

July 31, 1998

FOR: The Commissioners

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

SUBJECT: QUARTERLY STATUS REPORT ON THE PROBABILISTIC RISK ASSESSMENT IMPLEMENTATION PLAN

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PURPOSE:

To report the status of the Probabilistic Risk Assessment (PRA) Implementation Plan (PIP) for the period April 1 to June 30, 1998.

SUMMARY:

This paper describes accomplishments and changes to the staff's PIP for the period April 1 to June 30, 1998. The principal accomplishments in this second calendar quarter of 1998 are transmittal to the Commission of the revised standard review plan (SRP) and associated regulatory guide (RG) documenting general guidance on risk-informed decisionmaking for changes to the plant-specific licensing basis; transmittal to the Commission of proposed final risk-informed inservice testing (IST) guidance documents (RG 1.175 and SRP section 3.9.7), technical specifications (TS) (RG 1.177 and SRP Section 16.1), and graded quality assurance (GQA) (RG 1.176), SECY-98-067, April 2, 1998; transmittal to the Commission of revised versions of draft RG and SRP for risk informed inservice inspection (ISI), SECY-98-139,

June 11, 1998, indicating that the documents would be issued for trial use in the ongoing risk-informed ISI pilot plant and topical report reviews; completion of the safety evaluation report (SER) for the Comanche Peak risk-informed IST program; completion of an additional 13 Maintenance Rule baseline inspections; completion of two more IPEEE staff evaluation reports and an additional eight preliminary IPEEE reviews; completion of the final report on auxiliary feedwater (AFW) system operating experience, to be published as NUREG/CR-5500, Volume 1. It is also noted that the staff established several short term initiatives targeting a more efficient review and disposition of an anticipated increasing number of risk-informed licensing submittals; and completed a trial use of the "PRA Applications Database," to help identify and clarify significant regulatory uses of nuclear power plant PRA results and assessment of methods for efficient data collection and dissemination.

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BACKGROUND:

In a memorandum dated January 3, 1996, from the Executive Director for Operations to Chairman Jackson, the staff committed to submitting quarterly reports on the status of its development of risk-informed standards and guidance. Previous quarterly reports were sent to the Commission on March 26, June 20, and October 11, 1996; January 13, April 3, July 22, and October 14, 1997; January 23, and May 1, 1998. This quarterly report covers the period from April 1 to June 30, 1998.

DISCUSSION:

The significant accomplishments and changes for each individual section of the PIP are summarized here. More detailed information is included in [Attachment 1](#).

In order to better ensure execution of the PIP, the Steering Committee for NRC risk-informed activities is being reestablished to give policy, technical, and priority guidance on risk-informed regulatory activities. The committee will be comprised of the office directors from the Office for Analysis and Evaluation of Operational Data (AEOD), Office of Enforcement (OE), Office of Nuclear Regulatory Research (RES), Office of Nuclear Reactor Regulation (NRR), Office of Nuclear Material Safety and Safeguards (NMSS), and the Region II Regional Administrator. The Office of the General Counsel (OGC) will also be requested to participate. The Steering Committee will be chaired by Mr. Ashok Thadani, Director, RES. The first meeting of the reestablished Committee is briefly discussed under section 2.12, "Review of Agency Programs and Processes".

Section 1: Reactor Regulation

As the risk-informed regulatory guidance documents are issued in final form and the associated pilot programs are completed, the staff expects to see an increased number of risk-informed licensing submittals. Experience also indicates that improvements in the staff's review process are warranted. To ensure their efficient review and disposition, the staff established the following short term initiatives which are being implemented.

- The priority of risk-informed licensing action reviews is increasing. Allocation of staff resources will be based on the potential safety benefits of the actions, and on potential savings of staff and licensee resources.
- A lead project manager (PM) was established for the coordination of the risk-informed, performance-based licensing actions. The lead PM is responsible for identifying, monitoring, and coordinating risk-informed licensing actions; keeping track of the review schedules; helping identify problems that may require management attention; and coordinating followup actions (if any).
- The Steering Committee for NRC risk-informed activities is being reestablished, as discussed above.
- A database of risk-informed licensing actions is being created to facilitate monitoring and tracking of reviews and assist in focusing management attention where needed.

