April 3, 1997 SECY-97-076

FOR: The Commissioners

FROM: L. Joseph Callan /s/
Executive Director for Operations

SUBJECT: QUARTERLY STATUS UPDATE FOR THE PROBABILISTIC RISK ASSESSMENT (PRA) IMPLEMENTATION PLAN

PURPOSE:

To present a quarterly update on the progress of activities in the PRA Implementation Plan, including the development of risk-informed standards and guidance; and to respond to those items in the staff requirements memorandum of January 22, 1997, for which the Commission has requested a staff response in this calendar quarter.

BACKGROUND:

In a memorandum dated January 3, 1996, from the Executive Director for Operations to Chairman Jackson, the staff committed to submit quarterly updates on the status of its development of risk-informed standards and guidance. Previous updates on the status of activities in the PRA Implementation Plan, including the status of the staff's development of risk-informed standards and guidance, were sent to the Commission on March 26, June 20, and October 11, 1996, and on January 13, 1997.

DISCUSSION:

The staff has updated the status of activities in the agency's PRA Implementation Plan in Attachment 1. Significant achievements in the past quarter follow:

- The staff has incorporated proposed resolutions of the policy, technical, and process issues in new drafts of (1) the broad-scope general regulatory guide (RG) and standard review plan (SRP) and (2) the application-specific RG and SRP for inservice testing (IST), graded quality assurance (GQA)(RG only), and technical specifications (TS), and has discussed these new drafts with the Advisory Committee on Reactor Safeguards (ACRS) and the Committee To

CONTACT:
A. Thadani, NRR
415-1274

Review Generic Requirements (CRGR). Both the ACRS and the CRGR have reviewed the guidance and concurred in the staff's proposal to issue the guidance for comment by the public. By the end of March 1997, the staff intends to forward the draft guidance documents to the Commission and request its approval for issuing the documents for comment by the public.

In completing the draft RGs and SRPs to date, the staff has found that a greater than expected effort is required to consider all points of view and gain a concensus on draft guidance. With this experience and, because submittals from industry on inservice inspection (ISI) are delayed, the staff projects that the draft ISI RG and SRP will not be issued before July 1997 and the final RG and SRP will not be issued before February 1998.

- Regarding the pilot program for risk-informed technical specifications (TS), the staff has prepared a safety evaluation to provide the basis for granting the amendments for TS- allowed outage times (AOTs) for the safety injection tanks and low-pressure safety injection system at the lead plant, which is Arkansas Nuclear One, Unit 2 (ANO-2). The safety evaluation will be forwarded to the Commission shortly, in a separate Commission paper. Issuance of the ANO-2 amendments will complete Task 1.2 of the PRA Implementation Plan for the pilot application regarding technical specifications.

- In February 1997, the staff published Interim Revision 8 of NUREG-1021, "Operator Licensing Examination Standards for Operating Reactors." This revision to the operator licensing process treats the application of risk insights in operator licensing (Task 1.4). Licensees will implement the interim revision voluntarily until such time as NRC requirements in 10 CFR Part 55 are amended. The staff is developing a proposed revision to 10 CFR Part 55.

- The staff completed nine more maintenance rule baseline inspections, which included inspection of licensee methods for applying PRA in maintenance programs as well as inspection of safety assessments licensees perform when removing equipment from service for maintenance in accordance with Paragraph (a)(3) of the maintenance rule. The staff has now completed a total of 21 inspections. The staff intends to inspect all reactor sites by the third quarter of calendar year 1998.

- Six senior reliability analysts (SRAs) have completed their initial training requirements and are preparing certification request packages for review by the SRA Oversight Panel. These SRAs are currently working in their permanent positions at headquarters (HQ), and in Regions I, II, and IV.

The staff wishes to note that, in regard to the regulatory effectiveness evaluation (Task 1.7), they intend to include recent insights on the risks of pressure-induced and thermally-induced steam generator tube ruptures (SGTR) in determining whether there is adequate closure of severe accident issues addressed in the station blackout rule. This will involve consideration of the interrelationships between the induced SGTR issue and reactor coolant pump (RCP) seal failure and station blackout issues. Because potential backfits may draw benefits for averted risk from multiple related severe accident issues, it is important to consider such interrelationships in deciding whether further backfitting is warranted in these areas.

In its January 22, 1997 staff requirements memorandum (SRM), the Commission requested that in the March 31, 1997, update of the PRA Implementation Plan, the staff describe how performance monitoring is being addressed in the current PRA pilot applications and, where appropriate, other planned performance-based approaches, including treatment of the four key technical issues associated with performance monitoring presented to the Commission in the October 11, 1996 update of the PRA Implementation Plan (SECY-96-218). The four key technical issues are (1) the scope of systems, structures, and components (SSCs) to be monitored, (2) selection of performance characteristics, (3) process for performance monitoring, and (4) feedback of results into program implementation. The Commission requested that for maintenance rule implementation activities, the four issues be discussed in the context of the inspection process. Attachment 2 addresses the Commission's request made in the January 22, 1997, SRM.

COORDINATION:

The Office of the General Counsel has reviewed this paper and has no legal objections to its issuance.

L. Joseph Callan
Executive Director
for Operations

Attachments:
As stated

ATTACHMENT 1

QUARTERLY STATUS UPDATE OF THE AGENCY-WIDE
IMPLEMENTATION PLAN FOR PROBABILISTIC RISK ASSESSMENT (PRA)
(from January 1, 1997 to March 31, 1997)

SUMMARY OF SIGNIFICANT PROGRESS

(1) Regulatory Guide (RG) and Standard Review Plan (SRP) Development (Tasks 1.1 and 2.1)

The staff incorporated its proposed resolutions of policy, technical, and process issues into new drafts of (a) the broad-scope general regulatory guide (RG) and standard review plan (SRP) and (b) the application-specific RG and SRP for inservice testing (IST), graded quality assurance (GQA) (RG only), and technical specifications (TS). The staff discussed the new drafts with senior agency management, the Advisory Committee on Reactor Safeguards (ACRS), and the Committee to Review Generic Requirements (CRGR) in a number of meetings held over the past three months. Both the ACRS and the CRGR have completed their reviews of the guidance and concur in the staff's proposal to issue the guidance for comment by the public. By the end of March 1997, the staff intends to forward the draft guidance documents to the Commission and request Commission approval for issuing the documents for comment by the public. In completing the draft RGs and SRPs to date, the staff has found that a greater than expected effort is required to consider all points of view and gain a concensus on draft guidance. With this experience and, because submittals from industry on inservice inspection (ISI) are delayed, the staff projects that the draft ISI RG and SRP will not be issued before July 1997 and the final RG and SRP will not be issued before February 1998.

(2) Pilot Applications (Task 1.2)

The staff is reviewing a quality assurance (QA) program revision submitted by Houston Power and Light (South Texas) on January 21, 1997, in response to a staff request for additional information (RAI). The staff is continuing to review a submittal from Arizona Public Service Company (Palo Verde) dated September 12, 1996, that outlines planned enhancements in Palo Verde's procurement process based on previous staff evaluations. On February 27, 1997, the staff met with Nuclear Energy Institute (NEI) representatives and staff from the two volunteer plants to discuss the GQA initiative. At that meeting, industry representatives articulated a conceptual approach for a performance-based monitoring methodology that they propose be integrated with the GQA pilot implementation.

Regarding the risk-informed TS pilot application, the staff is preparing the safety evaluation to provide the basis for granting amendments for the extension of TS allowed outage times (AOTs) for the safety injection tanks and low-pressure safety injection system at the lead plant. The lead plant is Arkansas Nuclear One, Unit 2 (ANO-2). The safety evaluation is undergoing management review and will be forwarded to the Commission shortly, in a separate Commission paper. Issuance of the ANO-2 amendments will complete Task 1.2 of the PRA Implementation Plan for the technical specifications pilot application.

