a plan, but
2 I've asked for more information.

3 COMMISSIONER MERRIFIELD: Okay. We'll ask it
4 again in April.

5 MS. FEDERLINE: Commissioner, could I just add one
6 key point? One key point that I wanted to mention, in
7 tightly constrained times of FTEs, I think we need to look,
8 as an agency, how in critical areas, we can use over-hire
9 strategies, to bring people in at a lower level and give
10 them the necessary training that they need, so that when the
11 people leave the agency, there is that transition plan.

12 COMMISSIONER MERRIFIELD: Thank you, Mr. Chairman.

13 CHAIRMAN MESERUE: Well, we've come to the end of
14 our allotted time. I'd like to thank all of you for a very
15 informative and helpful briefing. The research component of
16 the agency really is a fundamental part. It's essential to
17 our long-term success, as well as of enormous help in the
18 short term. And, again, I'd like to appreciate -- express
19 my appreciation, on behalf of my colleagues, for the work
20 that you're doing.

21 Any other comments? If not --

22 COMMISSIONER DIAZ: I'm sorry, Mr. Chairman, it's
23 just something occurs to me that we never realized. There
24 is a fundamental difference between research in a regulatory
25 agency and research in a non-regulatory agency, and that

1 distinction, sometimes, is not clearly understood. The
2 clear difference is that research in a regulatory agency is
3 watched carefully by the industry and it could have impacts
4 on the industry long before the research is completed.

5 There is a very strong coupling. People realize
6 what's going on, just like when we start rulemaking. And
7 that -- this distinction is not clearly recognized and I
8 think it is a factor in what we select to do research, a
9 factor on what -- how credible it is. Because, it is
10 different in the Department of Defense, when it actually
11 looks at, say, anti-missile and there is no budget for it.
12 Here, there is somebody that is watching over you and is
13 feeling the impact of that research. This is a very
14 important concern.

15 Thank you, Mr. Chairman.

16 CHAIRMAN MESERUE: Good. With that, we stand
17 adjourned. Thank you.

18 [Whereupon, at 12:00 p.m., the briefing was
19 concluded.]

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CERTIFICATE

This is to certify that the attached description of a meeting of the U.S. Nuclear Regulatory Commission entitled:

TITLE OF MEETING: BRIEFING

OFFICE OF NUCLEAR REGULATORY RESEARCH

PLACE OF MEETING: Rockville, Maryland

DATE OF MEETING: Wednesday, February 9, 2000

was held as herein appears, is a true and accurate record of the meeting, and that this is the original transcript thereof taken stenographically by me, thereafter reduced to typewriting by me or under the direction of the court reporting company

Transcriber: Teresa Rowell

Reporter: Priscilla Hopchas



COMMISSION BRIEFING

OFFICE OF

NUCLEAR REGULATORY RESEARCH

FEBRUARY 9, 2000

AGENDA

- Role of RES
- Leveraging resources
- Current benefits of past research
- Planned Accomplishments and examples
- Future
- Summary

ELEMENTS OF RES ROLE

To achieve the mission, RES will:

- **Conduct research to improve the agency's knowledge**
- **Coordinate risk-informed, performance-based efforts**
- **Conduct systematic evaluations of regulatory requirements**
- **Conduct independent technical assessments**
- **Identify safety issues from research results, operating experience**
- **Perform anticipatory research**
- **Maintain an infrastructure of expertise, analytical tools, and data**

In performing its work RES will:

- **Ensure meaningful stakeholder participation**
- **Conduct work efficiently, including using leverage**

