

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

**Title: BRIEFING ON PRA IMPLEMENTATION PLAN -
PUBLIC MEETING**

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

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BRIEFING ON PRA IMPLEMENTATION PLAN

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PUBLIC MEETING

Nuclear Regulatory Commission
One White Flint North
Rockville, Maryland

Thursday, April 4, 1996

The Commission met in open session, pursuant to notice, at 10:05 a.m., Shirley A. Jackson, Chairman, presiding.

COMMISSIONERS PRESENT:

- SHIRLEY A. JACKSON, Chairman of the Commission
- KENNETH C. ROGERS, Commissioner
- GRETA J. DICUS, Commissioner

1 STAFF SEATED AT THE COMMISSION TABLE:

2 KENNETH HART, Technical Coordinator, Office of the
3 Secretary

4 STEPHEN BURNS, Associate General Counsel for
5 Hearings, Enforcement and Administration

6 PRESENTERS:

7 JAMES TAYLOR, EDO

8 DAVID MORRISON, Director, Office of NRR

9 ASHOK THADANI, Associate Director for Inspection
10 and Technical Assessment, NRR

11 GARY HOLAHAN, Director, Division of Systems Safety
12 and Analysis, NRR

13 CARL PAPERIELLO, Director, NMSS

14 EDWARD JORDAN, Director, AEOD

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P R O C E E D I N G S

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2 CHAIRMAN JACKSON: Good morning. I am pleased to
3 welcome members of the staff to brief the Commission on the
4 probabilistic risk assessment implementation plan. The plan
5 is intended to be a management tool to help ensure the
6 timely and integrated agency-wide use of PRA methods and
7 technologies in the agency's regulatory activities.

8 During recent years the use of PRAs in regulatory
9 activities has continued to increase. Recently the
10 Commission has tasked the staff to accelerate its efforts to
11 develop a standard review plan and regulatory guidance for
12 the industry and staff use in preparing and reviewing
13 requests based partially or totally on PRA insights.

14 I expect the staff to provide a discussion of this
15 effort, including its status as well as any anticipated
16 difficulties.

17 In addition, the Commission would like to hear
18 about the status and progress being made on activities
19 associated with industry initiatives, including quality
20 assurance, in-service inspection, in-service testing, and
21 technical specifications.

22 Also, we would be interested in the staff's
23 strategy or plan to integrate all of the diverse PRA
24 activities in a structure or framework that will ensure a
25 consistent and stable regulatory process. We would be

1 particularly interested in comments beyond the fact that we
2 know there is a coordinating group at the branch chief
3 level.

4 I and my fellow commissioners are pleased to hear
5 from you today. I understand that copies of the viewgraphs
6 are available at the entrances to the room.

7 Do any of my fellow commissioners have any opening
8 comments?

9 COMMISSIONER ROGERS: No, thank you.

10 COMMISSIONER DICUS: No, thank you.

11 CHAIRMAN JACKSON: Mr. Taylor, why don't you
12 proceed.

13 MR. TAYLOR: Good morning. As the Commission can
14 see, at the table I have a cross section of all the major
15 technical offices. Bill Russell was to be here. He may be
16 running a bit late. NRR is represented. I won't introduce
17 all these gentlemen, because I think you recognize them.

18 We provided a paper to the Commission on March 26,
19 and slides. This presentation will be in several parts.
20 The first part will be on reactor programs. That will be
21 given by Ashok Thadani.

22 MR. THADANI: Thank you, Jim. Good morning.

23 May I have the first viewgraph, please.

24 [Slide.]

25 MR. THADANI: I will go over some of the

1 background covering the last several months activities.

2 Gary Holahan is going to go through some of the
3 details of each element that is in the PRA implementation
4 plan, where we stand, and some of the significant issues
5 that have developed as part of the process that we have been
6 going through. He will also summarize what our next set of
7 activities is.

8 Next viewgraph, please.

9 [Slide.]

10 MR. THADANI: The PRA implementation plan was sent
11 to the Commission in March 1995. In April the staff briefed
12 the Commission on that implementation plan and associated
13 activities.

14 With Commission approval, in August 1995 the PRA
15 policy statement was published, which provided the
16 conceptual guidance on how far to proceed and what some of
17 the significant factors were that needed to be considered.

18 In November 1995 we responded to Commission
19 questions on the applicability of the process that was used
20 in the maintenance rule implementation, whether that process
21 could be applied in other categories. The staff's
22 conclusion was indeed that process could be applied in
23 several other applications.

24 Subsequent to that, in November of last year, the
25 staff provided its framework for applying probabilistic

1 techniques in regulatory activities. There were four parts
2 to this framework. Various regulatory applications which
3 could be grouped in different bins, so to speak.

4 These bins were screening type decisions where one
5 could go forward with fairly approximate studies.

6 The next category was risk ranking applications
7 where one would divide systems, structures and components
8 and high and low safety significance, what type of data
9 would be needed.

10 Finally, the third category was the one that would
11 require very detailed analyses. Examples were if one were
12 to modify technical specifications, particularly if one were
13 to delete certain things from requirements, one would have
14 to go through very extensive evaluations.

15 That was the first step, definition of different
16 types of applications.

17 The second step in the process was to make sure we
18 understood our regulatory requirements as far as that
19 application was considered, what deterministic assessments
20 had been done in the past, taking that into account and then
21 going forward with conducting probabilistic assessments, and
22 finally ending up with integrating both the probabilistic
23 studies as well as the deterministic evaluations that had
24 been done through some means, such as perhaps an expert
25 panel concept of integrating these ideas. That was

1 discussed in the framework paper that was issued in
2 November.

3 May I have viewgraph number four, please.

4 [Slide.]

5 MR. THADANI: As the Chairman noted, in November
6 you asked that we accelerate development of the regulatory
7 guides and standard review plans.

8 In response to that recommendation, the staff did
9 provide its plans and schedules for accelerating development
10 of the regulatory guides and the standard review plans. The
11 other element in that response was to identify that there
12 would in fact be close senior management attention to this
13 activity to make sure that we do end up with these products
14 on a timely basis.

15 Today's meeting is going to cover the elements
16 that are covered in the March 26 paper that we sent to the
17 Commission.

18 We will continue to provide quarterly updates to
19 the Commission as well as semi-annual briefings as asked for
20 by the Commission.

21 Viewgraph number five, please.

22 [Slide.]

23 MR. THADANI: As I said, the policy statement
24 provided what I would call a conceptual framework that was
25 to be utilized in developing the implementation plan. Key

1 pieces in the policy statement are described here.

2 That is, whatever applications where probabilistic
3 techniques are used, those techniques must in fact be
4 supported by appropriate methods as well as data.

5 The decision process should use probabilistic
6 techniques as complementing the deterministic assessments
7 that have already been done.

8 Finally, it was very important to make sure that
9 one pay close attention to the concept of defense-in-depth,
10 which I guess I will characterize as balance in design.
11 That is, there should in fact still be multiple layers of
12 protection so if one were to make a mistake in one area
13 there still are other layers of protection that are not
14 lost.

15 Another important element in the policy statement
16 is that at this time PRAs or such analyses are not
17 substitutes for meeting rules, regulations and requirements,
18 that those rules, regulations and requirements must be
19 adhered to until they are revised in a formal revision
20 process by the agency.

21 This issue has come up again as a result of some
22 information we have received. It was important to make sure
23 that all sectors of the agency knew that that is what the
24 policy statement had indicated. We have gone back to all
25 the regions and other folks at headquarters to reemphasize

1 this point.

2 Another guidance that was provided in the policy
3 statement was the staff in the application of probabilistic
4 techniques, if the criteria are based on safety goals or
5 subsidiary objectives of the safety goals, that they be
6 applied only in generic activities, generic decisions.

7 May I have the next viewgraph, please.

8 [Slide.]

9 MR. THADANI: The implementation plan, as I
10 indicated, does go beyond the policy statement and
11 identifies topics, schedules, responsible organizations.
12 Many of these activities in the implementation plan in fact
13 require joint office evaluations and development. I am very
14 happy to say that these interoffice activities are going
15 very well and there is very good cooperation as we go
16 forward trying to implement these activities.

17 As I said and as the Chairman said, the regulatory
18 guide and the standard review plan development had to be
19 accelerated. We have assigned a high priority. I do want
20 to recognize the effort that a lot of people are putting in
21 trying to make sure we meet those milestones.

22 In the backup viewgraphs, from viewgraph four
23 through eight, we have the names of staff from Office of
24 Research as well as NRR who are working together in
25 developing these regulatory guides and standard review

1 plans.

2 CHAIRMAN JACKSON: Maybe at the end of the meeting
3 you can put them up like credits at the end of a program. I
4 would like to see you do that.

5 MR. THADANI: I must say that there is lots of
6 enthusiasm. Things are going quite well. I am very
7 satisfied where we are today. The staff meets with the line
8 organizations regularly. As you noted, there is a
9 coordination committee consisting of branch chiefs from NRR,
10 Research, AEOD and NMSS who work with the staff. I meet
11 with the whole group once a month to get an idea of where we
12 are and what some of the issues might be and to provide
13 assistance as I can.

14 As I said, a lot of progress has been made.

15 During this period some significant issues have
16 come up. Gary is going to go through those, but I will give
17 you an example or two.

18 As I said, policy statements that use safety goals
19 for generic decisions. If we have to make plant-specific
20 decisions, should one utilize safety goals or subsidiary
21 objectives for plant-specific decisions? Should these
22 changes be risk neutral or could they lead to some small
23 increment in risk? If that is the case, what are the
24 criteria that say that increment is acceptable?

25 We are not at this stage asking for any decision

1 on these issues. We need to develop these issues further.
2 Then we expect to come to the Commission for guidance on how
3 to proceed on those issues.