Regarding the risk-informed inservice testing (RI-IST) pilot applications, the staff recently sent a second RAI to the licensee of the Comanche Peak Steam Electric Station (CPSES) and the Palo Verde Nuclear Generating Station (PVNGS). The second RAI was based primarily on proposed staff positions as described in the draft RI-IST regulatory guide and standard review plan. The second RAI also contained questions based on Oak Ridge National Laboratory's review of Nuclear Plant Reliability Data System (NPRDS) data on pumps and valves at the pilot plant sites. Because of ongoing work on the draft risk-informed RGs and SRP sections, the staff will need a further information request in addition to questions contained in the second RAI. It is anticipated that the final RAI will be sent to the RI-IST pilot plant licensees shortly after the draft RI-IST RG and SRP are issued for public comment.

Significant PRA-related technical support has been provided for the agency's maintenance rule (MR) baseline inspection effort. The goal of the MR baseline program is to conduct a full team inspection at each reactor facility in the first two years following the implementation date of the rule (July 10, 1996). To date, 21 full inspections have been conducted. These inspections have been conducted with the support of experienced staff and contractor personnel trained in the use of PRA, using an inspection procedure that focuses on the inspection and assessment of the relevant PRA-related technical aspects of the NRC-approved industry guideline for implementing the rule (i.e., NUMARC 93-01).

For risk-informed ISI, the staff has not received any of the pilot plant submittals. Because of this significant delay, the staff will not complete its review regarding the acceptability of pilot plant applications until April 1998.

(3) <u>Training for Inspectors (Task 1.3)</u>

Six SRAs have completed their initial training requirements and are preparing certification request packages for review by the SRA Oversight Panel. These SRAs are currently working in their permanent positions at HQ, and in Regions I, II, and IV. Two additional SRAs are expected to be ready for certification in June 1997. Two vacant SRA positions in Region III are being posted.

The staff is continuing to develop a new PRA course series for inspectors and other technical personnel within the reactor program. This PRA Technology and Regulatory Perspectives course will address the special needs of regional inspectors, resident inspectors, and other technical personnel who require knowledge of probabilistic risk assessment (PRA) issues and insights to perform better evaluations of the effects of design, testing, maintenance, and operating strategies on system reliability. Presentation of the pilot course is planned for May 1997. It is anticipated that the PRA Technology and Regulatory Perspectives course will replace Inspection Manual Chapter (IMC) 1245 requirements for the PRA Basics for Regulatory Applications course for NRR and regional employees. The staff plans to offer the course four times a year.

(4) <u>Application of Risk Insights in Operator Licensing (Task 1.4)</u>

The staff recommended in SECY-96-123, "Proposed Changes to the NRC Operator Licensing Program," that the revised operator licensing process be implemented on a voluntary basis with the issuance of Interim Revision 8 of NUREG-1021, "Operator Licensing Examination Standards for Power Reactors," and that the Commission approve the staff's pursuit of rulemaking to require power reactor facility licensees to prepare the operator licensing examinations in accordance with NUREG-1021. This revision to the operator licensing process treats the application of risk insights in operator licensing (Task 1.4). In a staff requirements memorandum dated December 17, 1997, the Commission documented its approval the staff's request, and NUREG-1021, Revision 8, was published in February 1997. In addition, a proposed rule was developed; it will be forwarded to the Commission shortly.

(5) Individual Plant Examination (IPE) and IPE of Externally Initiated Events (IPEEE) Reviews (Task 2.5)

IPE

Of the 75 IPE submittals received by RES, 68 were reviewed and the associated staff evaluation reports (SERs) have been submitted to NRR. Two of the 68 completed SERs, for the Dresden and Quad Cities facilities, indicated that the staff could not conclude that these IPEs met the intent of Generic Letter 88-20. The licensee has submitted an updated IPE; the staff is reviewing the revised submittal and, as necessary, is revising the associated SERs.

With respect to the remaining seven reviews, RES will complete the SERs for Crystal River, St. Lucie, and Summer by the end of the current calendar quarter, and is awaiting additional information from the licensees regarding the Braidwood, Byron, Ginna, and Susquehanna IPEs.

It should also be noted that TVA has not submitted an IPE for Browns Ferry Unit 3. Thus, no staff review has been performed.

IPEEE

The staff has received 63 of 74 expected IPEEE submittals. Currently, 33 submittals are under review. Ten additional submittals are expected to be received by the end of December 1997, and the submittal date of one IPEEE has yet to be determined.

Final IPE Insights and IPEEE Reports

The IPE Insights Report, NUREG-1560, was issued in October 1996 as a draft report for public comment. A public workshop will be held on April 7, 8, and 9, 1997, in Austin, Texas, to solicit public comments and discuss the draft report. The final version of the report is scheduled to be issued in June 1997; however, depending on the level and types of comments and information provided at the workshop, this date may be changed.

An initial structure for the IPEEE insights report has been developed on the basis of information in the first 24 submittals reviewed by the staff. An initial version of the report will be sent to the Commission as part of the annual Severe Accident Integration Plan update in May 1997; an additional update will be sent in September 1997 and a final report in September 1998.

(6) Accident Sequence Precursor (Task 3.2)

The independent contractor-based QA review of the revised plant-specific simplified plant models for accident sequence precursor (ASP) analysis was completed in March 1997. After the prime contractor and the ASP Technical Coordinating Group review the report, the staff will incorporate final changes to the models and the models will be available for use in August 1997.

(7) Reliability Data Rule (Task 3.5)

The staff completed its evaluation of industry's proposed voluntary alternative to the rule. Industry submitted data from the Safety System Performance Indicator (SSPI) program for six sites. A meeting was held in January 1997 to discuss technical problems with the SSPI data. Industry has since proposed modifications to the Equipment Performance Information Exchange (EPIX) system under development by the Institute of Nuclear Power Operations (INPO) to resolve concerns raised at the January meeting. The staff will prepare a paper for Commission approval detailing the status and options for future activity relating to the proposed rule.

(8) Staff Training (Task 3.6)

The staff presented the first PRA for Technical Managers course, February 11, 12, and 13, 1997. This course is designed to provide all levels of staff managers with a basic understanding of PRA methods, strengths, and limitations needed to implement risk-informed, performance-based regulations. Three utility personnel (coordinated through NEI) also attended. Current plans are to present the course three times a year.

The first presentation of the new PRA Level 2 course, Accident Progression Analysis, was held February 25, 26, and 27, 1997. This three-day course addresses accident phenomenology under post-core damage conditions and development of PRA models for this severe-accident regime. Development has also been completed for a new PRA Level 3 course, Accident Consequence Analysis. This three-day course addresses environmental transport of radionuclides and estimation of offsite consequences from core damage accidents. The first course is scheduled to be presented in March 1997. Current plans are to present each of these courses twice a year.

The development of a new course on external events should be completed by May 1997. This three-day course will address external events (such as fires, floods, earthquakes, high winds, and transportation accidents) and the development of external event PRA models such as those used in the IPEEEs. Development of this course is currently in the design phase. The course is scheduled for its first presentation in July 1997.

REVISIONS TO THE EXISTING PRA IMPLEMENTATION PLAN

In completing the draft RGs and SRPs to date, the staff has found that a greater than expected effort is required to consider all points of view and gain a concensus on draft guidance. With this experience and, because submittals from industry on inservice inspection (ISI) are delayed, the staff projects that the draft ISI RG and SRP will not be issued for comment by the public before July 1997 and the final RG and SRP will not be issued before February 1998.

The staff has not received any of the pilot plant submittals for the risk-informed ISI pilot program. This significant delay postpones the completion date for the staff's review regarding the acceptability of the pilot plant applications to April 1998.

The staff's evaluation of the GQA volunteer plant activities had been scheduled to be completed by June 1997. Progress on the GQA pilot activity has been delayed due to a redirection of resources to the development of the draft regulatory guidance. The staff will complete the review of the South Texas Project's proposal for a revised GQA program by the end of June 1997. Lessons learned from implementation of the South Texas program will be factored into the remainder of the pilot reviews which the staff expects to complete by December 1997.