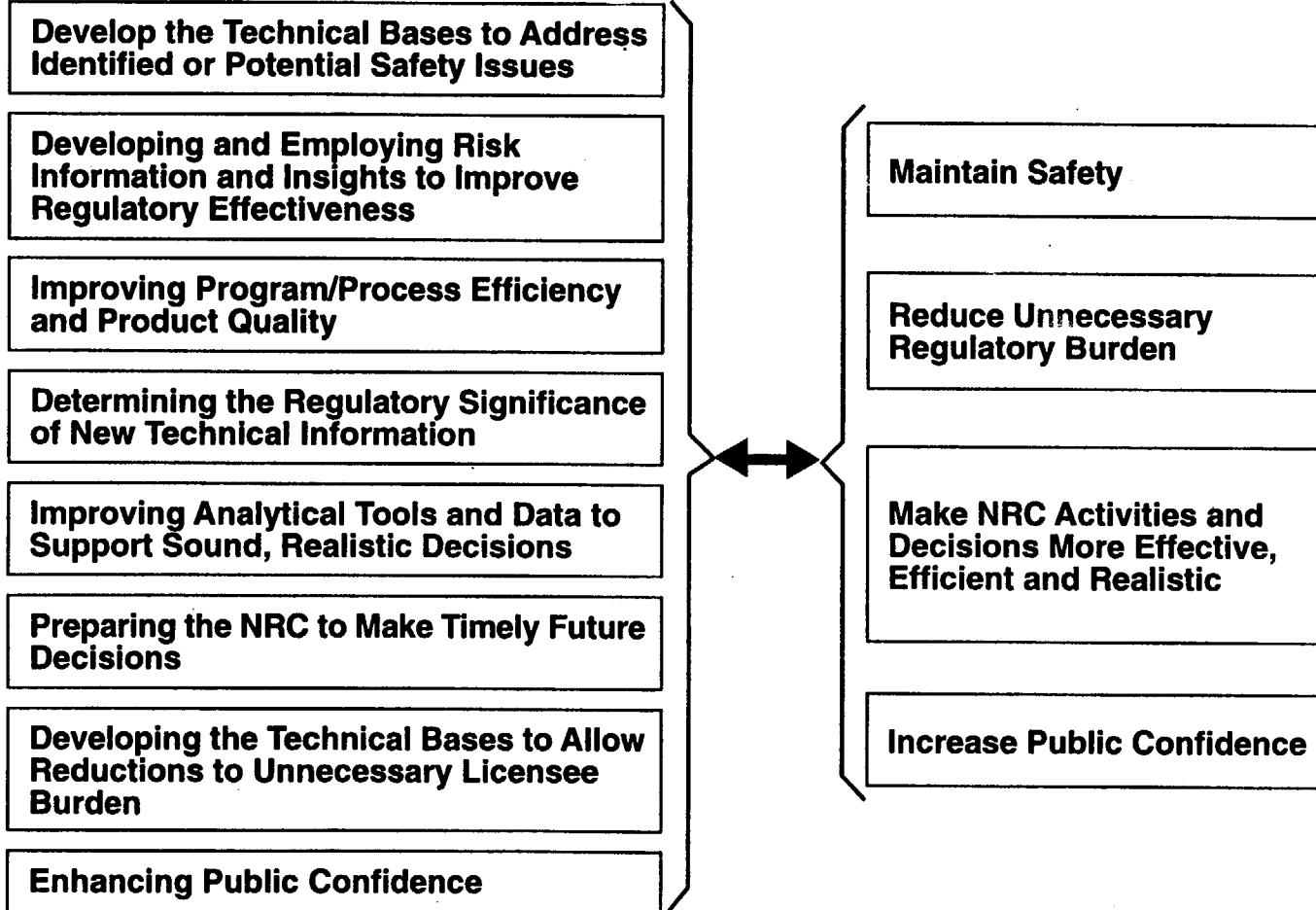
LEVERAGING NRC RESOURCES

- **Domestic agreements with 13 entities**
 - Electric Power Research Institute and Department of Energy participate in several programs
- **Bi-lateral or multi-lateral agreements with 29 countries**
- **For an NRC contribution of approximately \$4M, NRC receives a research benefit costing approximately \$60M**