4 Gary is going to cover many of these issues. I
5 just wanted to say that the pilot studies are also
6 progressing well. There is one pilot study that is not
7 going as well as we had hoped, which is in-service
8 inspection. It appears that that will be delayed. We can
9 discuss that as we go forward.

10 In order to accelerate development of the
11 regulatory guide and the standard review plan it was
12 important to go back and re-look at the whole implementation
13 plan. We have made certain adjustments in the
14 implementation plan. Some of those adjustments have been
15 delaying completion of some other activities. We will touch
16 on those.

17 As Mr. Taylor noted, this is not just an NRR and
18 Research activity. The standard review plan and reg guide
19 are essentially Research and NRR activities, but the
20 implementation plan has a whole range of activities that are
21 identified, and both AEOD and NMSS have a significant part
22 in terms of developing those activities further.

23 Gary is going to cover AEOD and NMSS activities
24 also in terms of where we are on accident sequence precursor
25 program, where we are on the data rule, and also in terms of

1 how PRA techniques are being used in addressing high-level
2 waste and low-level waste issues.

3 I did want to note that there is a considerable
4 international interest in this topic. The Committee of
5 Nuclear Regulatory Authorities, CNRA, did have a number of
6 countries participate in developing a report on regulatory
7 approaches to PSA in OECD member countries. That report is
8 complete. If you would like copies of this, we will make
9 these available.

10 CHAIRMAN JACKSON: Why don't you do that.

11 MR. THADANI: It turns out that most of the
12 Western European countries are applying these techniques to
13 their decision-making process at some level.

14 It was also clear at the last CNRA meeting that no
15 country really had any procedures and criteria for applying
16 these techniques in regulatory decisions. They had used
17 these techniques, but there were no procedures and criteria,
18 which is the same thing that you asked that we do quickly, a
19 regulatory guide and standard review plan. So there is a
20 group now under CNRA working on the same activity.

21 We are participating in that, and our
22 participation is sort of parallel to what we are doing in
23 developing our own reg guides and standard review plans. I
24 think during this participation we may learn some things we
25 may want to incorporate in what we are doing.

1 With that as background, Gary will go through the
2 plan itself.

3 MR. HOLAHAN: Slide number seven, please.

4 [Slide.]

5 MR. HOLAHAN: First I will discuss the revisions
6 to the implementation plan, then some of the accomplishments
7 to date and ongoing activities, and follow up and conclude
8 with actions that we are planning to take in the next six
9 months:

10 I would first like to mention that from the very
11 beginning the implementation plan was meant to be a living
12 document in the sense that we recognized that circumstances
13 would change, that new issues would arise, and that
14 priorities might change in such a way that revisions to the
15 plan would be necessary and in fact healthy. We are at one
16 of those stages now, but this is not a one-time change. I
17 expect to see other additions and revisions in the future.

18 The biggest change to take place recently is
19 focusing much of the attention on the development of
20 regulatory guides and standard review plans in the reactor
21 area. I will spend some time talking about those five
22 activities in some detail.

23 One of the implications of that focus has been to
24 put our pilot activities in the PRA area into a slightly
25 different context where they are now directly supporting the

1 development of guidance activities, but it has also caused
2 us to have to rearrange some priorities.

3 Where we had in the plan the consideration for
4 developing a standard review plan for construction and
5 design errors and some reevaluations of NUREG-1150, those
6 things have been deleted as low priority items. In
7 addition, an item has been deferred where we had planned to
8 address PRA issues for non-power reactors. Because of the
9 lower safety significance and also because of the state of
10 the art the methodologies don't really exist currently for
11 non-power reactors, we thought we would give that a lower
12 priority. That will be probably picked up in a time frame
13 after the development of the reg guides and the SRPs. That
14 will be revisited.

15 In addition to some prioritization changes, a few
16 new tasks have been added to the plan. I count
17 approximately 120 identifiable tasks in the implementation
18 plan at this stage.

19 The new ones are associated with some inspection
20 activities where we think it is important to take PRA
21 insights and get them into the inspection program, into the
22 field offices so that our inspection activities are more
23 risk focused. That is being done in part in preparation for
24 the inspections of the maintenance rule, which will begin
25 after the rule implementation in July of this year. And

1 also some new guidance on the inspection of design changes
2 at reactors.

3 In addition to the other training activities that
4 have taken place over the last few years, there is some
5 activity now to develop PRA training focused on inspectors
6 and what use inspectors can make of PRA and risk insights.

7 Slide number eight.

8 [Slide.]

9 MR. HOLAHAN: In terms of accomplishments to date,
10 I think there has been substantial progress made on the
11 regulatory guides and standard review plans. In each case
12 the scope of activities has been set out in detailed outline
13 of what those documents will be like.

14 There has been a considerable amount of discussion
15 both within the staff and between the staff and industry on
16 the role of the pilot applications and how those will be
17 used in developing the regulatory guides and the SRPs.

18 I think it is worth mentioning at this stage that
19 probably every time in the paper and virtually every time in
20 the slides you will see regulatory guide and SRP mentioned
21 together, because they are really not being treated
22 separately.

23 The way those are being written and the way even
24 the teams are being structured, one group of people is
25 developing both the regulatory guide, which is really

1 guidance to the industry as to what the NRC expects, and the
2 standard review plan, which is guidance to the staff as to
3 how to review industry applications. Those are being done
4 together by the same group of people.

5 There has been some progress on the PRA methods
6 development. I will mention a few examples a little later.

7 In terms of the IPEs, the examination for severe
8 accident vulnerability goes back to 1988. I think we have
9 made substantial progress on that. Submittals have been
10 made by all licensees. We are well along on the reviews.
11 Forty-five of the 75 reviews have been completed, meaning
12 safety evaluation reports that have been written by the
13 staff back to the licensees. Any additional ones will be
14 completed this summer.

15 I think we had originally planned on completing
16 them by June. A number of those are being re-reviewed
17 because of some difficulties. I think the main area the
18 staff had problems with some of the IPEs had to do with the
19 treatment of human reliability in the analysis. That is a
20 very difficult area. We think some of the IPEs were not up
21 to the standards that we expected. There is an additional
22 review effort to get those completed.

23 In addition, I will mention the common cause
24 failure database developed by AEOD, which I think is an
25 important step forward. Common cause failures are a very

1 important element of PRAs. The most likely mechanism for
2 losing redundant equipment is to have some hidden common
3 cause failure. I think the study that has been done is an
4 advancement to the state of the art and it will be folded
5 into both the regulatory guide and the standard review plan.

6 There have also been recent studies on high
7 pressure coolant injection on boiling water reactors and
8 emergency diesel generators.

9 Slide number nine, please.

10 [Slide.]

11 MR. HOLAHAN: Since the last Commission briefing
12 the 1984 accident sequence precursor report has been issued.
13 Those analyses were completed.

14 CHAIRMAN JACKSON: You mean 1994. You said 1984.

15 MR. HOLAHAN: Excuse me. In fact, 1982 and 1983
16 were also completed, but I believe 1984 was done in about
17 1986.

18 There has also been publication of the proposed
19 reliability data rule which would support the risk-informed
20 regulation.

21 There have been a substantial number of
22 improvements in the training programs and I think a
23 substantial increase in the number of individuals taking
24 those courses.

25 In the materials area performance assessment,

1 which I think I would describe as PRA-related methodology,
2 there has been some progress in that area, particularly in
3 some demonstration projects in the high-level waste area.

4 Slide number 10.

5 [Slide.]

6 MR. HOLAHAN: With respect to the standard review
7 plans and the regulatory guides, I would like to give some
8 details as to where the staff is in that arena.

9 First, we really have two types of activities
10 going on. One is the development of a general regulatory
11 guide and standard review plan which will establish general
12 scope and quality guidance and expectations, which would
13 really apply to all applications.

14 I think it is important to have that, because in
15 addition to the application-specific regulatory guides, the
16 four examples that we are dealing with now, we expect in the
17 future there will be a fifth and a sixth and at some point
18 there may be many others. When the general guidance is in
19 place, that will be helpful in allowing us to make a fifth
20 regulatory guide and a sixth, and I think it will establish
21 the expectations for all future issues.

22 With respect to application-specific regulatory
23 guides and standard review plans, we are working on four at
24 the moment: in-service testing, in-service inspection,
25 graded quality assurance, and technical specifications.

1 In each case there is a team in place. Each team
2 has an action plan with schedules and milestones, and in
3 each case they have at least a draft outline of the
4 regulatory guide and standard review plan which really
5 establishes the scope and organization of what is to be
6 accomplished. In some of the cases we are even a little
7 further along than that.

8 With respect to these issues, there have been
9 numerous meetings with the ACRS and numerous meetings with
10 the industry. Most of the industry meetings have been in
11 the context of the pilot applications and how they fit into
12 these activities.

13 One thing I think is worth mentioning -- Mr.
14 Thadani mentioned it early -- is that the one item on this
15 list that is not consistent with the schedule that we had
16 originally laid out is the in-service inspection activity.

17 We still think it's possible to meet the final
18 schedule for the regulatory guide and standard review plan
19 at the end of 1997. The other case is to be done about a
20 year ahead of time, that is, at the end of this year. That
21 is not possible in this area because of some delays in the
22 industry submittals.

23 I think that is not such a serious blow to the
24 program. As Mr. Thadani mentioned, we are really developing
25 guidance to cover three types of applications, screening

1 analysis, risk ranking, and detailed analyses. The
2 in-service inspection activities is one of a number of
3 examples of risk ranking type application. Even if the
4 in-service inspection activity is delayed or in fact if it
5 was not done on this schedule, I don't think it would have a
6 major impact on our development of the general guidance
7 activities, because in many ways it is a similar activity to
8 the in-service testing. The methodologies involved will be
9 tested pretty well in the in-service testing area and also
10 in the graded QA area.