The first offering of the regulatory applications training course (Task 1.3) has been delayed from May 1997 to October 1997. This three-week course is intended primarily for inspectors and other technical personnel in the reactor program. These delays are the result of both course contractors and inhouse staff being diverted to higher priority activities. The contractor has begun to develop the course, but progress has been slowed to support the higher priority maintenance rule baseline team inspections. Also, since this course is applications-oriented, considerable NRC staff involvement is anticipated to prepare examples for the development of case studies and workshops. Only a single individual in NRR is currently assigned part-time to developing this course due to competing assignments to support risk informed inspection activities. Thus, the date for competing development of this course has been changed from May 1997 to August 1997. Course development will include one "dry run" of the course using staff persons experienced in the material and knowledgable of the intended student audience. Resolution of comments from the dry run and from the PRA Training Focus Group is expected to require significant additional time (2 months) before the course is offered for the first time.

The IPE/IPEEE process has led to the resolution of a number of substantial generic issues, including Unresolved Safety Issue (USI) A-45 (Decay Heat Removal Reliability). The staff has begun the evaluation process to (1) evaluate IPE insights to determine necessary followup activities (Task 1.10); (2) identify plant-specific applicability of generic issues that were closed out on the basis of IPE and IPEEE programs (Task 1.6); and (3) assess the regulatory effectiveness of major safety issue resolution efforts, e.g., 10 CFR 50.63 (station blackout) and 10 CFR 50.62 (anticipated transients without scram)(Task 1.7). A target date of December 1997 has been established for developing the framework to address these major and complex regulatory activities. A target date for completing these regulatory activities is to be determined after the number and complexity of the issues are clarified. A schedule for any plant-specific backfit issues, however, would need to be determined on a case-by-case basis.

In regard to the regulatory effectiveness evaluation (Task 1.7), the staff intends to include recent insights on the risks of pressure-induced and thermally-induced steam generator tube ruptures (SGTR) in determining whether there is adequate closure of severe accident issues addressed in the station blackout rule. This will involve consideration of the interrelationships between the induced SGTR issue and reactor coolant pump (RCP) seal failure and station blackout issues. Because potential backfits may draw benefits for averted risk from multiple related severe accident issues, it is important to consider such interrelationships in deciding whether further backfitting is warranted in these areas.

Work has been placed on hold for developing PRA methods (Task 2.4) for use in evaluating medical devices containing nuclear material, because of the loss of key staff and the availability of staff relative to other, higher priority, PRA support activities.

Development of methods for incorporating aging effects in PRA has been delayed due to the loss of the contractor's principal investigator.

The demonstration analysis portion of the human reliability work in Task 2.4 is being delayed because the cooperating licensee had to allocate needed resources to other, higher priority, issues at the site.

Task 3.1 (Risk-based Trends and Patterns Analysis) will experience delays due to an unexpected loss of resources (1/3 of the staff has been out of work because of injury or illness for significant parts of the period), additional work assignments not previously part of the PIP (such as the review of the Senior Management Meeting process), and technical difficulties encountered by contractors working on elements in the risk-based analysis of reactor operating experience. Subtasks for trending the performance of risk-important components and initiating events analyses will be delayed seven months and three months, respectively. The subtask for trending of performance of risk-important systems will not be complete until September 1998.

Tasks 3.3 (Industry Risk Trends) and 3.4 (Risk-based Performance Indicators) require the completion of the elements in Task 3.1 mentioned above. Since the activities in Task 3.1 won't be complete until the end of 1998, there will consequently be a 1-year delay completing Task 3.3 and a 1-year delay completing Task 3.4.

Work on the development of PRA methods for use on industrial devices containing nuclear material (Task 4.4) has begun and is proceeding more slowly than expected using NRC staff and limited contractor support. The schedule for completing this work has been delayed from June 1997 to the end of FY1998 in order to maintain resources on higher priority PRA support activities.

A draft user's request has been developed for performing a PRA on spent fuel storage facilities (dry casks).

REVISED TASK TABLES

The attached task tables have been updated to reflect the progress and revisions to the PRA Implementation Plan from January 1, 1997, to March 31, 1997.

ATTACHMENT 2

SUMMARY DISCUSSION ON PERFORMANCE MONITORING IN THE CURRENT PRA PILOT APPLICATIONS

Performance Monitoring in PRA Pilot Applications

In its January 22, 1997 Staff Requirements Memorandum (SRM), the Commission stated that the staff should provide a summary discussion on how performance monitoring is being addressed in the current PRA Pilot Applications and, where appropriate, other planned performance-based approaches.

The PRA Pilot Applications are activities associated with evaluating risk-informed approaches to technical specifications, inservice testing of pumps and valves, inservice inspection, and quality assurance. Although the PRA Pilot Applications are not performance-based pilots, the staff has considered how performance-based strategies may be used to complement these risk-informed approaches. As a result of interactions with PRA Pilot Application licensees and the development of the risk-informed regulatory guides and standard review plans, the staff determined that implementation and performance-monitoring strategies are a key element of the risk-informed decision-making process. In fact, the fifth principle for considering risk-informed regulatory approaches indicates that the staff should ensure that “[p]erformance-based implementation and monitoring strategies are proposed that address uncertainties in analysis models and data and provide for timely feedback and corrective action.”

In general, the PRA Pilot Application licensees considered the monitoring approaches which they developed to implement the maintenance rule (10 CFR 50.65) as the starting point for establishing application-specific performance-monitoring strategies.

PRA Pilot Applications and Technical Issues Associated with Implementation and Monitoring

In SECY-96-218, “Quarterly Status Update for the Probabilistic Risk Assessment (PRA) Implementation Plan, Including a Discussion of Four Emerging Policy Issues Associated with Risk-Informed Performance-Based Regulation,” dated October 11, 1996, the staff provided a summary list of key technical and process issues associated with moving toward risk-informed, performance-based approaches. In its January 22, 1997 SRM, the Commission indicated that the staff should address the technical issues concerning how the implementation and monitoring aspects of performance-based regulations are considered in current or planned performance-based approaches.

Staff experiences with the PRA Pilot Applications, experiences with recent rulemaking concerning containment leakage requirements, and experiences developing and implementing the maintenance rule account for a large percentage of the staff’s experience with performance-based regulatory approaches. As previously mentioned, although the PRA Pilot Applications are not performance-based pilots, the staff has considered how performance-based strategies may be used to complement these risk-informed approaches. In the draft risk-informed regulatory guidance documents, the staff identified acceptable alternatives to address the technical issues associated with implementation and monitoring in a risk-informed decision-making process.

1. The first issue concerns identifying the appropriate performance characteristics to monitor. In each application-specific regulatory document, there is a discussion of the performance-monitoring attributes. The regulatory guides provide licensees with flexibility to determine appropriate parameters to monitor in order to ensure that the performance of the component does not deteriorate to an unacceptable level and to ensure that appropriate corrective action is pursued.

   In graded QA, the reliability of the components is the primary performance characteristic of interest, but it may be difficult or impossible to measure directly in practice at the values credited in the PRA. Graded QA would rely on performance indicators associated with the monitoring of equipment failures, and would also include industry experience input. It is envisioned that for some aspects, the Maintenance Rule monitoring could be useful for graded QA purposes. However, low safety significant equipment may only be monitored at the plant level under the Maintenance Rule. In that case, individual equipment failures attributable to reduced QA controls may not be identified under the Maintenance Rule monitoring approach. This would eliminate the ability to perform further evaluation of those failures to ascertain whether the QA controls need to be adjusted. The licensee will be expected to detect and correct unacceptable performance which, if uncorrected, may cause the availability of low-safety-significant SSCs to deteriorate beyond the bounding values used in the safety categorization process. The graded QA descriptions of the monitoring approach have only been discussed at the conceptual levels. Detailed implementation will be developed during the pilot reviews with additional guidance provided in the final GQA RG.