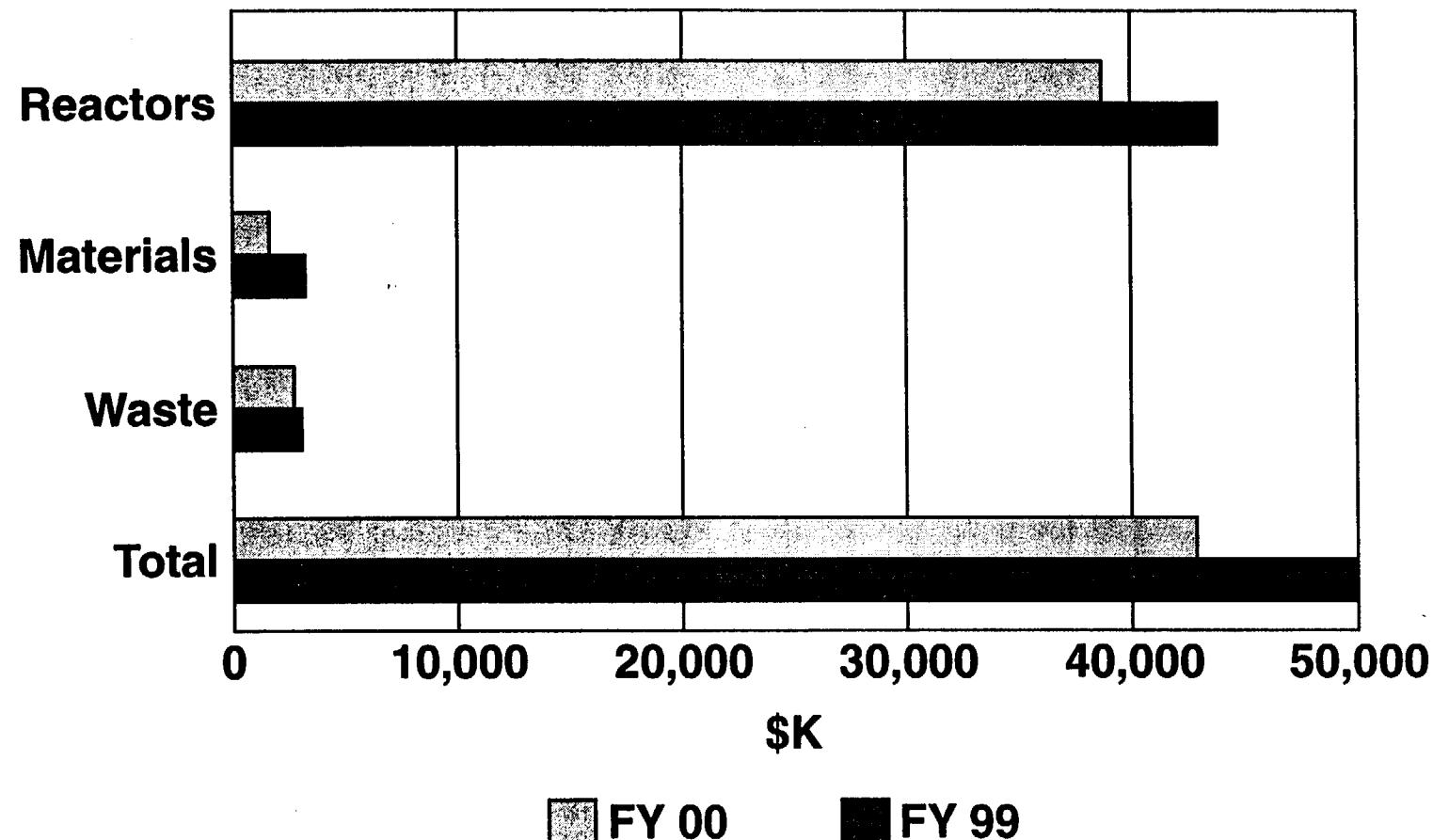
EXAMPLES OF CURRENT BENEFITS FROM PAST RESEARCH

- License Renewal**
- Risk Informed Activities**
- Decommissioning**
- Revised Source Term Rule**