11 As I mentioned, we expect by the end of this year
12 to be well along with the draft guidance and have the final
13 ones in place at the end of 1997.

14 Slide number 11, please.

15 [Slide.]

16 MR. HOLAHAN: I think slide number 11 is pretty
17 well covered except to say that in the graded QA area I
18 think there has been a little more progress and there is
19 actually a preliminary draft of a regulatory guide in
20 addition to what I would call a detailed outline in most of
21 the other cases.

22 Slide number 12.

23 [Slide.]

24 MR. HOLAHAN: With respect to the pilot
25 applications, in the motor operated valve area, which is

1 related also to in-service testing since in-service testing
2 covers pumps and valves, we also dealt with a specific piece
3 of valve testing, which was really follow up to a testing
4 program that the NRC put in place with Generic Letter 89-10,
5 which was to address valve performance under in-service
6 conditions. In other words, with the pressures and flows
7 from actual accident conditions.

8 The Boiling Water Reactor Owners' Group had
9 proposed a PRA-related technique for establishing priority
10 among valve testing, which valves should be tested more
11 often and which could be somewhat delayed. The staff
12 reviewed that application and in fact issued a safety
13 evaluation report agreeing with their approach in February
14 of this year.

15 The in-service testing program is a much broader
16 issue. We have two pilot plants at the moment, Palo Verde
17 and Comanche Peak. I think those reviews are progressing
18 well. There has been a request for additional information.
19 There have been a number of meetings and site visits.

20 In addition, the industry documents in this area
21 are under review and the staff has provided comments. I
22 think what is happening is industry standards are being
23 developed in parallel with the NRC guidance.

24 In several of these areas it is not entirely clear
25 how the format of the regulatory guides will end up. In

1 some cases, where there is a well established and acceptable
2 industry standard, the staff would reference that standard
3 as in large part an acceptable way of addressing in-service
4 testing. In other areas it may be that an industry guidance
5 document would play a minor role or perhaps no role at all,
6 or the staff might endorse an industry guidance document in
7 part to be supplemented with some other considerations that
8 the staff felt were important.

9 Exactly how the industry standards and the staff
10 guidance fit together is part of this developmental process,
11 but in each case I think there is substantial industry
12 activity going on. Exactly how that ends up remains to be
13 seen.

14 CHAIRMAN JACKSON: I am going to come back to that
15 one.

16 MR. HOLAHAN: Slide number 13, please.

17 [Slide.]

18 MR. HOLAHAN: In the in-service inspection area
19 there have been a number of meetings with the industry;
20 there have been a number of discussions as to what were
21 suitable pilot plants. Because the industry had been
22 developing more than one ISI technique, we wanted to make
23 sure that we were testing those approaches.

24 We also wanted to make sure that we were
25 addressing both boiling water reactors and pressurized water

1 reactors. So we have come up with a collection of pilot
2 plants, including ANO-2, which is a Combustion Engineering
3 plant, Fitzpatrick, which is a boiling water reactor, and
4 Surry, which is a Westinghouse designed plant. We are
5 expecting some industry documents by June of this year.
6 That really is a part of the critical path of getting the
7 draft document done by early in 1997. We will be watching
8 that schedule closely.

9 In the graded QA area, the staff has ongoing
10 discussions with three utilities, South Texas, Palo Verde
11 and Grand Gulf. There have been numerous site visits and
12 discussions. I think that is progressing.

13 This is a risk ranking type application in the
14 sense of deciding which equipment is more important than
15 other equipment and therefore should be given more detailed
16 attention. One is there has to be a strong approach for
17 having confidence that you have really identified the
18 important equipment when you are separating it from the less
19 important equipment.

20 One of the features of a graded QA approach that
21 the staff is enthusiastic about is that there may be
22 important pieces of equipment in the plant which a risk
23 analysis would identify which have not traditionally been
24 treated as safety-related equipment in the sense that they
25 are not design-basis accident mitigation equipment. It

1 could very well be that an additional standby pump or some
2 other equipment might play an important role in risk even
3 though it doesn't happen to fit into the deterministic
4 design basis of the plant.

5 A graded QA approach which uses risk insights to
6 identify that equipment and to give it additional attention
7 that it wasn't getting before is an important advancement.
8 One of the things that needs to be worked out is if there is
9 what is called non-safety-related equipment which also turns
10 out to be important, what do you do with that? What kind of
11 QA is appropriate for that equipment? It doesn't fit into
12 the traditional QA programs, and so whether it fits in the
13 same category as other important safety-related equipment or
14 whether we should give it some special focused attention is
15 part of what needs to be worked out in this activity.

16 MR. THADANI: Gary, let me add to that. I think
17 there are two issues. The first issue is exactly what Gary
18 described. Appendix B applies to safety-related component
19 systems and structures. We all know that there are
20 so-called non-safety-related components that have a
21 significant impact on risk.

22 If we go forward with the approach of risk ranking
23 and we have two categories, let's say high safety
24 significance and low safety significance, there is no doubt
25 in my mind that some of the structures and components that

1 rise up to high safety significance would be non-safety-
2 related components. If the industry has two different QA
3 approaches, then those non-safety-related components clearly
4 would have to get higher attention than they were getting
5 before.

6 The more difficult issue, I think, is going to be
7 things that fall into the low safety significance category.
8 It is very clear that the criterion which the industry would
9 prefer is, if there is failure, then we would take
10 corrective action, that you don't need to do a lot more,
11 because these components are not that significant.

12 Our view is that no matter what, for each failure
13 one should be able to do a thorough root cause and
14 corrective action plan. In order to do a thorough root
15 cause and corrective action plan one needs to have a certain
16 amount of information available on that component.

17 The second element we want to make sure of is, if
18 a component fails, even if it is not safety significant in
19 itself, there may be similar components within the plant and
20 other systems that one needs to keep such information, know
21 where these components are located, what systems, and so on.
22 What that means is, even for the so-called non-safety
23 significant component certain information has to be kept so
24 that one can in fact achieve what I would call key analyses
25 that could have a significant impact on risk.

1 As part of this review that is going on now that
2 is part of the debate: where is the industry going and what
3 do we think about that?

4 At this point, it seems to me for some
5 applications we seem to be coming together, but we will wait
6 and be sure what happens.

7 MR. TAYLOR: I'm not in the group doing this
8 review, but I think even the industry through the years in
9 terms of potential risk significance has recognized systems
10 such as air systems where air in some parts of the plant is
11 fairly mundane but used in operation of certain safety or
12 very important valves and stuff in the plant.

13 That sort of recognition always gets to be
14 important. It doesn't mean you have to procure that
15 equipment or all of the requirements of Appendix B, but it
16 raises the status of that equipment, particularly the
17 ability to supply air and a continuing supply. We have seen
18 this, of course, and then we have seen utilities look at air
19 systems and say, gee, do I have sufficient capability?
20 Because you are always having trouble with compressors; they
21 are out of service, and so forth. I've seen some plants
22 decide they will buy a backup diesel, sort of on a cart type
23 diesel compressor for air service.

24 This is a sort of a fertile area where you use the
25 risk potential to take a deeper look. It doesn't

1 necessarily mean rebuilding the system, but giving a lot
2 more attention to it.

3 MR. HOLAHAN: In the area of the maintenance rule,
4 there were nine pilot site visits done in order to determine
5 that the implementation approach to the maintenance rule was
6 viable and working well. That activity was completed and
7 there was a workshop conducted last summer on the subject.

8 In addition, there is some inspection type
9 training going on because there will be a baseline
10 inspection basically covering all plants and their
11 maintenance rule implementation.

12 In addition, the use of risk insights in the
13 maintenance rule occurs in three different areas. One of
14 them has to do with identifying more or less
15 safety-significant equipment. As we go along, I think we
16 are learning more about how to do that. We feel that it is
17 important that the industry is learning along with us.

18 In the implementation of the maintenance rule, a
19 key part of that implementation is done by an expert panel
20 which takes both deterministic engineering insights and risk
21 insights and combines those to come up with a list of more
22 or less risk-significant, safety-significant systems for the
23 maintenance rule. So the expert panel plays an important
24 role in that.

25 One of the areas that we think may need additional

1 clarification is that it is probably an enhanced role of the
2 expert panel in the sense that as we learn more about what a
3 good quality PRA really means, those questions and those
4 issues really ought to be on the minds of the expert panel
5 as they are deciding what is an important system to be given
6 specific treatment in the maintenance rule.

7 Slide number 14.

8 [Slide.]

9 CHAIRMAN JACKSON: I'm going to ask you to talk a
10 little faster.

11 MR. HOLAHAN: Maybe I will say fewer things.

12 CHAIRMAN JACKSON: No. You can increase the
13 speed, not decrease the volume.

14 MR. HOLAHAN: The last pilot application is the
15 technical specifications. The CE Owners' Group has given us
16 a request for extension of allowable outage time of
17 equipment. We are also dealing with the South Texas project
18 on two systems, on the service water system and on emergency
19 diesel generators.

20 What we appear to be converging on is what we are
21 now calling a 3-tiered approach, which is specific
22 limitations on when a piece of equipment can be out of
23 service based on risk insights, and also using risk insights
24 to decide what other equipment would be particularly
25 important during that outage period of time and putting

1 specific controls on that other equipment.

2 A simple example. If a plant has two diesel
3 generators and one is out of service, you really need to
4 make sure that the other diesel generator is given special
5 attention in that period of time.

6 The third piece of this 3-tiered approach is
7 also very important. If a piece of equipment is going to be
8 out of service for some extended period of time -- we have
9 seen applications for 14-day outages or 21-day outages --
10 other things can occur during that period of time, and
11 sometimes they could either be driven by equipment failures
12 that need to be dealt with or there may be just planned
13 activities.