   For inservice testing pilot activities, the staff is working with pilot application licensees to ensure that a performance monitoring program is included as part of the pilot application licensee's risk-informed inservice testing program if the licensee proposes to extend the test intervals for low safety significant components (LSSC) or change testing strategies for high safety significant components (HSSC). In the IST RG the staff has proposed that the performance-monitoring programs should have the following attributes: 1) enough tests are included to provide meaningful data, 2) the test is devised such that the incipient degradation can reasonably be expected to be detected, and 3) the licensee trends appropriate parameters as required by the ASME Code or ASME Code Case and (as necessary) to provide validation of the PRA. This will ensure that degradation is not significant for components that are placed on an extended test interval and that the failure rate assumptions for these components are not compromised. Therefore, and in contrast to the performance monitoring required by the maintenance rule, performance monitoring for risk-informed inservice testing must be done at the component level.[1] The staff acknowledges that any component monitoring that is performed as part of the Maintenance Rule implementation can be used to satisfy monitoring as described in the RI-IST program guidance provided the performance criteria chosen are compatible with the RI-IST guidance provided in DG-1062.

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[1] Under the maintenance rule, the performance of low safety significant SSCs is monitored at the plant level usually through monitoring unplanned scrams, unplanned capability loss, and/or unplanned safety system actuations.

Inservice inspection must also use performance indicators at a level below pipe rupture. Current plans are to characterize weld performance by monitoring the lack of flaw growth and the lack of leaks.

2. The second issue (related to performance-based implementation) concerns how the equipment to be monitored is selected. For risk-informed program changes, a monitoring program should be established for equipment covered by the proposed change. For some of the risk-informed pilot applications, the selection of components to be monitored is straightforward. In general, risk-informed applications include SSCs within the associated issues regulatory scope, as well as additional SSCs categorized as high safety significant components. The scope of the SSCs to categorize is similar to the maintenance rule scope, expanded to included SSCs characterized by non-maintenance preventable failures.

   For graded QA, the scope of application will be similar to the Maintenance Rule scope. In graded QA as currently envisioned, the QA controls on high-safety-significant, safety related SSCs will not be changed. Oversight of low-safety-significant but safety related SSCs may be reduced commensurate with their importance to safety. This includes a reduction of QA controls on equipment associated with specific operating modes which do not support the high-safety-significant operating mode. This allows, for example, a reduction in QA controls on the motor operator of a locked open, motor operated valve while maintaining full Appendix B requirements on the pressure boundary function of the valve.

   For risk-informed inservice testing the components to be monitored include the current ASME Code-required components as well as non-Code pumps and valves that are categorized as high safety significant components

   In ISI, pipe segments are defined but the inspection program is applied to selected welds within a segment as appropriate. Current plans are to inspect the welds exposed to the worst degradation mechanisms in a segment, or a representative selection if all degradation mechanisms are the same.

3. The third issue concerns how the selected equipment's performance should be monitored. In graded QA, the current industry proposals and staff guidance emphasize the monitoring of equipment failures and the feedback of observed failures into a plant specific quantitative data base for further evaluation by the licensee. The staff plans to also include the more traditional monitoring (use of audits and surveillances) of the licensee implementation of the graded QA implementation plan itself.

   In ISI, the monitoring (inservice inspection type and equipment) is to be adapted to the degradation mechanisms to which the selected welds are exposed. This should result in an improvement of the detection capability.

   Once the components to be monitored are identified, the monitoring program should provide a means to adequately track the performance of the equipment affected by the proposed change and should be capable of trending equipment performance after the change has been implemented to demonstrate that performance is consistent with that predicted by the traditional engineering and probabilistic analyses that were conducted to justify the change. For risk-informed inservice testing, licensees should monitor performance characteristics as required by a test strategy that is developed from looking at the failure modes and the associated failure causes. Testing should be designed to detect failures as well as degradation that leads to these failure causes (e.g., as described in ASME Code case OMN-1).

4. Finally, the fourth performance-based issue deals with how feedback from the monitoring will be used to make adjustments in implementation. For risk-informed graded quality assurance, operating experience, plant modifications and SSC replacements, degradation monitoring, and PRA monitoring will be used by the licensee to assess the need to revise SSC safety significance categorizations or adjust QA controls. ISI will include expanded testing if flaws are discovered during inspections. The discovery of new types of weld flaws in the industry is also intended to initiate a re-evaluation and expansion of the test program but it is not yet clear how such an industry wide program will be put in place. For technical specifications, a three-tiered approach will be used to support the overall configuration risk management process. If performance-monitoring reveals adverse trends in reliability or availability, the licensee will take appropriate corrective action that may include changes to the technical specifications.

   For risk-informed inservice testing, the feedback mechanism should ensure that if a particular component's test strategy is adjusted in a way that increased degradation or failures are observed, the IST program weakness is promptly detected and corrected. Subsequent corrective actions would 1) assess the validity of the PRA failure rate and unavailability assumptions in light of the failure(s), and 2) consider the effectiveness of the component's test strategy in detecting the failure or nonconforming condition. These corrective actions may result in adjustments to the test frequency and/or methods where the component (or group of components) experiences repeated failures or nonconforming conditions.

Addressing the Technical Issues Associated with Implementation and Monitoring in Maintenance Rule Inspection Activities

Monitoring performance under the Maintenance Rule is accomplished through the approach described in NUMARC 93-01, which was endorsed by the NRC through RG 1.160. The purpose of monitoring under the maintenance rule is to determine the effectiveness of maintenance. Monitoring programs developed using the guidance in NUMARC 93-01 evaluate performance at the system or train level for high safety significant and standby SSCs and at the plant level for low safety significant normally operating SSCs. High safety significant SSCs are determined by the expert panel using input from the PRA as well as knowledge of plant design and operation and existing engineering analyses. For high safety significant SSCs, performance is monitored by considering unavailability and reliability or condition of the SSC, usually at the train level. For low safety significant normally operating SSCs, performance is monitored at the plant level usually through monitoring unplanned scrams, unplanned capability loss, and/or unplanned safety system actuations. The reliability of low-safety significant stand-by systems is monitored at the train level. All SSCs in scope of the rule are monitored by one of these means, unless the licensee makes the determination that the SSC is either inherently reliable (such as cable trays) or can be "run to failure" (such as fuses). Feedback from the monitoring of preventive maintenance determines whether the SSC can continue to be monitored using these criteria (meeting the criteria substantiates the effectiveness of the preventive maintenance); or, when preventive maintenance is no longer effective, the SSC is subject to corrective action and goal setting. Goal setting is a form of performance monitoring that is specific to the equipment and identified failure mechanism. Feedback from the monitoring programs is used to adjust preventive maintenance activities to balance reliability and availability of SSCs and, as necessary, to reevaluate risk significance based on actual performance.