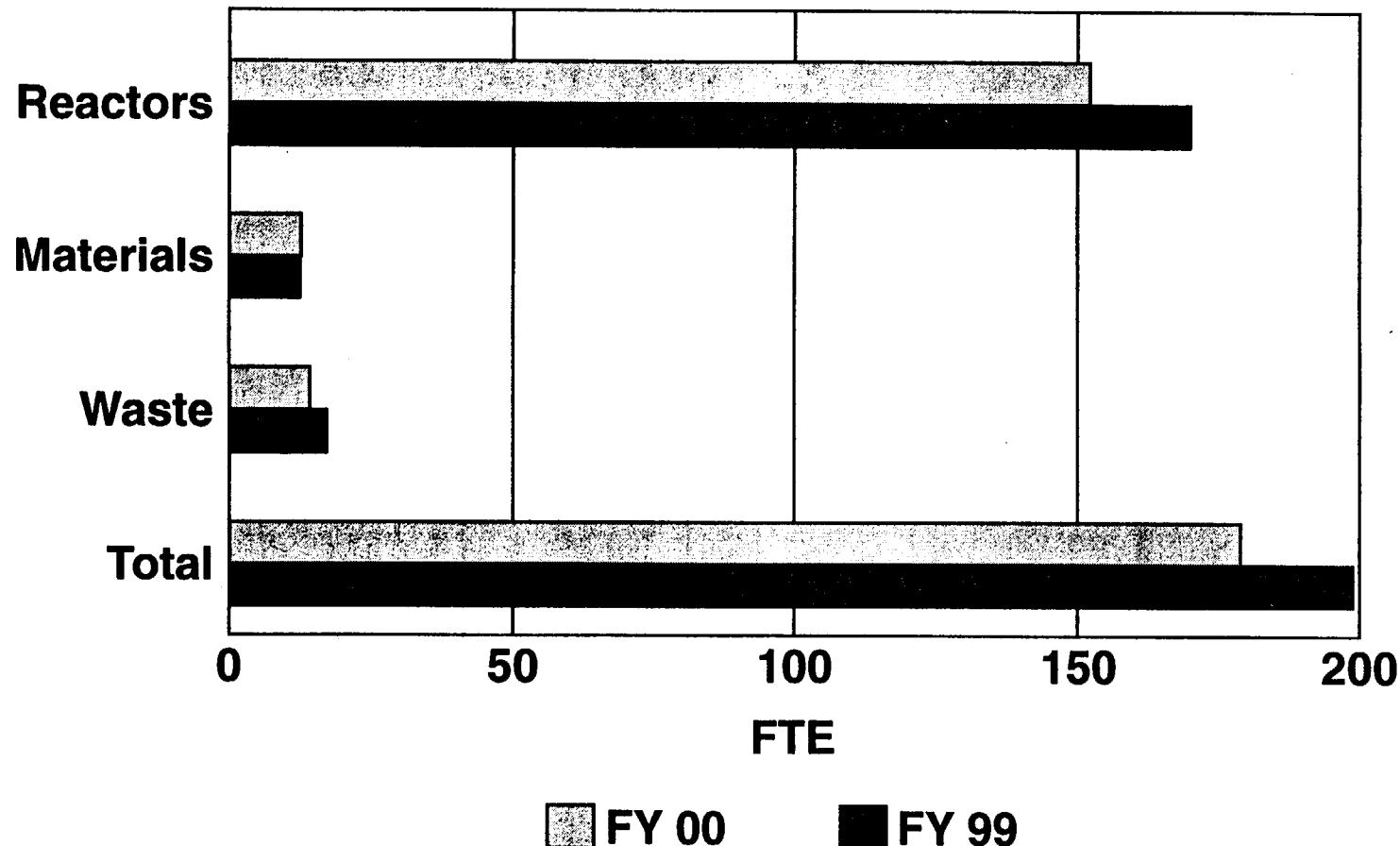
EIGHT PLANNED ACCOMPLISHMENTS ARE OUTCOME ORIENTED



RESOURCE TREND OVERVIEW - \$



RESOURCE TREND OVERVIEW - FTE



ASSURING THE INTEGRITY OF THE RPV

OUTCOME: Plants can increase operational flexibility and a few plants can have flexibility to consider license renewal through improved understanding of RPV issues