14 We are saying the third tier in this approach
15 would be a risk management approach based on what the
16 maintenance rule already calls upon for licensees to look
17 at, the impact of taking equipment out of service, and give
18 special attention to taking equipment out of service or
19 finding equipment out of service while they are in an
20 allowable outage time, because that may complicate a
21 situation also.

22 We are working out that process.

23 Slide 15, please.

24 [Slide.]

25 MR. HOLAHAN: In the methods development area,

1 there have been two notable items in the reactor area, both
2 related to developments for treating errors of commission.
3 This is a difficult subject. Traditionally it has been much
4 easier to put probabilities on reactor operators failing to
5 take the proper action, but it is much more difficult to
6 have a technique which says, in addition to that, what else
7 could they do wrong? This has been an issue that has been
8 recognized ever since the reactor safety study in the
9 mid-1970s, and I think there is some significant progress
10 being made in that area.

11 Number 16, please.

12 [Slide.]

13 MR. HOLAHAN: With respect to the individual plant
14 examinations and the examinations for external events, I
15 think there has been good progress. As I mentioned earlier,
16 45 safety evaluations have been written, with the rest to be
17 completed by September.

18 There is also a preliminary insights report. I
19 think that is important for looking at the overall industry
20 and identifying what issues are important in addition to the
21 IPE program, which was really intended to find any
22 plant-specific vulnerabilities. But it is an excellent
23 opportunity for learning broadly what areas are important.

24 In the IPSEE program, the NRC's request came
25 afterwards. So we are still in the process of receiving

1 submittals from the industry. Five of our reviews are
2 completed; an additional 20 are under review and will be
3 completed within the next several months.

4 The staff is working on a plan to complete the
5 additional 49 or 50 IPEEEs but to try to do it in a way
6 that focuses on just the most important issues.

7 Because of resource considerations, although we
8 spent a lot of resources on the first five and will do a
9 pretty in-depth review on the initial submittals, we think
10 we can learn from the first few submittals and focus our
11 attention on those items that are most important to be more
12 efficient in the remaining ones. There is a Commission
13 paper due in the near future which will lay out our approach
14 for accomplishing that.

15 MR. THADANI: There are a number of issues in the
16 past that we have said we don't believe we need to take any
17 action, that these issues would be addressed as part of
18 IPEEE. So the review process we are going to go into is to
19 take out all the areas where we have said we were going to
20 rely on the IPEEE evaluations and lay out those issues, go
21 back, take a look at the IPEEEs, review them so that we can
22 make sure we can make decisions on those specific regulatory
23 issues. So the review is going to be driven by decisions
24 that we need to be making on those issues.

25 MR. HOLAHAN: Slide number 17, please.

1 [Slide.]

2 MR. HOLAHAN: The draft of the reliability data
3 rule was published for comment. The comment period ends
4 this summer.

5 A regulatory guide will be completed this month.

6 We expect as part of the rulemaking process for
7 there to be a public workshop and comments, and we are
8 targeting the end of this year for putting that rule in
9 place.

10 Number 18, please.

11 [Slide.]

12 MR. HOLAHAN: The accident sequence precursor
13 program is a program to look at actual operating events,
14 actual reactor events, and to use probabilistic risk
15 assessment techniques to identify the most significant of
16 those events and also what about those events was really
17 important. That program calculates a conditional
18 probability of core damage given the event that did occur,
19 how many more things, how much worse would it have had to be
20 in order to have gone to core damage. In that sense, it is
21 a measure of how much margin was left, how close we came to
22 a core damaging event.

23 The report for the 1994 events was published in
24 December.

25 In addition, the program, which has gone on for

1 many years, had a gap in it. It had not previously been
2 funded to cover the years 1982 and 1983. There was a
3 feeling that there was sort of incompleteness to the
4 program, that there might be some insights in those years,
5 and also it would be helpful in your ability to make any
6 judgments about trending; it was important to fill in those
7 gaps. Those analyses have been completed.

8 An accelerated program is in place now, so that
9 rather than waiting for all of the events of the year and
10 trying to deal with them all at once, they are being dealt
11 with in AEOD on an event by event basis. So not only are
12 the 1995 analyses being done on an event by event basis, but
13 in fact some of the 1996 events are also being started.
14 There will still be a compilation report. I guess in the
15 AEOD annual report there will still be an annual
16 compilation, but there would be more of an event by event
17 analysis available to the staff and the industry to see what
18 is important.

19 Slide number 19, please.

20 [Slide.]

21 MR. HOLAHAN: AEOD also has a number of other
22 initiatives related to using risk techniques in reviewing
23 operating experience.

24 There is a general plan to increase that activity.
25 Common cause database is something that I mentioned earlier

1 and I think is an important advancement.

2 There are also a series of safety system
3 performance studies which are basically equipment
4 reliability studies that give good insights across a number
5 of reactors and also across a period of time. That is
6 dealing with high pressure cooling injection, emergency
7 diesel generators, isolation condensers, a number of
8 important safety systems on boiling water reactors and
9 pressurized water reactors.

10 One important element of this program. Not only
11 does it help identify important equipment or trends in
12 equipment reliability, it can be used as a building block
13 for inspection program, focusing inspection activities on
14 equipment that has either been shown to be degrading or less
15 reliable than other equipment, or in fact focusing on a
16 particular plant or set of plants that might be out of line
17 with its peers.

18 This is an important check where the staff and
19 industry are doing PRAs and using them in regulatory
20 applications. Here is an actual operating experience that
21 can be compared with the assumptions in the PRA to give a
22 good objective sanity check.

23 Number 20, please.

24 [Slide.]

25 MR. HOLAHAN: The PRA training activities are also

1 in the Office of AEOD. There have been revisions,
2 improvements, I would say, to the curriculum in a number of
3 areas.

4 There are also additional items which are being
5 tested and are being planned to deal with configuration
6 management and uncertainty. A number of important issues
7 are being worked into the program.

8 One of the ones that I liked is the idea of having
9 a course for technical managers, because if the
10 implementation plan is to succeed, it is not for the few
11 experts in the few expert branches. It has got to be a
12 broadly understood and implemented program.

13 Chairman Jackson, this goes to one of your
14 comments in your introduction, that if risk-informed
15 regulation is going to be an agency approach, it needs to be
16 worked into the infrastructure of the agency. Not only as
17 programs, but as an understanding on the part of the staff.

18 The senior reactor analyst program is an important
19 program that I would like us to spend a moment on. There
20 are ten senior reactor analysts in training. They are in a
21 two-year training program. They are predominantly senior
22 level inspectors from the regional offices. After their
23 training is done they will go back to the regional offices.
24 They are receiving training in probabilistic risk assessment
25 techniques. They are having rotational assignments in the

1 branches that are dealing with PRA activities.

2 They are developing expertise to be taken back to
3 the regional offices. They are also developing a strong
4 understanding of what tools are available here in
5 headquarters, and maybe as important as anything else, they
6 are making important contacts here with what will be, when
7 they go back to the regions, their contacts back here so
8 that they can form a communications link between the
9 regional offices and headquarters. I think that is also an
10 important part of what I will call risk-informed
11 infrastructure of the agency.

12 MR. THADANI: These senior reactor analysts will
13 become part of the baseline inspections that will be done in
14 terms of follow-up to the maintenance rule implementation.
15 They will participate in those inspections.

16 MR. HOLAHAN: Slide number 21, please.

17 [Slide.]

18 MR. HOLAHAN: In the waste management area, which
19 parenthetically I might need some help on, the performance
20 assessment techniques continue to be used in the high-level
21 and low-level waste areas.

22 In the high-level waste area there is basically a
23 three-phase program for implementing performance assessment.
24 There was an initial demonstration phase, which was
25 completed. Then back in October of 1995 there was

1 completion of the second phase, which was characterized as a
2 completion of the demonstration. The third phase, which is
3 really an application of the methodology, is an ongoing
4 activity.

5 In the high-level waste area the key issues seem
6 to be related to timing and a probabilistic treatment of
7 timing issues such as the time frame of interest, the period
8 for which it is appropriate to give credit for engineering
9 barriers, and treatment of issues such as the evolution with
10 time of site conditions. So performance assessment is a
11 probabilistic way of dealing with those difficult issues.

12 In the low-level waste area there is also a
13 performance assessment activity. There is a plan to publish
14 a branch technical position this summer. That is about all
15 I know on the subject, unless Carl would like to help some.

16 MR. PAPERIELLO: We are doing it for low-level
17 waste performance. We have just begun to do it in SDMP
18 performance assessment. What you do is you vary parameters
19 and you find out what parameters change the outcome. So I
20 kind of look on performance assessment compared to PRA as
21 contradictory. It is more of a deterministic probability
22 where you have bi-values for things and for the parameters
23 that we have in performance assessment you have a
24 distribution function. You look for which distributions
25 affect the outcome and which ones the outcome is not very

1 sensitive to the change in the input. For high level waste
2 it tells you should we worry about a particular phenomenon
3 or is it not going to change the outcome very well.

4 Basically, that is how performance assessment is
5 used in NMSS.

6 MR. HOLAHAN: Thank you, Carl.

7 Slide number 22, please.

8 [Slide.]

9 MR. HOLAHAN: The last two topics I would like to
10 cover are emerging policy issues and then what activities we
11 expect to be completing over the next six months.

12 The emerging policy issues are discussed in a
13 Commission paper. We felt it was important to give the
14 Commission early warning on potentially complex issues that
15 are coming up. At this state we don't feel we need
16 Commission guidance. We don't have a specific proposal for
17 the Commission for dealing with these issues, but we thought
18 it was important to identify them early on.