REVISED PRA IMPLEMENTATION PLAN
TASK TABLE (March 1997)

1.0 REACTOR REGULATION

Regulatory Activity	Objectives	Methods	Target Schedule	Lead Office(s)
1.1 DEVELOP STANDARD REVIEW PLANS FOR RISK-INFORMED REGULATION	Standard review plans for NRC staff to use in risk-informed regulatory decision-making.	* Evaluate available industry guidance. * Develop a broad scope standard review plan (SRP) chapters and a series of application specific standard review plan chapters that correspond to industry initiatives. * These SRPs will be consistent with the Regulatory Guides developed for the industry. * Draft SRPs transmitted to Commission to issue for public comment General IST ISI TS * Issue final SRP General IST ISI TS	3/97 3/97 7/97 3/97 12/97 12/97 2/98 12/97	NRR
1.2 PILOT APPLICATION FOR RISK-INFORMED REGULATORY INITIATIVES	* Evaluate the PRA methodology and develop staff positions on emerging, risk-informed initiatives, including those associated with: 1. Motor operated valves. 2. IST requirements. 3. ISI requirements. 4. Graded quality assurance. 5. Maintenance Rule. 6. Technical specifications. 7. Other applications to be identified later.	* Interface with industry groups. * Evaluation of appropriate documentation (e.g., 10 CFR, SRP, Reg Guides, inspection procedures, and industry codes) to identify elements critical to achieving the intent of existing requirements. * Evaluation of industry proposals. * Evaluation of industry pilot program implementation. * As appropriate, complete pilot reviews and issue staff findings on regulatory requests.	1. 2/96C* 2. 6/97 3. 4/98 4. 6/97 (STP) 12/97 (others) 5. 9/95C 6. 3/97	NRR

Regulatory Activity	Objectives	Methods	Target Schedule	Lead Office(s)
1.3 INSPECTIONS	* Provide guidance on the use of plant-specific and generic information from IPEs and other plant-specific PRAs.	* Develop IMC 9900 technical guidance on the use of PRAs in the power reactor inspection program.	4/97	NRR
		* Revise IMC 2515 Appendix C on the use of PRAs in the power reactor inspection program.	6/97	
		* Propose guidance options for inspection procedures related to 50.59 evaluations and regular maintenance observations.	10/97	
		* Review core inspection procedures and propose PRA guidance where needed.	6/97	
		* Issue draft Graded QA Inspection Procedure for public comment	9/97	
		* Issue final Graded QA Inspection Procedure	3/98	
	* Provide PRA training for inspectors.	* Identify inspector functions which should utilize PRA methods, as input to AEOD/TTD for their development and refinement of PRA training for inspectors.	7/96C	NRR
		* Develop consolidated/comprehensive 2-3 week PRA for regulatory applications training course.	8/97	NRR/ AEOD
		* First course offering.	10/97	NRR/ AEOD
		* Conduct training for Maintenance Rule baseline inspections	8/96C	
	*Provide PRA training for Senior Reactor Analysts (SRA)	* Conduct training courses according to SRA training programs	3/97	NRR
		* Rotational assignments for SRAs to gain working experience	3/97	NRR/RES
	* Continue to provide expertise in risk assessment to support regional inspection activities and to communicate inspection program guidance and examples of its implementation.	* Monitor the use of risk in inspection reports.	Ongoing	NRR
		* Develop new methodologies and communicate appropriate uses of risk insights to regional offices.		
		* Update inspection procedures as needed.		
		* Assist regional offices as needed.		
		* Conduct Maintenance Rule baseline inspections	7/98	

Regulatory Activity	Objectives	Methods	Target Schedule	Lead Office(s)
1.4 OPERATOR LICENSING	Monitor insights from HRAs and PRAs (including IPEs and IPEEEs) and operating experience to identify possible enhancements for inclusion in planned revisions to guidance for operator licensing activities (initial and requalification)	* Revise the Knowledge and Abilities (K/A) Catalogs (NUREGs 1122 and 1123) to incorporate operating experience and risk insights. * Revise the Examiner Standards (NUREG-1021), as needed, to reflect PRA insights.	8/95C 3/97C	NRR NRR
1.5 EVENT ASSESSMENT	* Continue to conduct quantitative event assessments of reactor events while at-power and during low power and shutdown conditions.	* Continue to evaluate 50.72 events using ASP models.	Ongoing	NRR
	* Assess the desirability and feasibility of conducting quantitative risk assessments on non-power reactor events.	* Define the current use of risk analysis methods and insights in current event assessments. * Assess the feasibility of developing appropriate risk assessment models. * Develop recommendations on the feasibility and desirability of conducting quantitative risk assessments.	TBD	NRR
1.6 EVALUATE USE OF PRA IN RESOLUTION OF GENERIC ISSUES	* Audit the adequacy of licensee analyses in IPEs and IPEEEs to identify plant-specific applicability of generic issues closed out based on IPE and IPEEE programs.	* Identify generic safety issues to be audited. * Select plants to be audited for each issue. * Describe and discuss licensees' analyses supporting issue resolution. * Evaluate results to determine regulatory response; i.e., no action, additional audits, or regulatory action.	TBD	NRR
1.7 REGULATORY EFFECTIVENESS EVALUATION	* Assess the effectiveness of major safety issue resolution efforts for reducing risk to public health and safety.	* Develop process/guidance for assessing regulatory effectiveness. * Apply method to assess reduction in risk. * Evaluate result, effectiveness of rules. * Propose modifications to resolution approaches, as needed. * Identify other issues for assessment if appropriate.	TBD	NRR & RES
1.8 ADVANCED REACTOR REVIEWS	* Continue staff reviews of PRAs for design certification applications.	* Continue to apply current staff review process.	Ongoing	NRR
	* Develop SRP to support review of PRAs for design certification reviews of evolutionary reactors (ABWR and System 80+).	* Develop draft SRP to tech staff for review and concurrence. * Finalize SRP.	6/98 12/99	NRR

Regulatory Activity	Objectives	Methods	Target Schedule	Lead Office(s)
	* Develop independent technical analyses and criteria for evaluating industry initiatives and petitions regarding simplification of Emergency Preparedness (EP) regulations.	* Reevaluate risk-based aspects of the technical bases for EP (NUREG-0396) using insights from NUREG-1150, the new source term information from NUREG-1465, and available plant design and PRA information for the passive and evolutionary reactor designs.	12/96C	NRR & RES
1.9 ACCIDENT MANAGEMENT	* Develop generic and plant specific risk insights to support staff audits of utility accidents management (A/M) programs at selected plants.	* Perform an assessment of A/M-related information contained in IPE databases to develop generic insights into A/M strategies and capabilities and document it in IPE Insights Report. * Develop plant-specific A/M insights/information for selected plants to serve as a basis for assessing completeness of utility A/M program elements (e.g., severe accident training)	6/97 TBD	NRR & RES
1.10 EVALUATING IPE INSIGHTS TO DETERMINE NECESSARY FOLLOW-UP ACTIVITIES	* Use insights from the staff review of IPEs to identify potential safety, policy, and technical issues, to determine an appropriate course of action to resolve these potential issues, and to identify possible safety enhancements. * Determine appropriate approach for tracking the regulatory uses of IPE/IPEEE results.	* Review the report “IPE Program: Perspectives on Reactor Safety and Plant Performance” and identify the intial list of required staff and industry actions (if any). Finalize list of required staff and industry actions. * Audit licensee improvements that were credited in the IPEs to determine effectiveness of licensee actions to reduce risk. * Define use for information, clarify "regulatory use", and assess the most effective methods for data collection. * If appropriate, develop approach for linking IPE/IPEEE data bases.	9/97 12/97 TBD 12/97 12/98	NRR & RES NRR

*C=Complete

Regulatory Activity	Objectives	Methods	Target Schedule	Lead Office(s)
2.1 DEVELOP REGULATORY GUIDES	Regulatory Guides for industry to use in risk-informed regulation.	* Draft PRA Regulatory Guides transmitted to Commission for approval to issue for public comment. General IST ISI GQA TS * Issue final PRA Regulatory Guides. General IST ISI GQA TS	 3/97 3/97 7/97 3/97 3/97 12/97 12/97 2/98 12/97 12/97	RES
2.2 TECHNICAL SUPPORT	* Provide technical support to agency users of risk assessment in the form of support for risk-based regulation activities, technical reviews, issue risk assessments, statistical analyses, and develop guidance for agency uses of risk assessment.	* Continue to provide ad hoc technical support to agency PRA users. * Expand the database of PRA models available for staff use, expand the scope of available models to include external event and low power and shutdown accidents, and refine the tools needed to use these models, and continue maintenance and user support for SAPHIRE and MACCS computer codes. * Support agency efforts in reactor safety improvements in former Soviet Union countries.	Continuing Continuing Continuing	RES RES RES