ACCOMPLISHMENTS: FY99

- PTS re-evaluation project
- Completed work with ASME on revision of basis for P-T limits

KEY FUTURE ACTIVITIES: FY00 FY01

- Complete development of technical bases for PTS re-evaluation
- Complete final draft of RG 1.99, Rev. 3 on Radiation Embrittlement

T/H program supports

LONG TERM STORAGE OF SPENT FUEL

OUTCOME: Realistic evaluation of spent-fuel storage systems and timely evaluation of dry cask storage renewal requests

ACCOMPLISHMENTS: FY99

- Initiated a cooperative program with EPRI and DOE
- Opened the Castor-V/21 steel cask loaded in 1985
- Performed a visual inspection of the cask seals, fuel assemblies, and fuel tubes

KEY FUTURE ACTIVITIES: FY00 FY01

- Remove 12 rods from one assembly to determine fuel integrity
- Perform a visual inspection of the VSC-17 concrete cask exterior
- Seek foreign and additional domestic participation
- Develop models for nuclide inventories and source characteristics

REALISTIC IMPACTS - RADIATION EXPOSURE

OUTCOME: Realistic decisions on decommissioning, clearance, and products and materials exempt from licensing, resulting in better safety focus and reduced cost

ACCOMPLISHMENTS: FY99

- Characterization of waste disposal costs
- Initiate BEIR VII - health effects, low level ionizing radiation
- Feasibility study of entombment as a decommissioning option

KEY FUTURE ACTIVITIES: FY00 FY01

- Technical basis for collective doses and costs for clearance rule
- Assessment of doses for exempt products and materials
- Completion of dose modeling for DandD and RESRAD codes

OPERATIONAL DATA ASSESSMENTS

OUTCOME: Important lessons of operating experience are learned. Operational experience can be used to evaluate the effectiveness of the regulatory framework.

ACCOMPLISHMENTS: FY99

- Evaluation of operating events
- Development of performance indicators
- Preparation of reports on reactor system reliability

KEY FUTURE ACTIVITIES: FY00 FY01

- Review of operating events and system reliability
- Development of risk-based performance indicators
- Maintain equipment reliability databases

RISK-INFORM REGULATIONS AND ACTIONS

OUTCOME: Regulations and regulatory actions will have a better safety focus. Will result in safety improvements and in lower costs

ACCOMPLISHMENTS: FY99

- SECY-98-300 on options for modifying Part 50 to be risk-informed
- Provided insights on risk-informed inspection program

KEY FUTURE ACTIVITIES: FY00 FY01

- Complete study of reactor technical requirements and develop bases for proposed changes
- Finalize RG on ISI, update RGs on TS, IST, QA
- Develop Agency plan for risk-informed activities

T/H program supports

MANAGING AND RESOLVING GSIs

OUTCOME: Important new risk-significant generic information is incorporated into the regulatory process

ACCOMPLISHMENTS: FY99

- One GSI was reprioritized based on updated information, and five GSIs were resolved with no new or revised requirements for licensees.
- A new Management Directive was developed to improve the efficiency, timeliness, and clarity of the Generic Issue process.

KEY FUTURE ACTIVITIES: FY00 FY01

- Three new reactor GSIs were identified for prioritization.

PROVIDING BURNUP CREDIT TO REDUCE REGULATORY BURDEN

OUTCOME: Potentially fewer casks needed for storage or transportation of spent fuel

ACCOMPLISHMENTS: FY99

- Interim Staff Guidance for assessment of residual BUC margins for actinides
- Finalize agreement with Belgonucleaire for integral test data

KEY FUTURE ACTIVITIES: FY00 FY01

- Assessment of residual BUC margins for fission products and 62 Gwd/MTU fuel
- Obtain fission product test data to validate codes used for BUC