19 Mr. Thadani already mentioned the issue of use of
20 the safety goals in decision criteria. I think this is an
21 issue that the ACRS has raised with the staff. I think
22 because risk-informed regulation will call for some
23 decisions, it seems to me that in some sense the decision
24 criteria that the staff has on individual issues needs to be
25 in some way informed consistent with the safety goal, but

1 how that plays out is something to be developed. We
2 understand that the Commission wants to be involved in such
3 a decision.

4 With respect to performance-based regulation, the
5 relationship between performance-based regulation and
6 risk-informed regulation is not completely defined. There
7 are some elements of performance-based regulation which are
8 inherent in risk-informed regulation. For example,
9 equipment reliability or living PRAs by definition are
10 feeding back the performance of equipment into an ongoing
11 assessment of risk insights.

12 But there is an additional element of
13 performance-based regulation that we need to deal with, and
14 this is very much related to industry initiatives to move
15 towards performance measures as opposed to programmatic
16 requirements.

17 To the extent that focusing on performance means
18 focusing less attention or no attention on programmatic
19 requirements, I think the staff wants to take a cautious
20 approach to this activity to make sure that if in fact we
21 are using a performance-based approach in a given area that
22 there is measurable information, that that information will
23 give good insight as to the safety significance of
24 activities. For example, as in the maintenance rule, any
25 failures or poor performance doesn't result in unacceptable

1 or intolerable conditions.

2 The maintenance rule is a good example of
3 performance-based approach, because individual equipment
4 failures can be counted, can be addressed. So long as there
5 is something to measure and measuring failures is not
6 unacceptable, that is a reasonable approach, but there are
7 other areas for which programmatic requirements are probably
8 very important.

9 The example perhaps is a little bit extreme, but I
10 think it is a helpful example. In the seismic area you
11 simply can't wait and count earthquakes and see how well the
12 plants perform. It simply doesn't make any sense, a strong
13 program and an inspection program where there is really
14 nothing to measure; there is no output in the normal
15 performance-based sense. Either we have to find other
16 things to measure, other surrogates for real performance in
17 a demanding situation, or else it is more appropriate to
18 continue to focus on the strengths and the qualities of the
19 program that gives you confidence that the diesel generator
20 and the buildings are built to strong standards so that they
21 are seismically capable.

22 That is an issue that we need to sort out, how
23 much belongs with the PRA implementation plan and what is
24 the right mix of performance-based and programmatic
25 requirements.

1 MR. THADANI: I think that issue probably should
2 be discussed a little bit further. Even under the
3 maintenance rule the criteria that the industry is setting
4 up are not probabilistic or numerical criteria in terms of
5 performance of systems and components. For example, they
6 might set up for pumps criteria like changes in flow,
7 changes in vibration. That is, there would be some
8 engineering-based criterion that would be set up and they
9 would be monitoring that pump, let's say, to make sure that
10 they don't get that condition. That condition is a
11 precursor to potential failure so that problems can be
12 detected in time before they lead to failure. That approach
13 is going to be applied for all the components that are in
14 high safety significance category.

15 In some rare cases, if the component performance
16 is not acceptable, they would move those components into a
17 category where they set up goals, go back and take a look at
18 their programs, ask questions: why are we seeing poor
19 performance from this component? Modify their program but
20 put that component in a category where attention is given by
21 management. That is called category A-1. At that point
22 that is a goal, and that goal could be numerical, but by and
23 large we don't expect numerical goals for components even
24 under the maintenance rule.

25 MR. HOLAHAN: The third item is related to the

1 second, which is the staff needs to settle and presumably
2 bring to the Commission its advice on how to treat increases
3 in risk which may be allowed as part of the risk-informed
4 regulation. It is certainly included in the current
5 industry guidance.

6 The last item is really an implementation.

7 CHAIRMAN JACKSON: The last item you mentioned,
8 the risk-informed in-service testing and inspection?

9 MR. HOLAHAN: Yes.

10 CHAIRMAN JACKSON: We are going to talk about that
11 if we get a chance.

12 MR. HOLAHAN: I would propose to give you a chance
13 by simply saying slide 23 and 24 are two pages of promises
14 for the next six months. I will note that it is a long list
15 of significant promises. I won't go into them in any
16 detail. I won't even list them.

17 CHAIRMAN JACKSON: It sounds like you are tracked
18 to fulfill them.

19 MR. HOLAHAN: Yes, ma'am.

20 CHAIRMAN JACKSON: Let's have a few questions.
21 You talked about the emerging policy issue with respect to
22 in-service testing and in-service inspection. It seems that
23 there is this issue of the methodology for the review and
24 approval of changes, perhaps what someone might want to call
25 risk-informed changes to in-service inspection and testing

1 requirements.

2 I guess the question I have, and I think
3 Commissioner Dicus has a similar concern, is, how do you
4 make a finding under 10 CFR 50.55(a) based on the licensee
5 submittal alone without having the benefit of information
6 that you may have gotten from the pilots?

7 Put another way, is the pilot being used de facto
8 or being judged de facto to be an acceptable alternative by
9 definition which then is subject to change after the pilot?

10 MR. THADANI: If I may go back, 50.55(a) states
11 that the utility should meet the ASME standards in terms of
12 in-service testing.

13 CHAIRMAN JACKSON: Exactly.

14 MR. THADANI: The requirement may be that each
15 safety-related pump has to be exercised quarterly. It may
16 turn out that not all pumps are equally important; some
17 pumps in the plant are more important than others.

18 The idea behind this approach is that the
19 utilities take all those components and try to develop an
20 understanding of the relative importance of those
21 components. If some of the pumps have less safety
22 significance, then they could assign lower testing
23 frequency. The code calls for quarterly testing, for
24 example. In this case they may go to six months, a year, or
25 some longer time period before they test those components.

1 The staff has to review that. The code allows the
2 staff to provide approval if there is an alternative
3 approach that the licensees are using that is deemed of high
4 quality and is in fact acceptable to the staff. At this
5 point the staff is working with the utilities. For example,
6 IST with Palo Verde and Comanche Peak, getting into the
7 details of how did they decide what components are more
8 important and less important, and what is the right
9 frequency of testing.

10 If after the evaluation is complete the staff
11 agrees with the licensee over some modifications, agrees
12 that those changes are appropriate, that the licensee's
13 assessment is still acceptable, at that point that licensee
14 can go to the revised approach that has been reviewed and
15 approved by the staff.

16 Our expectation is as follows. After these two
17 pilots are done, once the staff says it is okay, they can go
18 forward. However, our intention is to go back and revise
19 the regulation to allow risk-informed thinking to be built
20 in as part of the code. The code committees are also
21 working on this issue so that they can modify the code
22 itself and in the future reference to that code will meet
23 appropriate requirements.

24 CHAIRMAN JACKSON: I guess an issue has to do with
25 in the meantime the fact that essentially to implement the

1 alternative testing requirements the licensee needs to be
2 granted relief from current requirements.

3 MR. THADANI: Not at this stage. After the staff
4 is done with its review.

5 CHAIRMAN JACKSON: I am saying the staff is going
6 to be doing a review.

7 MR. THADANI: Yes.

8 CHAIRMAN JACKSON: That would essentially grant
9 relief from current testing requirements.

10 MR. THADANI: Correct.

11 CHAIRMAN JACKSON: You talked about evaluations,
12 but the question is, what is going to be the basis for doing
13 those evaluations for granting the relief?

14 MR. THADANI: The basis would be essentially
15 negligible impact on risk. That is the thrust of this
16 approach. If you go back and do the analyses with quarterly
17 testing for pump X, it may not even appear in most of what I
18 would call important accident scenarios. For that
19 particular pump, changing the frequency from three months to
20 six months or a year, I don't think one would even see it in
21 the evaluation.

22 CHAIRMAN JACKSON: Maybe it is a message as much
23 as a question. Even though the staff has the capability
24 under 10 CFR 50.55(a), I think it would be helpful for the
25 Commission to understand what the methodology is and what

1 bases you are using for making these judgment in the absence
2 of the input from the pilots and in the absence of the
3 development of the regulatory guidance, et cetera.

4 MR. THADANI: We would certainly come back.

5 One of the issues that I don't think we have total
6 agreement on yet also looking at is, are the tests that are
7 done in some cases giving us all the information that one
8 would like to have, or should the test itself be revised?
9 Not just the frequency issue, but are some of the testing
10 procedures appropriate in catching the dominant contributors
11 to failure of that pump? That issue is still under
12 discussion. The ASME code people are looking at that also.

13 CHAIRMAN JACKSON: Let me ask you one last
14 question about the pilots. Will the pilot studies tell us
15 anything about the required scope and level of detail of
16 modeling in a PRA?

17 MR. THADANI: I think so.

18 CHAIRMAN JACKSON: Are we approaching it with
19 goals in mind that would allow us to get at this issue?

20 MR. HOLAHAN: Yes, absolutely. The reason that we
21 are including pilot activities as part of the plans for the
22 SRP and the reg guide is that it is very difficult to write
23 review standards or general guidance in an abstract way. It
24 is much better to have an actual example or numerous
25 examples while you are trying to establish what kind of

1 scope is important, what kind of quality features am I
2 looking for. I think it is very helpful to have those pilot
3 applications in front of the staff. I think they form an
4 integral part of developing guidance.

5 CHAIRMAN JACKSON: The last question for the
6 moment. You mentioned your review of licensee submittals of
7 IPES. Can you say at this point whether the implementation
8 of your proposed risk-informed and performance-based
9 approaches will require licensees to upgrade their IPES to
10 full scope PRAs, level 3's?

11 MR. HOLAHAN: I don't think I can give you a
12 clear-cut yes or no answer. I think it relates to what
13 application is in mind.