Regulatory Activity	Objectives	Methods	Target Schedule	Lead Office(s)
2.3 SUPPORT FOR NRR STANDARD REACTOR PRA REVIEWS	* Modify 10 CFR 52 and develop guidance on the use of updated PRAs beyond design certification (as described in SECY 93-087).	* Develop draft guidance and rule. * Solicit public comment. * Finalize staff guidance and rule.	5/98 11/98 12/99	RES RES RES
2.4 METHODS DEVELOPMENT AND DEMONSTRATION	* Develop, demonstrate, maintain, and ensure the quality of methods for performing, reviewing, and using PRAs and related techniques for existing reactor designs.	* Develop and demonstrate methods for including aging effects in PRAs. * Develop and demonstrate methods for including human errors of commission in PRAs. * Develop and demonstrate methods to incorporate organizational performance into PRAs.	TBD 9/97 9/97	RES RES RES
2.5 IPE AND IPEEE REVIEWS	* To evaluate IPE/IPEEE submittals to obtain reasonable assurance that the licensee has adequately analyzed the plant design and operations to discover vulnerabilities; and to document the significant safety insights resulting from IPE/IPEEEs.	* Complete reviews of IPE submittals. * Complete reviews of IPEEE submittals. * Continue regional IPE presentations. * Issue IPE insights report for public comment. * Final IPE insights report * Issue interim IPEEE insights report * Issue draft final IPEEE insights report	9/97* 12/98 Ongoing 10/96C 6/97 9/97 9/98	RES RES RES RES RES RES RES
2.6 GENERIC ISSUES PROGRAM	* To conduct generic safety issue management activities, including prioritization, resolution, and documentation, for issues relating to currently operating reactors, for advanced reactors as appropriate, and for development or revision of associated regulatory and standards instruments.	* Continue to prioritize and resolve generic issues.	Continuing	RES

* See text for discussion of IPE review status.

3.0 ANALYSIS AND EVALUATION OF OPERATING EXPERIENCE, AND TRAINING

Regulatory Activity	Objectives	Methods	Target Schedule	Lead Office
3.1 RISK-BASED TRENDS AND PATTERNS ANALYSIS	* Use reactor operating experience data to assess the trends and patterns in equipment, systems, initiating events, human performance, and important accident sequence.	* Trend performance of risk-important components. * Trend performance of risk-important systems. * Trend frequency of risk-important initiating events. * Trend human performance for reliability characteristics.	9/97 9/98 8/97 TBD	AEOD
	* Evaluate the effectiveness of licensee actions taken to resolve risk significant safety issues.	* Trend reactor operating experience associated with specific safety issues and assess risk implications as a measure of safety performance.	As Needed	AEOD
	* Develop trending methods and special databases for use in AEOD trending activities and for PRA applications in other NRC offices.	* Develop standard trending and statistical analysis procedures for identified areas for reliability and statistical applications. * Develop special software and databases (e.g. common cause failure) for use in trending analyses and PRA studies.	Complete CCF-Complete Periodic updates	AEOD
3.2 ACCIDENT SEQUENCE PRECURSOR (ASP) PROGRAM	* Identify and rank risk significance of operational events.	* Screen and analyze LERs, AITs, IITs, and events identified from other sources to obtain ASP events. * Perform independent review of each ASP analyses. Licensees and NRC staff peer review of each analysis. * Complete quality assurance of Rev. 2 simplified plant specific models. * Complete feasibility study for low power and shutdown models. * Complete initial containment performance and consequence models.	Ongoing Annual report, Ongoing 3/97C 11/96C Complete	AEOD AEOD RES RES RES

	* Provide supplemental information on plant specific performance.	* Share ASP analyses and insights with other NRC offices and Regions.	Annual rpt	AEOD

Regulatory Actvity	Objectives	Methods	Target Schedule	Lead Office
3.3 INDUSTRY RISK TRENDS	* Provide a measure of industry risk that is as complete as possible to determine whether risk is increasing, decreasing, or remaining constant over time.	* Develop program plan which integrates NRR, RES, and AEOD activities which use design and operating experience to assess the implied level of risk and how it is changing. * Implement program plan elements which will include plant-specific models and insights from IPEs, component and system reliability data, and other risk-important design and operational data in an integrated frame work to periodically evaluate industry trends.	Complete 9/98	AEOD
3.4 RISK-BASED PERFORMANCE INDICATORS	* Establish a comprehensive set of performance indicators and supplementary performance measures which are more closely related to risk and provide both early indication and confirmation of plant performance problems.	* Identify new or improved risk-based PIs which use component and system reliability models & human and organizational performance evaluation methods. * Develop and test candidate PIs/performance measures. * Implement risk-based PIs with Commission approval.	Complete 3/99 9/99	AEOD
3.5 COMPILE OPERATING EXPERIENCE DATA	* Compile operating experience information in database systems suitable for quantitative reliability and risk analysis applications. Information should be scrutable to the source at the event level to the extent practical and be sufficient for estimating reliability and availability parameters for NRC applications.	* Manage and maintain SCSS and the PI data base, provide oversight and access to NPRDS, obtain INPO's SSPI, compile IPE failure data, collect plant-specific reliability and availability data. * Develop, manage, and maintain agency databases for reliability/availability data (equipment performance, initiating events, CCF, ASP, and human performance data). * Revise reporting rules to better capture equipment reliability information. * Evaluation of voluntary approach for collecting reliability data * Final reliability data rule (if necessary) * Determine need to revise LER rule to eliminate unnecessary and less safety-significant reporting. * Determine need to revise reporting rules and to better capture ASP, CCF, and human performance events.	Ongoing Ongoing 10/97 4/97 6 mo. After Decision on Vol. Approach. 4/97 6/98	AEOD

Regulatory Activity	Objectives	Methods	Target Schedule	Lead Office(s)
3.6 STAFF TRAINING	* Present PRA curriculum as presently scheduled for FY 1996	* Continue current contracts to present courses as scheduled. * Maintain current reactor technology courses that include PRA insights and applications. * Improve courses via feedback. * Review current PRA course material to ensure consistency with Appendix C.	Ongoing Ongoing Ongoing Complete	AEOD
	* Develop and present Appendix C training courses.	* Prepare course material based on Appendix C. * Present courses on Appendix C.	Complete Complete	RES and AEOD
	* Determine staff requirements for training, including analysis of knowledge and skills, needed by the NRC staff.	* Review JTAs performed to date. * Perform representative JTAs for staff positions (JTA Pilot Program). * Evaluate staff training requirements as identified in the PRA Implementation Plan and the Technical Training Needs Survey (Phase 2) and incorporate them into the training requirements analysis. * Analyze the results of the JTA Pilot Program and determine requirements for additional JTAs. * Complete JTAs for other staff positions as needed. * Solicit a review of the proposed training requirements. * Finalize the requirements.	Complete Complete Complete Ongoing Ongoing Ongoing Ongoing	AEOD
	* Revise current PRA curriculum and develop new training program to fulfill identified staff needs.	* Prepare new courses to meet identified needs. * Revise current PRA courses to meet identified needs. * Revise current reactor technology courses as necessary to include additional PRA insights and applications.	12/97 12/97 Complete 3/96	AEOD
	* Present revised PRA training curriculum.	* Establish contracts for presentation of new PRA curriculum. * Present revised reactor technology courses. * Improve courses based on feedback.	Ongoing Ongoing Ongoing	AEOD