1.1 Standard Review Plans for Risk-Informed Regulation

The proposed final versions of SRP Chapter 19 and RG 1.174, documenting general guidance on the use of PRA in risk-informed decisionmaking for changes to the plant-specific licensing basis, were forwarded to the Commission in SECY-98-015 on January 30, 1998. In its May 20, 1998, SRM, the Commission approved for publication SRP Chapter 19 and RG 1.174. They are scheduled to be published in final form in July 1998.

The staff completed its review of public comments on the draft risk-informed RGs and SRPs for IST, TS, and GQA. The proposed final versions of the risk-informed regulatory documents for IST (RG 1.175 and SRP Section 3.9.7), TS (RG 1.177 and SRP Section 16.1), and GQA (RG 1.176) were sent to the Commission on April 2, 1998, in SECY-98-067. The SRM for

SECY-98-067, which approved publication of the *Federal Register* Notice and issuance of the "Final Application-Specific Regulatory Guides (RGs) and Standard Review Plans (SRPs) for Risk-Informed Regulation of Power Reactors" after appropriate revisions by the staff, was issued on June 29, 1998. The staff plans to publish the final guides in August 1998.

The staff completed its review of public comments on the draft RG and SRP for ISI. The staff sent the revised versions to the Commission in SECY-98-139, June 11, 1998, indicating that the documents would be issued for trial use in the ongoing risk-informed ISI pilot plant and topical report reviews. This approach sets the ISI RG and SRP apart from the other risk-informed documents recently transmitted to the Commission that were developed with the benefit of pilot plant applications and were proposed for issuance as final documents. The trial versions of these documents incorporate public comments, changes to the general guidance documents (RG 1.174 and SRP Chapter 19), additional management review, and OGC, Advisory Committee for Reactor Safeguards (ACRS), and Committee for Review of Generic Requirements (CRGR) comments. The staff discussed these documents with the full ACRS membership on May 3 and June 4, 1998, and with CRGR on May 21, 1998. The staff intends to publish the ISI RG and SRP for trial use in August 1998.

1.2 Pilot Applications for Risk-Informed Regulatory Initiatives

The staff is continuing to work toward submittal of final safety evaluation reports to the Commission for the ISI pilot plants according to the schedule presented in the May 1, 1998, PRA Implementation Plan Update (Vermont Yankee -- 10/98, Arkansas Nuclear One Unit 2 (ANO-2) and Surry -- 12/98). Schedule completion dates are dependent on the licensees meeting critical milestones. Vermont Yankee was in a refueling outage and has not yet responded to the first-round of requests for additional information (RAIs) forwarded in March 1998. In response to the staff's request that Surry supplement its original submittal because of completeness concerns, Surry delayed submitting additional material while it requested a review fee waiver. The waiver was granted on June 12, 1998, and Surry submitted the additional material on June 18, 1998. In recognition of substantial industry and NRC interest in expedited review, the staff had prepared first-round RAIs based on Surry's initial, incomplete submittal. In a conference call with the licensee and Westinghouse on June 24, 1998, Surry requested that these RAIs be forwarded immediately rather than waiting for the staff's review of the new material submitted on June 18, 1998. The RAIs were transmitted to Surry. The staff also transmitted first-round RAIs for the ANO-2 submittal and prepared second-round RAIs for "Westinghouse Owners Group Application of Risk-Informed Methods to Piping Inservice Inspection Topical Report," WCAP-14572.

An additional risk-informed ISI submittal from a non-pilot plant was received from Arkansas Nuclear One Unit 1 (ANO-1) in June. Browns Ferry and FitzPatrick have, through the Nuclear Energy Institute (NEI), also indicated that they intend to submit programs for approval. The staff has developed a long-term plan to address risk-informed reviews to be conducted following the three pilot plant reviews as well as overall risk-informed ISI regulatory activities for Fiscal Year (FY) 1998 to FY2002. The plan is consistent with NRC strategic and operating plans for the period. The staff is also considering granting a relief of up to two years regarding submitting an update of the next 10-year ISI program for the ISI of piping to give licensees an opportunity to develop and obtain approval for the risk-informed ISI program for piping, when properly justified. During the two-year extension period, licensees would be required to continue to implement their current ISI program. For those licensees that receive such an extension, the first ten-year interval under an approved risk-informed ISI program would be shortened by the period of extension, and the total number and types of examinations would have to be adjusted and adequately justified by the licensee based on its individual circumstances.