14 CHAIRMAN JACKSON: The real answer is you have to
15 work your way further through this implementation plan
16 before you can give us an answer.

17 MR. HOLAHAN: I will give you a guess.

18 CHAIRMAN JACKSON: Okay.

19 MR. HOLAHAN: Mr. Thadani mentioned screening type
20 applications, risk ranking and detailed applications. From
21 what I have seen of most of the IPES, I think they are
22 suitable for screening type applications. My guess is that
23 many of them are good enough for risk ranking but that some
24 would require additional improvements. At this stage I
25 wouldn't be confident in saying that many of them are good

1 enough for detailed applications. I would say maybe only a
2 few.

3 MR. THADANI: Let me add to that. In terms of
4 risk ranking, as we have indicated before, we are looking at
5 clarification and guidance. It may be because of some of
6 the variability in studies it is even more important to make
7 sure that the importance measures that are used in getting a
8 better understanding are carefully considered and the
9 criteria that one uses in applying those importance measures
10 become important.

11 I think we are trying to get a clearer
12 understanding of what is the proper criterion. Is it five
13 percent impact? 10 percent impact? I think what is clear is
14 we need to look at these various measures and look at the
15 hardware that shows up in appropriate category by using
16 different approaches to get a better understanding of what
17 these criteria are actually doing, that is, which components
18 end up in high and low importance categories. There I think
19 we need to do a bit more than we have done in the past.

20 CHAIRMAN JACKSON: There are going to be these
21 pilot applications. It would strike me that in looking at
22 what you hope to get out of them, which we have talked about
23 before, that you need to think about all these things where
24 you know you have these questions to see to what extent you
25 can get what you need.

1 I am going to yield to Commissioner Rogers.

2 COMMISSIONER ROGERS: I am concerned about the
3 same thing. We are talking now about applications of PRA
4 that I think go way beyond what we had originally thought of
5 a few years ago when using them for screening was clearly a
6 very valuable thing to do and valuable insights that the
7 licensee would get by doing the PRA. Now we are beginning
8 to think, well, now we can use this very powerful tool for
9 some other purposes. They are very interesting purposes,
10 and I think it is important to look at them.

11 I guess my concern follows sort of along the lines
12 of the Chairman's, and that is, what are the bases we use to
13 judge that a PRA is a good PRA? It is all very well to say
14 the risk is less or the risk analysis shows, but what is the
15 basis on which we decide that that risk analysis itself was
16 well done and sound?

17 It relates to questions about peer review of the
18 PRA process itself, to what extent are we availing ourselves
19 of peer reviews of PRA processes in what we are doing and
20 what licensees are doing, and is there some codification
21 possible of analyzing whether a PRA has been acceptably
22 performed?

23 It is easy for us to look at the input data to
24 know what the reliability database is that has been
25 referenced in putting numbers into the PRA, but I am

1 thinking about the general structure, the fault tree and
2 event tree structures of performing these and whether there
3 is some basis for deciding, yes, this is a really sound job.
4 Or do we have to ad hoc each one of these things? Is there
5 some way that one can codify test criteria for looking at
6 PRA that more or less meet standards of the scientific and
7 technological community?

8 CHAIRMAN JACKSON: And will this be in the reg
9 guide you are developing?

10 MR. HOLAHAN: It is more than in the reg guide; it
11 is the reg guide.

12 MR. TAYLOR: One of the reasons we finished
13 NUREG-1150 was that was the standard, presumably. Of course
14 we spent a great deal of time. Not we the agency, but those
15 that assisted us preparing such a study.

16 COMMISSIONER ROGERS: Yes, but it was just for
17 those plants.

18 MR. TAYLOR: Right, but it set the standard.
19 Having both a mix of BWRs and PWRs was an attempt to set a
20 base standard.

21 Is that not correct, Dave?

22 MR. MORRISON: That's correct.

23 You have raised a good point. What we need to do
24 is build on the experience and the insights that we have
25 gained from the IPE process where we have a large number of

1 these and recognize that perhaps what we set then was not
2 sufficient for people to be able to do what we now require
3 as an acceptable PRA.

4 MR. TAYLOR: We are pushing even beyond the
5 screen.

6 COMMISSIONER ROGERS: I wondered whether even the
7 1150 analyses would be good enough to make some of the
8 decisions that we are thinking about making using PRAs now.
9 They really sort of led us to see how the safety goals were
10 being met or not met, but now we are talking about very
11 detailed applications.

12 MR. THADANI: I don't think in my lifetime we will
13 know how to do so-called perfect probabilistic risk
14 assessment where I can really believe everything that comes
15 out of that evaluation, because we will continue to have
16 questions about cognitive errors, errors of commission, and
17 things like that will always be around; there will always be
18 some questions.

19 I think the policy statement lays out clearly the
20 recognition that there are some places where one can apply
21 these techniques, but you can't just depend on these
22 techniques alone. We have this infrastructure. We have the
23 knowledge and evaluation studies that have been done up to
24 now through our deterministic process. One can't just
25 replace that. Rather, the value of these techniques would

1 be in selected areas to see if we can do better: Have we
2 gone too far? Has there been an area of perhaps what I
3 would call overregulation or underregulation?

4 COMMISSIONER ROGERS: You don't have to take into
5 account all of the human factors analyses perhaps for
6 certain types of decisions.

7 Let's move on a little bit. This question about
8 safety goals. That was a pioneering effort when a
9 Commission put those in place. On the other hand, they
10 really do relate in their initial form, if you want to use
11 PRA, to a level 3 PRA. That means you have to know
12 something about the location of the plant, the population
13 distribution. You have to do that. Level 3 has been a big
14 challenge for a number of licensees. I guess not very many
15 have actually gone to level 3. There have been a few, but
16 mostly it has been level 2 where they terminate.

17 When we start talking about safety goals for
18 making some kind of regulatory decision that involves PRAs,
19 are you going to have to move to subsidiary goals in order
20 to do something meaningful here?

21 MR. THADANI: Exactly. I think that is it.
22 Uncertainties just get worse as you go on all the way out to
23 consequence calculations and health effects.

24 As the Commission has approved, the regulatory
25 analysis group put together a document on subsidiary

1 objectives and core damage frequency and containment
2 performance in terms of early or late containment failure.
3 Those are criteria that we use in our generic approaches to
4 safety issues, rulemaking activities, and so on. If we
5 follow the path we are on, those will be the criteria we
6 will propose.

7 COMMISSIONER ROGERS: Have we totally wrapped up
8 what the acceptable subsidiary goals are?

9 MR. THADANI: Currently the Commission approved
10 use of those criteria in any new rulemaking activities and
11 generic activities. We have applied those in some of the
12 recent regulations.

13 COMMISSIONER ROGERS: As we proceed to deal with
14 the use of safety goals in regulatory decision-making, I
15 think we ought to be brought up to date on what the status
16 is of the surrogates for the level 3 statements of safety
17 goals.

18 MR. THADANI: We did send up a Commission paper
19 indicating how difficult it was to define a large early
20 release.

21 COMMISSIONER ROGERS: I remember that. That's why
22 I'm not sure how wrapped up this is.

23 MR. THADANI: So we went to containment
24 performance instead, timing of containment failure as a
25 reflection of significant releases.

1 COMMISSIONER ROGERS: I want to say one more thing
2 and then we will give Commissioner Dicus a chance.

3 You mentioned these expert panels that are being
4 used in the application of the maintenance rule. I take it
5 those are licensee panels.

6 MR. THADANI: Yes.

7 COMMISSIONER ROGERS: Have you thought at all
8 about trying to use what we have come to so far in studying
9 the use of expert judgment in the high-level waste area as
10 some useful guidance to provide to these expert panels for
11 use in the maintenance rule? It is two different sides of
12 the house now. Can you take something from one and usefully
13 provide it to the other?

14 MR. HOLAHAN: I think we have not, but I think it
15 is an interesting thought we can follow up on.

16 COMMISSIONER ROGERS: Thank you.

17 CHAIRMAN JACKSON: Commissioner Dicus.

18 COMMISSIONER DICUS: I am making it unanimous that
19 we all have some general concerns here. I think it is clear
20 that all three of us would like to hear a little bit more
21 back from you, not necessarily today, but sometime in the
22 near future, on some of these issues, particularly these
23 policy concerns that you have raised.

24 I would add one thing, and that is perhaps some
25 sequencing in how these are resolved. It may be necessary

1 to have some resolution of the safety goals, this risk
2 neutral versus increases in risk policy issues, and come to
3 some points there even before you can come to some
4 resolution of these applications that are coming in. That
5 would be the only thing I would add.

6 CHAIRMAN JACKSON: Let me ask you two quick
7 follow-up questions. I note that several guidance documents
8 are being prepared by industry and reviewed by the staff,
9 including the NEI PSA applications guide. Can you clarify
10 again what the relationship is between these documents and
11 the staff's review of them and the guidance documents being
12 prepared by the staff?

13 MR. HOLAHAN: Yes. The PSA applications guide
14 developed by EPRI for NEI, I consider that to be the same
15 scope as what we have called the general SRP and regulatory
16 guide. It is that type of document. As part of our
17 development of the regulatory guide and SRP that team is
18 reviewing that guidance document. If we found that to be a
19 complete, thorough document, then we would propose to
20 reference it as part of the regulatory guide.

21 In our review of the last draft of that guide we
22 raised a number of issues. I think it was 12 or 15. Some
23 of those issues have been dealt with by NEI in the revision
24 to the guide, and I think some of them have not.

25 In its current form, I think there are a number of

1 open issues for which the staff wouldn't be satisfied with
2 it as a reference document. Whether it is referenced at all
3 or whether the staff develops independent thoughts on the
4 same scope remains to be seen. It is part of the review
5 process.