Regulatory Activity	Objectives	Methods	Target Schedule	Lead Office(s)
4.1 Validate risk analysis methodology developed to assess most likely failure modes and human performance in the use of industrial and medical radiation devices.	* Validate risk analysis methodology developed to assess the relative profile of most likely contributors to misadministrations for the gamma stereotactic device (gamma knife).	* Hold a workshop consisting of experts in PRA and HRA to examine existing work and to provide recommendations for further methodological development. * Examine the use of Monte Carlo simulation and its application to relative risk profiling. * Examine the use of expert judgement in developing error rates and consequence measures.	8/94 Completed 9/95 Completed 9/95 Completed	NMSS
	* Continue the development of the relative risk methodology, with the addition of event tree modeling of the brachytherapy remote afterloader.	* Develop functionally based generic event trees.	TBD	RES/ NMSS
	* Extend the application of the methodology and its further development into additional devices, including teletherapy and the pulsed high dose rate afterloader.	*Develop generic risk approaches.	TBD	RES/ NMSS
4.2 Continue use of risk assessment of allowable radiation releases and doses associated with low-level radioactive waste and residual activity.	* Develop decision criteria to support regulatory decision making that incorporates both deterministic and risk-based engineering judgement.	* Conduct enhanced participatory rulemaking to establish radiological criteria for decommissioning nuclear sites; technical support for rulemaking including comprehensive risk based assessment of residual contamination. * Work with DOE and EPA to the extent practicable to develop common approaches, assumptions, and models for evaluating risks and alternative remediation methodologies. (Risk harmonization).	8/94 PR Complete Final Rule 4/97 (Dependent on EPA) Ongoing	RES & NMSS
4.3 Develop guidance for the review of risk associated with waste repositories.	* Develop a Branch Technical Position on conducting a Performance Assessment of a LLW disposal facility.	* Solicit public comments * Publish final Branch Technical Position	4/97 8/97	NMSS & RES

Regulatory Activity	Objectives	Methods	Target Schedule	Lead Office(s)
4.4 Risk assessment of Material uses.	* Develop and demonstrate a risk assessment for industrial gauges containing cesium-137 and cobalt-60 using PRA and other related techniques. *The assessment should allow for modification based on changes in regulatory requirements. * Use emperical data as much as practicable. * Develop and demonstrate risk assessment methods for application to medical and industrial licensee activities.	* Develop and demonstrate methods for determining the risk associated with industrial gauges containing cesium-137 and cobalt-60. * Final report as NUREG	7/98 10/98	

Regulatory Activity	Objectives	Methods	Target Schedule	Lead Office(s)
5.1 REGULATION OF HIGH-LEVEL NUCLEAR WASTE	* Develop guidance for the NRC and CNWRA staffs in the use of PA to evaluate the safety of HLW programs.	* Assist the staff in pre-licensing activities and in license application reviews. * Develop a technical assessment capability in total-system and subsystem PA for use in licensing and pre-licensing reviews. * Combine specialized technical disciplines (earth sciences and engineering) with those of system modelers to improve methodology.	Ongoing	NMSS
	* Identify significant events, processes, and parameters affecting total system performance.	* Perform sensitivity studies of key technical issues using iterative performance assessment (IPA).	Ongoing	NMSS
	* Use PA and PSA methods, results and insights to evaluate proposed changes to regulations governing the potential repository at Yucca Mountain.	* Assist the staff to maintain and to refine the regulatory structure in 10 CFR Part 60 that pertains to PA. * Apply IPA analyses to advise EPA in its development of a Yucca Mountain regulation * Apply IPA analyses to conform 10 CFR 60 to EPA's regulations	Ongoing	NMSS
	* Continue PA activities during interactions with DOE during the pre-licensing phase of repository development, site characterization, and repository design.	* Provide guidance to the DOE on site characterization requirements, ongoing design work, and licensing issues important to the DOE's development of a complete and high-quality license application. * Compare results of NRC's iterative performance assessment to DOE's TSPA-95 to identify major differences/issues.	Ongoing	NMSS
5.2 APPLY PRA TO SPENT FUEL STORAGE FACILITIES	* Demonstrate methods for PRA of spent fuel storage facilities.	* Prepare user needs letter to RES * conduct PRA of dry cask storage	4/97 TBD	NMSS/RES
5.3 CONTINUE USE OF RISK ASSESSMENT IN SUPPORT OF RADIOACTIVE MATERIAL TRANSPORTATION	* Use PRA methods, results, and insights to evaluate regulations governing the transportation of radioactive material.	* Update the database on transportation of radioactive materials for future applications * Revalidate the results of NUREG-0170 for spent fuel shipment risk estimates	end of FY 99 6/99	NMSS

ATTACHMENT 2

SUMMARY DISCUSSION ON PERFORMANCE MONITORING IN THE CURRENT PRA PILOT APPLICATIONS

Performance Monitoring in PRA Pilot Applications

In its January 22, 1997 Staff Requirements Memorandum (SRM), the Commission stated that the staff should provide a summary discussion on how performance monitoring is being addressed in the current PRA Pilot Applications and, where appropriate, other planned performance-based approaches.

The PRA Pilot Applications are activities associated with evaluating risk-informed approaches to technical specifications, inservice testing of pumps and valves, inservice inspection, and quality assurance. Although the PRA Pilot Applications are not performance-based pilots, the staff has considered how performance-based strategies may be used to complement these risk-informed approaches. As a result of interactions with PRA Pilot Application licensees and the development of the risk-informed regulatory guides and standard review plans, the staff determined that implementation and performance-monitoring strategies are a key element of the risk-informed decision-making process. In fact, the fifth principle for considering risk-informed regulatory approaches indicates that the staff should ensure that "[p]erformance-based implementation and monitoring strategies are proposed that address uncertainties in analysis models and data and provide for timely feedback and corrective action."

In general, the PRA Pilot Application licensees considered the monitoring required by the maintenance rule (10 CFR 50.65) as the starting point for establishing application-specific performance-monitoring strategies.

Reliability and availability monitoring aspects of this section can be performed using the data anticipated from the proposed reliability and availability data rule for those systems and components under the scope of the rule. For systems and components outside the proposed rule scope, similar data would suffice for monitoring equipment reliability and availability performance.

PRA Pilot Applications and Technical Issues Associated with Implementation and Monitoring

In SECY-96-218, "Quarterly Status Update for the Probabilistic Risk Assessment (PRA) Implementation Plan, Including a Discussion of Four Emerging Policy Issues Associated with Risk-Informed Performance-Based Regulation," dated October 11, 1996, the staff provided a summary list of key technical and process issues associated with moving toward risk-informed, performance-based approaches. In its January 22, 1997 SRM, the Commission indicated that the staff should address the technical issues concerning how the implementation and monitoring aspects of performance-based regulations are considered in current or planned performance-based approaches.

Staff experiences with the PRA Pilot Applications, experiences with recent or proposed rulemaking concerning containment leakage requirements, fire protection and shutdown risk, and experiences developing and implementing the maintenance rule account for a large percentage of the staff's experience with performance-based regulatory approaches. As previously mentioned, although the PRA Pilot Applications are not performance-based pilots, the staff has considered how performance-based strategies may be used to complement these risk-informed approaches. In the draft risk-informed regulatory guidance documents, the staff identified acceptable alternatives to address the technical issues associated with implementation and monitoring in a risk-informed decision-making process.

The first issue concerns identifying the appropriate performance characteristics to monitor. In each application-specific regulatory document, there is a discussion of the performance-monitoring attributes. The regulatory guides provide licensees with flexibility to determine appropriate parameters to monitor to ensure that the performance of the component does not deteriorate to an unacceptable level and ensure that appropriate corrective action is pursued.

In graded QA, the availability of the components is the performance characteristic of interest, but may be difficult or impossible to measure directly in practice at the magnitudes credited in the PRA. Graded QA would rely on performance indicators associated with the monitoring of equipment failures, and would also include industry experience input. It is envisioned that for some aspects, the Maintenance Rule monitoring could be useful for graded QA purposes. However, low safety significant equipment may only be monitored at the plant level under the Maintenance Rule. In that case, individual equipment failures attributable to reduced QA controls may not be identified under the Maintenance Rule monitoring approach. This would preempt the ability to perform further evaluation of those failures to ascertain whether the QA controls need to be adjusted. The licensee will be expected to detect and correct unacceptable practices which, if uncorrected, may cause the availability of low-safety-significant SSCs to deteriorate beyond the bounding values used in the safety categorization process. The graded QA descriptions of the monitoring approach have only been discussed at the conceptual levels. Detailed implementation will be developed as the pilot reviews and completed with additional guidance provided in the final GQA RG.