The staff is preparing a letter to Arizona Public Service documenting completion of the volunteer GQA interactions at Palo Verde. Although the licensee did not submit GQA program changes for review and approval, the interactions with Arizona Public Service and the information provided informally have aided the staff in developing GQA guidance documents. The pilot program phase of volunteer interactions on GQA is considered complete. The staff will continue to monitor all volunteer plant GQA implementation as appropriate. Development of the GQA inspection guidance procedure will continue to be tracked under Activity 1.3.

The staff is nearing completion of the SER on the Comanche Peak risk-informed IST program. The SER reflects TU Electric's revised risk-informed IST Program Description dated May 21, 1998, and TU Electric's request to use ASME Code Case OMN-1 to respond to NRC Generic Letter 96-05, "Periodic Verification of Design-Basis Capability of Safety-Related Motor-Operated Valves" (TU Electric Relief Request V-8), dated June 23, 1998. The SER is consistent with the recently approved RG 1.175 and SRP 3.9.7. The SER is currently being reviewed by management and the Office of the General Counsel and should be sent to the licensee in the near future.

Arizona Public Service (APS) recently told the staff orally of its intention to withdraw Palo Verde as a risk-informed IST pilot plant. APS has indicated that in the near future it plans to formally document this decision and its basis in a letter to the staff.

The staff has received, reviewed, and prepared safety evaluations and license amendments for risk-informed TS applications, using RG 1.177. These applications include extended allowed outage times (AOTs) for (1) ECCS (emergency core cooling system) equipment at San Onofre Units 2 and 3, which is the Combustion Engineering Owners Group pilot application, and (2) emergency diesel generators (EDGs) at the Fermi and Vogtle stations. The staff issued these license amendments in May and June 1998. In addition, the staff has received, reviewed, and is developing safety evaluations and license amendments, in accordance with RG 1.177, for follow-on risk-informed TS amendments, for example, the Southern California Edison supplemental request, received in January 1998, for extending the EDG AOT at San Onofre. The staff anticipates issuing these license amendments later this year.

The staff received (on March 2, 1998) from the licensee for ANO 1 and 2, a request for relief from the staff position in NUREG-0737 for hydrogen monitoring. The request was made in accordance with "Task Zero" of the Risk-Informed, Performance-Based Regulation Pilot Program ("Whole Plant Study") proposed by NEI. The staff is reviewing the proposal and believes that extending the time of initiation of hydrogen monitors may result in improved coordination of the activities in the control room following an accident. A meeting with the licensee has been requested to obtain additional information and expedite completion of the review with proposed completion by September 1998, subject to licensee support of the needed license amendment.

1.3 Inspections

The staff completed an additional thirteen Maintenance Rule (MR) baseline inspections during the second quarter of 1998 (April through June). This included inspection of licensee methods for using PRA in maintenance rule programs and inspection of safety assessments performed by licensees when taking equipment out of service for maintenance in accordance with 10 CFR 50.65(a)(3). The staff completed the last MR baseline inspection in the first week of July 1998.

Of the 18 core inspection procedures (IPs), 11 have been modified to incorporate guidance on use of risk insights. Application of risk insights was found to be impractical for five core IPs. As noted in SECY-98-096, changes to the remaining two core inspection procedures will be completed as follows: (1) for IP 71001, "Licensed Operator Requalification Program Evaluation," PRA guidance will be incorporated before August 31, 1998, and (2) for IP 82701, "Operational Status of the Emergency Preparedness Program," PRA guidance will be incorporated by April 1, 1999, after an audit of licensee severe-accident management programs. It is anticipated that revisions to Sections a(3) and a(4) of the Maintenance Rule may also influence the IP revisions. These changes are intended primarily to stress the use of Inspection Manual Chapter 2515 Appendix C "Use of Insights Derived From Probabilistic Risk Assessment (PRA)" in the selection of inspection items. Further efforts to incorporate a risk-informed basis within the inspection program are being made as part of an overall reassessment of the inspection program.