6 For example, in the maintenance rule area, the
7 regulatory guide does reference the NEI 9301 document.
8 There is basically an acceptance of that as an approach.

9 CHAIRMAN JACKSON: Are you saying that you are
10 reviewing them with respect to their potential suitability
11 for the staff to endorse them?

12 MR. HOLAHAN: Yes, to reference for endorsement.

13 CHAIRMAN JACKSON: In lieu of development of our
14 own reg guides?

15 MR. HOLAHAN: In a practical sense, it's not in
16 place of it. There will be a regulatory guide. I would say
17 it is likely that if there is an endorsement it will be a
18 partial endorsement with remaining issues to be dealt with.

19 CHAIRMAN JACKSON: In each case we would have our
20 own reg guide and we would either incorporate in that a
21 reference and/or an endorsement as appropriate.

22 MR. HOLAHAN: Yes.

23 MR. THADANI: At this stage there are some issues
24 with the industry guide. We do have some concerns and those
25 concerns have been identified. When we go forward, even on

1 these pilots, we will try to utilize our best views on the
2 issues as well as try and see if one were to apply the PSA
3 guide approach the industry put together how different the
4 answers might be to get a little better understanding of
5 what these differences might mean.

6 MR. HOLAHAN: There is some value to endorsing an
7 industry guide if you are comfortable with the quality of
8 it. It has had a lot of industry input; the utilities are
9 more comfortable with a guide that they have tried out and
10 that they were involved in the development of; and it
11 probably is an easier and smoother implementation. Whether
12 we can do that or not depends on whether we feel the issues
13 are adequately addressed in those documents.

14 CHAIRMAN JACKSON: I note that you state that
15 numerical criteria are espoused by the NEI PSA application
16 guide and that some of these criteria will be tested in the
17 ongoing industry initiated pilot applications. Can you give
18 us an example?

19 MR. THADANI: Examples of the criteria?

20 CHAIRMAN JACKSON: Right, some criteria and how
21 they would be tested.

22 MR. THADANI: If you go through some results from
23 probabilistic safety studies, NEI guidance document would
24 say that for a given change -- let's say there is a change
25 that is to be made to the plant, a permanent change to the

1 plant. They would propose delta core damage frequency of
2 some magnitude being acceptable. In addition to that, they
3 would propose that certain importance measures be looked at.

4 The value of importance measures is it helps you a
5 little bit in terms of the uncertainties that might exist in
6 these studies. They have proposed some specific criteria
7 for these importance measures to be used. We don't
8 necessarily agree that those are the right values to be
9 used. What we would try and do is to use these criteria and
10 some other criteria to see how the results change, take a
11 look at the output, and then use your best judgment: Does
12 this seem a better breakdown, so to speak, of what is more
13 important and what is less important? The devil is in the
14 details.

15 CHAIRMAN JACKSON: You are building this into your
16 review of the pilot applications and what you are going to
17 be looking for?

18 MR. THADANI: Yes.

19 MR. HOLAHAN: Yes.

20 MR. THADANI: We have already indicated that there
21 are some issues we are worried about in this guide. We have
22 told NEI that.

23 CHAIRMAN JACKSON: You have your list of what your
24 information needs are that you feel you need to get out of
25 these pilots?

1 MR. THADANI: Yes.

2 CHAIRMAN JACKSON: Have you given any thought to
3 how uncertainty will be dealt with in the performance-based
4 side of the equation?

5 MR. THADANI: I don't have a clear answer to that.
6 Uncertainty is one area that I am a little uncomfortable
7 with. If you look at many of the studies done, they don't
8 necessarily do a very good job of addressing uncertainties.
9 In my view, when we get to performance-based approaches, as
10 you have yourself said on many an occasion, our requirements
11 should be clear and consistent.

12 I am not sure that one should have numerical
13 criteria in terms of performance. I think we have got to
14 stay back to something else that will tell us if one reaches
15 that threshold, it's a sign of a problem, and deal with
16 that. That is a non-numerical approach at that point. I
17 think numerical approaches would be difficult.

18 Commissioner Rogers was here when we had this
19 issue of how do you know what is the underlying reliability
20 of diesel generators. If you have a rigorous statistical
21 approach to that, then you almost cannot tolerate any
22 failure at all even though the underlying reliability of the
23 diesel may in fact be what one wants.

24 So you get into this very tough scenario. Diesel
25 unreliability is on the order of 5 percent. Other component

1 reliability or unreliability is much lower. So the
2 magnitude of this issue will just grow. That is an issue
3 not identified in the implementation plan today, those kinds
4 of difficulties. I think we need to address that issue as
5 part of this activity.

6 CHAIRMAN JACKSON: Let me thank you very much for
7 a comprehensive briefing on the PRA implementation plan. I
8 do want to commend you for the progress you have made to
9 date in this sometimes difficult area.

10 [Slide.]

11 CHAIRMAN JACKSON: You can put the credits up as I
12 speak.

13 MR. HOLAHAN: In addition to just the credits, we
14 have the actual people here.

15 CHAIRMAN JACKSON: Maybe those credits ought to
16 stand. Why don't the team members stand up so we can see
17 who you are.

18 Very good. Now that I see you, I can encourage
19 you to continue to improve the PRA process and to provide
20 appropriate review mechanisms to ensure that the PRA is used
21 appropriately throughout the agency and consistently. I
22 know it is widely used throughout the respective offices and
23 so it has already become an important regulatory tool.

24 In striving to enhance the process and to ensure
25 its consistent use, let me reiterate four points that I

1 think have come out of our meeting today.

2 With respect to the issue of referencing safety
3 goals and decision criteria, I think the point that was made
4 about the use of subsidiary goals, laying those out,
5 clarifying where they are appropriately used is important.

6 Second, you raised yourself the issue of the
7 performance-based approaches and where performance measures
8 vice programmatic approaches are important. It seems to me
9 that is an issue that you have to clarify, where systems or
10 applications can be appropriately binned one way or another
11 as opposed to necessarily trying to force everything within
12 one pot.

13 Third, you have the IPE reviews that you are
14 completing and you have the industry initiated pilots. It
15 seems to me you have to put the two of them together to very
16 carefully consider what your lessons are, and, either
17 looking back or prospectively, how they will be used in
18 developing the reg guides as well as the standard review
19 plans.

20 Finally, as I think came out of the discussion on
21 alternative approaches for reviewing ISI and IST changes,
22 the message is that the staff should provide the Commission
23 with the pros and cons of potential staff approaches and
24 recommendations on all of the emerging policy issues prior
25 to the staff taking a position.

1 With that, I will ask if my fellow commissioners
2 have any further comments.

3 COMMISSIONER ROGERS: No, thank you.

4 COMMISSIONER DICUS: No.

5 CHAIRMAN JACKSON: We stand adjourned.

6 [Whereupon at 11:50 a.m. the meeting was
7 adjourned.]

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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 ON PRA IMPLEMENTATION PLAN -
PUBLIC MEETING

PLACE OF MEETING: Rockville, Maryland

DATE OF MEETING: Thursday, April 4, 1996

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: Michael Paulus

Reporter: Michael Paulus



STATUS UPDATE OF PROBABILISTIC RISK ASSESSMENT (PRA) IMPLEMENTATION PLAN

**Ashok C. Thadani
Gary M. Holahan**

April 4, 1996

OVERVIEW

- **Background**
- **Revisions to the PRA Implementation Plan**
- **Accomplishments and Activities to Date**
- **Emerging Policy Issues**
- **Future Activities**

BACKGROUND

- **Previously briefed the Commission on April 5, 1995 on status update of the PRA Implementation Plan**
- **Final PRA Policy Statement published on August 16, 1995**
- **SECY-95-265, “Response to August 9, 1995, Staff Requirements Memorandum Request to Analyze the Generic Applicability of the Risk Determination Process Used in Implementing the Maintenance Rule” issued November 1, 1995**
- **SECY-95-280, “Framework for Applying Probabilistic Risk Analysis in Reactor Regulation” issued on November 27, 1995**

BACKGROUND (CONTINUED)

- **November 30, 1995, Chairman Jackson issued memorandum requesting staff plans to develop Regulatory Guides (RGs) and Standard Review Plans (SRPs) in 2 years**
- **January 3, 1996, staff submitted action plans for accelerating the development of RGs, SRPs and Inspection Procedures**
- **March 26, 1996, staff submitted memorandum to update the status of the PRA Implementation Plan**
- **Staff will provide quarterly written updates on the progress of the PRA Implementation Plan and brief the Commission semi-annually**

KEY ELEMENTS OF THE PRA POLICY STATEMENT

- **Increase PRA applications in all regulatory decisions**
 - supported by methods and data
 - complements deterministic approach
 - supports defense-in-depth philosophy
- **PRAs are not substitutes for meeting current rules, regulations and requirements. Current rules and regulations shall be complied with unless these rules and regulations are revised**
- **Safety Goals and subsidiary numerical objectives are to be used for generic requirements**

PRA IMPLEMENTATION

- **Inter-office activities underway**
- **High priority assigned to RG/SRP development**
- **Pilot studies progressing well**
- **Reprioritization of PRA Implementation Plan tasks**
- **Accident Sequence Precursor (ASP) Program and PRA training**
- **Use of performance assessment in environmental settings**
- **Participation in international PRA activities**

REVISIONS TO PRA IMPLEMENTATION PLAN

- **Accelerated effort to develop RGs and SRPs**
- **Better focused industry pilot applications**
- **New tasks to incorporate risk insights into inspection programs and procedures**
- **Risk assessment for non-power reactors and SRP for evolutionary reactors are deferred**
- **Several PRA methods development efforts and some ASP tasks were deleted due to higher priority activities**