BENEFITS TO NRC FROM T/H CODES

- **Independent capability to assess/audit vendor/licensee analyses**
 - Identified a problem with AP600 automatic depressurization system sizing
 - Aided review of AP600 test and analysis program
 - Identified problem with licensee analysis of Electro-sleeves
- **Assess operating events, support risk-informed regulation activities**
- **Respond to industry initiatives**
 - Power uprates, longer operating cycles, new fuel designs
- **Resolution of safety issues**
 - PTS, Boron dilution, ATWS, BWR stability

ANALYSIS INFRASTRUCTURE

ISSUE: Maintaining and Improving NRC Analysis Infrastructure in Thermal-Hydraulics, Fuel Behavior, and Severe Accidents

OUTCOMES: (1) Independent, more accurate codes to be used by the Agency to support regulatory decisions, including development of a risk-informed Part 50, (2) Assessment of high burnup fuel performance, and (3) Reduction in the cost of code maintenance

ACCOMPLISHMENTS: FY99

- Consolidated the Boiling Water Reactor, Pressurized Water Reactor, and 3-D neutronic capabilities into a single code: TRAC-M
- Developed the Graphical User Interface for RELAP5 Code
- Performed analyses to support assessment of steam generator tubes repaired by Electro-sleeving

ANALYSIS INFRASTRUCTURE (CONT)

KEY FUTURE ACTIVITIES: FY00 - FY03

- **T/H code**
 - In FY 2001, support two codes: TRAC-M and RELAP-5
 - In FY 2003, TRAC++ will replace existing suite of codes
 - In FY 2003, complete all major test programs
- **Fuel behavior code**
 - In FY 2001, complete peer review and release of improved FRAPTRAN code

ANALYSIS INFRASTRUCTURE (CONT)

KEY FUTURE ACTIVITIES: FY00 - FY03

- **Severe accident code**
 - Supporting two codes FY 2000: SCDAP/
RELAP5, MELCOR
 - In-house analyses for source term
implementation
 - In FY 2003, all capabilities merged into a single
code
 - In FY 2003, complete international experimental
study on lower head creep

EXAMPLES OF IMPORTANT ISSUES FOR THE FUTURE

- **High burnup fuel properties and failure criteria**
- **Digital instrumentation and control**
- **Plant aging**
- **Mixed oxide fuel**
- **Risk-informed power plant performance indicators**
- **Future waste technologies**
- **Economic deregulation**
- **New designs**

ENHANCED INTEGRATION WITH INTERNAL STAKEHOLDERS

- RES employees involved in vision statement, in self-assessment, to achieve culture change
- ACRS/ACNW reviews and communications
- Periodic office-level meetings with NRR and NMSS
- Quarterly Divisional counterpart meetings
- Program level review meetings
- Active participation of RES in licensing issues that involve new or complex technical issues
- Research Effectiveness Review Board
- Linking RES Operating Plan with NRR and NMSS
- Enhanced Regional communications

ENHANCED INTEGRATION WITH EXTERNAL STAKEHOLDERS

- Periodic open meetings of PRA Steering Committee - NRC and industry
- Public workshops
- Periodic office-level meetings with EPRI and DOE
- MOUs with EPRI and DOE
- Participation in university workshops
- Cooperative research with other Federal agencies
- Annual meeting with national laboratory Directors
- Participation in standard setting organizations and professional societies
- Annual Light Water Reactor Safety Meeting
 - NEI, EPRI, utilities, universities, foreign partners
- RES web page improved

CHALLENGES FOR THE FUTURE

- Current plants are operating with a mix of technologies, some developed over 25 years ago
- Infrastructure of US experimental facilities for assessing safety is declining
- Competitive market exists for replacement of nuclear skills and knowledge
- US influence in world nuclear research agenda has declined in key areas

SUMMARY

- **Research program is directly tied to NRC goals**
- **Research program is outcome oriented**
- **Research program is providing a center of technical expertise in many areas**
- **Today, NRC and industry are reaping the benefits of past research - we must ensure that forward-looking research will similarly prepare us for the future**
- **Additional challenges remain for the future**