The schedule for issuing the draft and final GQA IPs has been revised. The staff now expects to issue the draft GQA inspection guidance in September 1998 and the final guidance in December 1998. This change was made because key personnel were assigned to higher priority tasks, such as conducting allegation-related inspections, working on licensing actions, working on a rulemaking petition for 10 CFR 50.59(a), and supporting AP600 design certification.

For the purpose of making risk information more accessible to inspectors, a new subtask has been initiated. This subtask, "Evaluate Methods of Presenting Risk Analysis Results in a Form Most Useful to Inspectors and Develop Options Relating to Providing Inspectors With Plant-Specific Risk Information," is scheduled to be finished in March 1999.

1.6 Use of PRA in Resolution of Generic Safety Issues

This activity has been moved to Section 1.10 of the PIP (Evaluating Integrated Plant Evaluation (IPE) Insights to Determine Necessary Follow-Up

Activities) where licensee closure of generic safety issues using plant-specific IPE results will be tracked.

1.8 Advanced Reactor Reviews

In the SRM for SECY-94-182, the Commission instructed the staff to develop a rule that would require applicants and holders of a combined construction and operating license (COL) to maintain, update, and use a PRA for the life of the facility. In the last few Rulemaking Activity Plan updates sent to the Commission, the staff stated this rulemaking activity is on hold pending additional resources. Since no significant interest by a U.S. utility in requesting a COL for an evolutionary LWR design is foreseen, the best use of the staff's resources at the present time appears to be to apply them in other risk-informed initiatives. Therefore, the staff transmitted a memorandum to the Commission on July 1, 1998, indicating it is giving this task a low priority. This activity is being tracked in the Rulemaking Activity Plan.

1.10 IPE Follow-Up Activities

In a May 21, 1996, Staff Requirements Memorandum (SRM), the Commission directed the staff to track regulatory uses of the results of individual plant examination/individual plant examination, external events (IPE/IPEEE). Subsequently the Commission directed the staff to establish procedures to monitor the cumulative changes in risk for a given nuclear facility as the result of license amendments that are conducive to quantitative risk assessments. In response to both Commission directives, the staff is developing a PRA Applications Database capable of tracking regulatory uses of PRA and monitoring changes in quantitative facility risk caused by plant, process, or procedure modifications that receive NRC review.

The staff noted that the guidance contained in draft RG DG-1061 and draft SRP Chapter 19 was intended to enable the staff to track and monitor cumulative changes in risk associated with risk-informed license amendment requests. Data collected from cumulative risk tracking forms that will be filled out by the staff will be incorporated into the PRA database. This risk tracking process collects information on changes in risk associated with regulatory activities that NRC normally reviews, such as licensing activities and actions. It is not designed to collect information on risk changes in areas in which NRC does not normally perform a risk review such as licensee-initiated PRA modeling changes, plant experience (e.g., changes in equipment failure rates or initiating event frequencies), licensee-initiated PRA assumption changes, or plant modifications made under 10 CFR 50.59. The cumulative risk captured by the database will provide snapshots of the effect that both licensing and other activities have on plant risk; but the database will not provide a continual statement of risk estimates unless they are routinely and voluntarily submitted by licensees.

The staff has completed a trial-use database to help identify and clarify significant regulatory uses of nuclear power plant PRA results and assessment of methods for efficient data collection and dissemination. The staff intends to track (1) risk-informed licensing changes, (2) inservice testing and inspection program changes, (3) GQA program changes, (4) risk-informed exemptions, (5) risk-informed notices of enforcement discretion (NOEDs), and (6) other significant PRA applications identified by senior reactor analysts (SRAs) at headquarters or the regions. Contractor assistance to fully implement the PRA Applications Database on the NRC LAN (local area network) has been obtained and work has commenced. The staff plans to complete procedures to support future data collection and creation of a user interface that can support widespread staff use by December 1998.

Section 2: Reactor Safety Research

2.1 Regulatory Guides

As discussed above, the proposed final versions of SRP Chapter 19 and RG 1.174 were approved by the Commission in an SRM dated May 20, 1998, and they were published in final form in July 1998.