ACCOMPLISHMENTS TO DATE

- **RGs and SRPs development underway**
- **Review of industry-initiated pilot applications**
- **PRA methods development**
- **Review of Individual Plant Examination (IPE) submittals**
- **Common Cause Failure (CCF) Database completed**
- **High pressure coolant injection (HPCI) and emergency diesel generator (EDG) system reliability studies completed**

ACCOMPLISHMENTS TO DATE (CONTINUED)

- **1994 accident sequence precursor (ASP) report issued**
- **Published proposed Reliability Data Rule**
- **Training program and new courses for PRA**
- **Performance assessment for High-level waste and Low-level waste**

RGs AND SRPs DEVELOPMENT

- **Inter-office teams established to develop**

General RG and SRP

Application-specific RGs and SRPs

- **Inservice testing (IST)**
 - **Inservice inspection (ISI)**
 - **Graded Quality Assurance (GQA)**
 - **Technical Specifications (TS)**
- **Draft RGs and SRPs for public comment by the end of 1996 (3/97 for ISI)**
 - **Final RGs and SRPs to be completed by the end of 1997**

RGs AND SRPs DEVELOPMENT (CONTINUED)

- **General RG and SRP - annotated outlines developed, preliminary draft RG under staff review**
- **Application-specific RGs and SRPs - annotated outlines developed, preliminary draft RG for Graded QA under staff review**

PILOT APPLICATIONS

- **Motor operated valve (MOV) testing**
 - Reviewed BWROG (Boiling Water Reactor Owners' Group) report on PRA application in MOV testing and issued Safety Evaluation on 2/27/96
- **Inservice testing (IST)**
 - Reviewed Palo Verde and Comanche Peak applications, Request for Additional Information (RAI) issued
 - Reviewed draft IST guidance from industry and provided comments

PILOT APPLICATIONS (CONTINUED)

- **Inservice inspection (ISI)**
 - Met with industry to discuss technical approach and pilot applications
 - ANO-2, FitzPatrick, Surry submittals expected in 6/96
 - Draft ISI guidance from industry expected in 4/96

- **Graded QA**
 - Staff is evaluating graded QA programs from South Texas, Palo Verde and Grand Gulf

- **Maintenance Rule**
 - NUREG-1526 documented lessons learned from early implementation of the Maintenance Rule at nine nuclear power plants
 - Conducted public workshop

PILOT APPLICATIONS (CONTINUED)

- **Technical Specifications**
 - Reviewed Combustion Engineering Owners' Group (CEOG) request to extend allowed outage time (AOT)
 - Currently reviewing response to staff RAI
 - Currently reviewing South Texas 3-tiered approach to extending the AOTs

PRA METHODS DEVELOPMENT

- **Completed initial development of methods for modeling human errors of commission in PRA**
 - **NUREG/CR-6265, “Multidisciplinary Framework for Human Reliability Analysis with an Application to Errors of Commission and Dependencies,” August 1995**
 - **NUREG/CR-6350, “A Technique for Human Error Analysis (ATHEANA): Technical Basis and Methodology Description,” expected June 1996**
- **Initiating demonstration phase**

IPE/IPEEE REVIEWS AND INSIGHTS

- **Completed preliminary review of all IPE submittals**
- **Issued 45 Evaluation Reports, remaining 30 to be completed by 9/96**
- **Issued SECY-96-051 on preliminary IPE insights**
- **Briefing regions on plant-specific IPE results and insights**
- **Completed 5 IPEEE reviews and 20 are under review**
- **Staff is reassessing the IPEEE review plan**

RELIABILITY DATA RULE

- **Draft rule has been published for comment**
- **Regulatory guide will be completed in early April 1996**
- **Public workshop to be held in May 1996**
- **Public comment period closes on June 11, 1996**
- **Target date for the final rule is December 1996**

ACCIDENT SEQUENCE PRECURSOR PROGRAM

- **1994 ASP report was published in December 1995**
- **1982-1983 precursor preliminary analyses have been finished and the results will be issued to the staff and licensees for information**
- **1995 analyses are being completed and the results will be made available on an event basis**
- **ASP Technical Coordination Group meets monthly to assess progress on modeling, methods, and analyses**

RISK-BASED ANALYSIS OF OPERATING EXPERIENCE

- **Plan for “Risk-Based Analysis of Operating Experience” has been prepared and is being implemented**
- **Common Cause Failure (CCF) Database has been completed, CCF parameters estimated and forwarded to the staff for use, review, and comment**
- **Safety system performance studies are progressing on schedule. HPCI and EDG are complete. Additional studies are underway (IC, RCIC, HPCS, AFW)**

PRA STAFF TRAINING

- **The PRA training curriculum is revised and expanded**
- **A “configuration management module” was piloted in FY 1995 and is being added to selected courses**
- **An “uncertainty module” is being developed and will be added to selected courses**
- **“PRA for Technical Managers” course is being developed**
- **Senior Reactor Analysts are in training and rotational assignments**
- **Over 400 staff members have attended PRA training since the last update**

PRA PROGRESS IN WASTE MANAGEMENT

- **Performance assessment continues to be applied to high-level waste (HLW), low-level waste (LLW), and Site Decommissioning Management Plan (SDMP) sites**
- **High-level waste performance assessment (PA)**
 - **Iterative performance assessment (IPA) Phase 2 results published in NUREG-1464**
 - **Current IPA Phase 3 work focuses on risk-informed issue resolution**
- **Low-level waste performance assessment (PA)**
 - **Publish for comment Branch Technical Position (BTP) on LLW PA for LLW disposal facilities (to Commission June 30, 1996)**
 - **Document test case which demonstrates BTP approach**

EMERGING POLICY ISSUES

- **Role of “performance-based regulation” in the PRA Implementation Plan**
- **Referencing Safety Goals in decision criteria**
- **Risk neutral vs. Increases in risk**
- **Implementation of risk-informed IST and ISI requirements**

FUTURE ACTIVITIES (NEXT 6 MONTHS)

- **Working draft for general and application-specific RGs and SRPs**
- **Initiate inter-office review of RGs and SRPs (except ISI)**
- **Continue review of the pilot applications (complete IST and technical specification pilots)**
- **Complete inspection manual revisions and training material for inspectors**
- **Continue PRA model development efforts**
- **Complete IPE reviews**
- **Reevaluate scope of IPEEE review**

FUTURE ACTIVITIES (NEXT 6 MONTHS) (CONTINUED)

- **1982-1983 ASP final report and additional system studies**
- **Reliability Data Rule public workshop**
- **Preliminary ASP analysis for 1995 and selected 1996 operational events**
- **Continue staff PRA training**
- **PRA Implementation Plan updates to the Commission in June and September 1996**
- **PRA Implementation Plan briefing for the Commission in October 1996**
- **ACRS full and subcommittee meetings**

RESPONSIBLE STAFF/ORGANIZATION FOR RG/SRP AND PILOT APPLICATIONS

- **Management oversight**

Responsible senior manager - A. Thadani

Resolution of interoffice issues - Office Directors

**Overall coordination and technical guidance -
PRA Coordination Committee**

E. Butcher (NRR), M. Cunningham (RES)

P. Baranowsky (AEOD), J. Austin (NMSS)

Daily coordination and supervision -

M. Rubin (NRR)

A. Ramey-Smith (RES)

RESPONSIBLE STAFF/ORGANIZATION FOR RG/SRP AND PILOT APPLICATIONS

- Inter-office, inter-disciplinary teams assembled for development of RG/SRP and integration of pilot plant experience

Broad-based, General RG and SRP

A. El-Bassioni (co-leader)	RES/PRAB
M. Caruso (co-leader)	NRR/SPSB
T. Hiltz	NRR/SPSB
M. Cheok	NRR/SPSB
S. Dinsmore	NRR/SPSB
R. Woods	RES/PRAB
B. Hardin	RES/PRAB
J. Guttman	RES/PRAB
J. Schiffgens	NRR/SPSB

RESPONSIBLE STAFF/ORGANIZATION FOR RG/SRP AND PILOT APPLICATIONS (CONTINUED)

Risk-informed ISI inter-office team

J. Guttmann (co-leader)	RES/PRAB
S. Ali (co-leader)	NRR/ECGB
A. Hsia	NRR/SPSB
S. Dinsmore	NRR/SPSB
D. Jeng	NRR/ECGB
M. Caruso	NRR/SPSB
C. Hrabal	RES/EMMEB

RESPONSIBLE STAFF/ORGANIZATION FOR RG/SRP AND PILOT APPLICATIONS (CONTINUED)

Risk-informed IST inter-office team

D. Fischer (co-leader)	NRR/EMEB
B. Hardin (co-leader)	RES/PRAB
M. Cheok	NRR/SPSB
A. Hsia	NRR/SPSB
W. Gleaves	RES/EMMEB
M. Caruso	NRR/SPSB
J. Schiffgens	NRR/SPSB

RESPONSIBLE STAFF/ORGANIZATION FOR RG/SRP AND PILOT APPLICATIONS (CONTINUED)

Graded QA inter-office team

R. Gramm (co-leader)	NRR/HQMB
R. Woods (co-leader)	RES/PRAB
T. Hiltz	NRR/SPSB
R. Latta	NRR/HQMB
L. Campbell	NRR/HQMB
J. Peralta	NRR/HQMB
S. Dinsmore	NRR/SPSB
M. Caruso	NRR/SPSB
O. Gormley	RES/EMMEB

RESPONSIBLE STAFF/ORGANIZATION FOR RG/SRP AND PILOT APPLICATIONS (CONTINUED)

Risk-informed TS inter-office team

R. Woods (co-leader)

RES/PRAB

N. Gilles (co-leader)

NRR/TSB

M. Wohl

NRR/SPSB

A. Hsia

NRR/SPSB

M. Caruso

NRR/SPSB