For inservice testing pilot activities, the staff is working with pilot licensees to ensure that a performance-monitoring program is included as part of the pilot licensee's risk-informed inservice testing program if the licensee proposes to extend the test intervals for low safety significant components (LSSC) or change testing strategies for high safety significant components (HSSC). The performance-monitoring programs should have the following attributes: 1) enough tests are included to provide meaningful data, 2) the test is devised such that the incipient degradation can reasonably be expected to be detected, and 3) the licensee trends appropriate parameters as required by the ASME Code or ASME Code Case and (as nesessary) to provide validation of the PRA. This will ensure that degradation is not significant for components that are placed on an extended test interval and that the failure rate assumptions for these components are not compromised. Therefore, and in contrast to the performance monitoring required by the maintenance rule, performance monitoring for risk-informed inservice testing must be done at the component level.[2] The staff acknowledges that any component monitoring that is performed as part of the Maintenance Rule implementation can be used to satisfy monitoring as described in the RI-IST program guidance provided the performance criteria chosen are compatible with the RI-IST guidance provided in DR-1062. Where a licensee chooses to rely upon the monitoring by the Maintenance Rule to satisfy monitoring conducted in support of a RI-IST program for safety-related and important to safety SSCs, that monitoring should be subject to the requirements of 10 CFR Part 50, Appendix B.

In service inspection must also use performance indicators at a level below pipe rupture. Current plans are to characterize weld performance as the lack of flaw growth and the lack of leaks. The staff is investigating the option of establishing the number of inspections and frequency of inspections based on leak target goals. A performance-based inspection program may be developed with those target goals as indicators. Applying these goals in a risk-informed inservice inspection program may provide an alternative that assures an acceptable level of quality and safety {per 50.55a(a)(3)(I)}, while at the same time reducing excessive conservatisms in the present programs, directing inspection programs on critical weld locations, adhering to the ALARA principles (reduction in personnel radiation exposure), and enhancing safety by inspecting high-safety-significant piping that is presently not under the ASME Section XI inspection programs (roughly estimated as contributing to 20% of the risk from pipe breaks).

The second issue (related to performance-based implementation) concerns how the equipment to be monitored is selected   For risk-informed program changes, a monitoring program should be establish for equipment covered by the proposed change. For some of the risk-informed pilot applications, the selection of components to be monitored is straightforward. In general, risk-informed applications include SSCs within the associated issues regulatory scope, as well as additional SSCs categorized as high safety significant components. The scope of the SSCs to categorize is similar to the maintenance rule scope, expanded to included SSCs characterized by non-maintenance preventable failures.

For graded QA, the scope of application will be similar to the Maintenance Rule scope. In graded QA as currently envisioned, the QA controls on high-safety-significant, safety related SSCs will not be changed. Oversight of low-safety-significant but safety related SSCs may be reduced commensurate with their importance to safety. This includes a reduction of QA controls on equipment associated with specific operating modes

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Under the maintenance rule, the performance of low safety significant SSCs is monitored at the plant or system level usually through monitoring unplanned scrams, unplanned capability loss, and/or unplanned safety system actuations.

which do not support the high-safety-significant operating mode. This allows, for example, a reduction in QA controls on the motor operator of a locked open, motor operated valve while maintaining full Appendix B requirements on the pressure boundary function of the valve.

For risk-informed inservice testing the components to be monitored include the current ASME Code required components as well as non-Code components that are categorized as high safety significant components

In ISI, pipe segments are defined but the inspection program is applied to selected welds within a segment as appropriate. Current plans are to inspect the welds exposed to the worst degradation mechanisms in a segment, or a representative selection if all degradation mechanisms are the same.

The third issue concerns how the selected equipment's performance be monitored. In graded QA, the current industry proposals and staff guidance emphasize the monitoring of equipment failures and the feedback of observed failures into a plant specific quantitative data base for further evaluation by the licensee. The staff plans to also include the more traditional monitoring (use of audits and surveillances) of the licensee implementation of the graded QA implementation plan itself.

In ISI, the monitoring (inservice inspection type and equipment) is to be adapted to the degradation mechanisms to which the selected welds are exposed. This should result in an improvement of the detection capability.

Once the components to be monitored are identified, the monitoring program should provide a means to adequately track the performance of the equipment affected by the proposed change and should be capable of trending equipment performance after the change has been implemented to demonstrate that performance is consistent with that predicted by the traditional engineering and probabilistic analyses that were conducted to justify the change .In the case of risk-informed technical specifications, for example, the monitoring under the requirements of the maintenance rule would satisfy the monitoring program requirements necessary to support risk-informed changes to technical specification, provided that this monitoring is subject to the requirements of 10 CFR Part 50 Appendix B. For risk-informed inservice testing, licensees should monitor performance characteristics as required by a test strategy that is developed from looking at the failure modes and the associated failure causes. Testing should be designed to detect failures as well as degradation that leads to these failure causes (e.g., as described in ASME Code case OMN-1).

Finally, the fourth performance-based issue deals with how feedback from the monitoring will be used to make adjustments in implementation. For risk-informed graded quality assurance, operating experience, plant modifications and SSC replacements, degradation monitoring, and PRA monitoring shall be used by the licensee to assess the need to revise SSC safety significance categorizations or adjust QA controls. ISI will include expanded testing if flaws are discovered during inspections. The discovery of new types of weld flaws in the industry is also intended to initiate a re-evaluation and expansion of the test program but it is not yet clear how such an industry wide program will be put in place. For technical specifications, a three-tiered approach will be used to support the overall configuration risk management process. If performance-monitoring reveals adverse trends in reliability or availability, the licensee shall taken appropriate corrective action that may include changes to the technical specifications.

For risk-informed inservice testing, the feedback mechanism should ensure that if a particular component's test strategy is adjusted in a way that is ineffective in detecting component degradation and failure, the IST program weakness is promptly detected and corrected. Subsequent corrective actions should 1) assess the validity of the PRA failure rate and unavailability assumptions in light of the failure(s), and 2) consider the effectiveness of the component's test strategy in detecting the failure or nonconforming condition. These corrective actions may result in adjustments to the test frequency and/or methods where the component (or group of components) experiences repeated failures or nonconforming conditions.

Addressing the Technical Issues Associated with Implementation and Monitoring in Maintenance Rule Inspection Activities

Monitoring performance under the Maintenance Rule is accomplished through the approach described in NUMARC 93-01, which was endorsed by the NRC through RG 1.160. The purpose of monitoring under the maintenance rule is to determine the effectiveness of maintenance. Monitoring programs developed using the guidance in NUMARC 93-01 evaluate performance at the system or train level for high safety significant and standby SSCs and at the plant level for low safety significant normally operating SSCs. High safety significant SSCs are determined by the expert panel using input from the PRA as well as knowledge of plant design and operation and existing engineering analyses. For high safety significant and stand-by SSCs, performance is monitored by considering unavailability and reliability or condition of the SSC, usually at the train level. For low safety significant normally operating SSCs, performance is monitored at the plant level usually through monitoring unplanned scrams, unplanned capability loss, and/or unplanned safety system actuations. The reliability of low-safety significant stand-by systems is monitored at the train level. All SSCs in scope of the rule are monitored by one of these means, unless the licensee makes the determination that the SSC is either inherently reliable (such as cable trays) or can be "run to failure" (such as fuses). Feedback from the monitoring of preventive maintenance determines whether the SSC can continue to be monitored using these criteria (meeting the criteria substantiates the effectiveness of the preventive maintenance); or, when preventive maintenance is no longer effective, the SSC is subject to corrective action and goal setting. Goal setting is a form of performance monitoring that is specific to the equipment and identified failure mechanism. Feedback from the monitoring programs is used to adjust preventive maintenance activities to balance reliability and availability of SSCs and, as necessary, to reevaluate risk significance based on actual performance.