The proposed final versions of the regulatory documents for risk-informed IST (RG 1.175 and SRP Section 3.9.7), risk-informed TS (RG 1.177 and SRP Section 16.1), risk-informed GQA (RG 1.176) were submitted to the Commission in SECY-98-067, and the Commission issued its SRM on SECY-98-067 on June 29, 1998, approving their issuance. They are expected to be published in final form by August 1998.

The guidance documents for risk-informed ISI, RG 1.178 (formerly DG-1063) and SRP Section 3.9.8, have been revised to reflect public comments and to conform to the general guidance documents (RG 1.174 and SRP Chapter 19). The proposed trial versions of the risk-informed regulatory documents were submitted to the Commission in SECY-98-139, and are to be published for trial use in August 1998.

2.4 Methods Development and Demonstration

An international peer review on ATHEANA, "A Technique for Human Event Analysis" was performed on June 11-12, 1998. ATHEANA is a next-generation human reliability analysis (HRA) method being developed by RES to more completely and accurately assess human reliability. The meeting also afforded an opportunity for other interested parties to learn about the method, including representatives from Spain, France, Japan, and the Netherlands and from several national laboratories. The review comments from the peer reviewers, along with feedback from others who have reviewed or used the HRA method, were supportive of the method and will be incorporated into a revision of NUREG-1624, "Technical Basis and Implementation Guidelines for A Technique for Human Event Analysis (ATHEANA)."

In its SRM dated June 29, 1998, the Commission directed the staff to eliminate any FY1998 "resource expenditures specifically directed at developing a systematic method of inferring management performance," and disapproved the use of any FY1999 and FY2000 resources for these purposes. Therefore, efforts for developing and demonstrating methods to incorporate organizational performance into PRAs have been terminated.

2.5 IPE and IPEEE Reviews

The staff has reviewed all of the 76 IPE submittals and issued staff evaluation reports (SERs) on its findings to each licensee. During this quarter the staff reissued to the licensee the SER for Crystal River 3 IPE; also, RES staff sent to NRR its SER on the revised Susquehanna 1&2 IPE, with the recommendation that it be issued to the licensee. On the basis of information provided regarding the revisions performed by the licensees to address the staff's concerns documented in the SERs for the original submittals, the staff concluded that the revised IPEs for both Crystal River Unit 3 and Susquehanna Units 1 and 2 met the intent of Generic Letter (GL) 88-20. The SER for Browns Ferry Unit 3 (BF3), stating that the staff was unable to

conclude that the BF3 IPE meets the intent of GL 88-20, was issued to the licensee during this quarter; the staff is planning to meet with the licensee in the near future.

The staff completed its review of an additional two IPEEE submittals (D.C. Cook, and Millstone Unit 3) and issued the SERs for these plants. The staff concluded that both of these submittals met the intent of Supplement 4 to GL 88-20. In addition, the staff completed preliminary reviews of an additional eight IPEEE submittals.

2.8 PRA Standards Development

ASME has formed a task group, which includes a representative from the RES staff, to develop PRA standards. The task group had a first draft ready by July 15, 1998, and is scheduled to have a draft ready for the ASME review and comment process by November 4, 1998. Although the staff continues working with ASME in this activity, it has some concerns in regard to the scope and quality of the group's work. These concerns will be discussed with ASME after completion of the staff's review of the July 15 draft and, if not resolved, could cause reconsideration of the staff's continued participation in this activity.

2.12 Review of Agency Programs and Processes (new item)

As a result of a July 21, 1998 memorandum from Chairman Jackson to J. Funches, a new item has been added to reflect improving the effectiveness and efficiency of agency programs and to search for opportunities to make these activities more risk informed. The work under this new task will be directed by the Steering Committee for NRC risk-informed activities being chaired by Mr. Thadani. The Steering Committee held its first meeting to discuss these issues on July 29, 1998. Specific tasks and schedules will be developed in the near future and reported in the next Implementation Plan update.

Section 3: Analysis and Evaluation of Operating Experience and Training

3.1 Risk-Based Trends and Patterns Analysis

With respect to the system reliability studies, the final report of the Auxiliary Feedwater (AFW) System Study was completed and it will be issued as NUREG/CR-5500, Volume 1, "Reliability Study: Auxiliary Feedwater System, 1987-1995." Some major findings of this study are (1) no failures of the entire system were identified in 1,117 unplanned system demands for the time period 1987-1995; (2) the variability in AFW system unreliability primarily reflects the diversity found in AFW system designs and, to a lesser extent, the variation in equipment performance among plants with similar designs; (3) and AFW systems composed of only turbine-driven pumps were less reliable than AFW systems with three redundant trains of diverse design (e.g., two motor-driven pumps and one turbine-driven pump).

The Westinghouse Reactor Protection System Study was sent out for peer review; comments from the NRC's program offices and the regions have been received. Also, the draft Initiating Event (IE) Update was completed and sent out for peer review; comments have been received. In addition, presentations were given to the regional administrators and to the Commissioners' technical assistants on June 4, 1998, on this report.

The report on loss of offsite power (LOSP) events was updated and it will be issued as NUREG/CR-5496, "Evaluation of Loss of Offsite Power Events at Nuclear Power Plants: 1980-1996." This study found that plant-centered events accounted for most of the losses of offsite power during power as well as during non-power modes of operation; LOSP frequency for plant-centered events is significantly higher (by a about a factor of four) during shutdown modes of operation than during power operation; events induced by severe weather are much less frequent but tend to have the longest duration of power outages; and grid-related events occur even less frequently.

The technical reports (four volumes) that support the Common-Cause Failures (CCF) Database were prepared as NRC reports in the NUREG/CR series (NUREG/CR-6362, Volumes 1- 4). Plans are to distribute the database to utilities during the next quarter.

Two new studies were initiated during this quarter: one for the PWR high-pressure injection system and one for the General Electric reactor protection system .

3.2 Accident Sequence Precursor (ASP) Program

The preliminary analyses for all 1997 events have been completed and are being reviewed by licensees. Seven preliminary precursors were identified for 1997 compared to 14 precursors identified for 1996 and 10 for 1995. However, more LERs were issued: from about 1400 for 1996 to 1500 for 1997. Preliminary analysis of the 1998 events has commenced and efforts are under way for establishing an in-house capability for a high quality and efficient ASP assessment to improve the timeliness and reduce the cost of future ASP work.

3.5 Operating Experience Data

The database requirements specifications for the NRC Reliability Database were completed during this quarter. The database will provide NRC staff and industry with data to produce unit-specific and generic estimates of reliability parameters required for PRAs and risk-informed applications. It will contain data elements from INPO's Safety System Performance Indicator (SSPI) and Equipment Performance Information Exchange (EPIX) database along with other data derived from LERs and NRC's Performance Indicator Program. A contract to begin development of the NRC Reliability Database will be issued next quarter.

INPO gave users access to its new EPIX system through its Web site in May 1998, including the NRC and NRC contractors. The Office of Chief Information Officer (OCIO) will install the required software to give NRC access to EPIX in a pilot mode by the end of July. OCIO will provide full access based on the results of the pilot activity at a date to be determined.

The NRC staff attended the first meeting of the EPIX Ad Hoc Users Group in June 1998. Data entry into EPIX is running slightly behind schedule. About 80 percent of the plants have provided failure data for 1997 and for the first quarter of 1998. The data were originally expected to be completed by the

end of May 1998. Other reliability data originally scheduled to be provided by June 1998 will likely not be ready before the fourth quarter of 1998. INPO will then begin sending quarterly data from EPIX to NRC for inclusion in the reliability database. AEOD is continuing discussions with industry to resolve issues relating to limitations and "workarounds" identified in SECY 97-101, which discussed the voluntary alternative to the reliability and availability data rule.

3.6 Staff Training

The new 2-week PRA Technology and Regulatory Perspectives course (P-111) was offered again May 11-22, 1998. It is scheduled to be offered two more times during 1998. Course attendance and registration support the staff's goal of having one resident inspector at each site complete this course by the end of 1998. Current plans call for one course to be presented each quarter to meet anticipated needs.

The 4-day PRA Basics for Regulatory Applications course (P-105) was offered three more times, April 21-24, May 5-8 and June 2-5, 1998. This course will be offered two more times during 1998, to address the need for more NRC technical staff to attend this course. Nine more presentations are planned for FY1999 to meet the staff's needs.

The 3-day PRA for Technical Managers course (P-107) was offered twice, on April 14-16 and June 23-25, 1998. This course will be offered one more time during FY1998 to support the staff's goal of having two-thirds of the agency's technical managers complete it by the end of FY1998. Four additional presentations are planned for FY1999. The PRA curriculum continues to be updated as more agency policy on risk-informed regulation becomes available.

Procurement actions continue for acquiring risk-monitor software. Current plans are to integrate the risk monitor into the reactor technology and PRA technology curricula to improve staff understanding of configuration management, the importance of plant operations to the risk profile of the plants, and the use of the tool to gain insights regarding the industry's use of risk-informed applications. The risk monitor will be used to demonstrate the capabilities and limits of this and similar tools as they are being used by the industry.

Section 4: Nuclear Materials and Low-Level Waste Safety and Safeguards Regulation

4.5 Framework for Use of PRA in Regulating Nuclear Materials

The staff's plan for developing a framework for using risk-informed approaches to regulate nuclear materials was forwarded to the Commission by SECY-98-138 on June 11, 1998. The first step in the plan is a scoping effort in which the staff will (1) complete a preliminary association of appropriate risk assessment methods with regulated uses of nuclear materials, (2) as appropriate, for each regulated use and in coordination with the Agreement States, identify how these associated risk assessment methods can best be used in a risk-informed regulatory approach for materials, and (3) estimate the resources needed to develop the framework and make a recommendation to the Commission about its feasibility given the NRC's resource constraints.

COORDINATION:

The Office of the General Counsel has reviewed this paper and has no legal objection to it.

L. Joseph Callan
Executive Director for Operations

Attachments: As stated

ATTACHMENT 1⁽¹⁾

PRA IMPLEMENTATION PLAN ACTIVITY TABLE (March 1998)
1.0 REACTOR REGULATION

Regulatory Activity	Objectives	Methods	Target Schedule	Lead Office(s)	Status (this quarter)
1.1 STANDARD REVIEW PLANS FOR RISK-INFORMED REGULATION	Develop standard review plans (SRPs) to be used in risk-informed regulatory decisionmaking.	*Evaluate available industry guidance		NRR /RES	
		*Develop broad-scope SRP chapters and a series of application-specific SRP chapters that correspond to industry initiatives			
		*The SRPs will be consistent with the regulatory guides (RGs) developed for the industry			
		*Transmit draft SRPs to the			

		Commission for approval to issue for public comment:			
		General IST ISI TS	4/97C ⁽²⁾ 4/97C 8/97C 4/97C		
		*Transmit final SRPs to the Commission for approval:			
		General IST ISI TS	1/98C 3/98 C 6/98 3/98C		Completed (Note 1.1a)
		Update and revise annually SRPs:			
		General IST GQA TS	6/99 8/99 8/99 8/99		New (Note 1.1b)

1.2 PILOT APPLICATIONS FOR RISK-INFORMED REGULATORY INITIATIVES	Evaluate the PRA methodology and develop staff positions on emerging, risk-informed initiatives, including those associated with:	*Interface with industry groups		NRR/RES	
	1. Motor-operated valves	*Evaluate appropriate documentation (e.g., 10 CFR, SRP, RGs, inspection procedures, and industry codes) to identify elements critical to achieving the intent of existing requirements	1. 2/96C		
	2. IST requirements 2a. Comanche Peak 2b. Palo Verde	*Evaluate industry proposals	2a. 7/98 2b. withdrawn		Changed (Note 1.2a)
	3. ISI requirements	*Evaluate industry pilot program implementation	3. 12/98		
	4. Graded quality assurance (GQA)	*As appropriate, complete pilot reviews and issue staff findings on regulatory requests	4. 1/98C		
	5. Maintenance Rule		5. 9/95C		
	6. Technical specifications 6a. Commission approval 6b. Pilot amendments Issued		6a. 5/97C 6b. 6/98		Completed (Note 1.2b)
7. Other applications					

to be identified later (e.g., applications related to diesel generator start times and hydrogen control)

7a. ANO request for relief from the staff position in NUREG-0737 for hydrogen monitoring, on the basis of "Task Zero" of the Risk-Informed, Performance-Based Regulation Pilot Program ("Whole Plant Study") proposed by NEI.

7a. 9/98

See Note 1.2c

1.3 INSPECTIONS

Provide guidance on the use of plant-specific and generic information from individual plant examinations (IPEs) and other plant-specific PRAs.

*Develop IMC 9900 technical guidance on the use of PRAs in the power reactor inspection program

6/97C

NRR

*Revise IMC 2515 Appendix C on the use of PRAs in the power reactor inspection program

7/97 C

*Propose guidance options for inspection procedures (IPs) related to 50.59 evaluations and regular maintenance observations

10/97C

*Review core IPs and propose PRA guidance where needed

10/97C

*Complete revision to proposed core IPs except for IP 71007 and 82701.

6/98

Completed (Note 1.3a)

*Issue draft GQA IP

9/98

Changed (Note 1.3b)

*Issue final GQA IP

12/98

Changed (Note 1.3b)

Provide PRA training for inspectors and senior reactor analysts (SRAs).

*Evaluate methods for presenting risk analysis results in a form most useful to inspectors and their management, and develop options for providing inspectors with plant-specific risk information

3/99

Changed (Note 1.3c)

		*Identify inspector functions that should utilize PRA methods, as input to AEOD/TTD for their development and refinement of PRA training for inspectors	7/96C	NRR	
		*Develop consolidated and comprehensive 2--3 week PRA for regulatory applications training course	10/97C	NRR/AEOD	
		*Conduct training for Maintenance Rule baseline inspections	8/96C	NRR	
		*Conduct training courses according to SRA training programs	Ongoing	AEOD	
		*Develop rotational assignments for SRAs to gain working PRA experience	Ongoing	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	Ongoing		
		* Update inspection procedures as needed	Ongoing		
		* Assist regional offices as needed	Ongoing		
		* Conduct Maintenance Rule baseline inspections	7/98		
1.4 OPERATOR LICENSING	Monitor insights from human reliability analyses (HRAs) of PRAs (including IPEs and individual plant examinations, external events (IPEEs)) and operating experience to identify possible enhancements for inclusion in planned revisions to guidance for	* Revise the Knowledge and Abilities Catalogs (NUREGs- 1122 and 1123) to incorporate operating experience and risk insights	8/95C	NRR	
		*Revise the Examiner Standards (NUREG-1021), as needed to reflect PRA	3/97C		

	operator licensing activities (initial and requalification).	insights			
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 accident sequence precursor (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	TBD		
		*Assess the feasibility of developing appropriate risk-assessment models			
		*Develop recommendations on the feasibility and desirability of conducting quantitative risk assessments			
1.6 USE OF PRA IN RESOLUTION OF GENERIC SAFETY ISSUES	Audit the adequacy of licensee analyses in IPEs and IPEEEs to identify plant-specific applicability of generic safety issues closed out based on IPE and IPEEE programs.			NRR/RES	Changed (Note 1.6)
1.7 REGULATORY EFFECTIVENESS EVALUATION	Assess the effectiveness of major safety issue resolution efforts for reducing risk to public health and safety.			RES/NRR	It is tracked now as item 2.11
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 for technical staff review and concurrence	TBD	NRR	
		* Finalize SRP	TBD		
	Develop independent	* Reevaluate risk-based aspects of	12/96C	NRR/RES	

	technical analyses and criteria for evaluating industry initiatives and petitions regarding simplification of emergency preparedness (EP) regulations.	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			
	Modify 10 CFR Part 52 and develop guidance on the use of updated PRAs beyond design certification (as described in SECY 93-087).	*Develop draft guidance and rule	TBD	NRR	Changed (Note 1.8)
*Solicit public comment		TBD			
*Finalize staff guidance and rule		TBD			
1.9 ACCIDENT MANAGEMENT	Develop generic and plant-specific risk insights to support staff audits of utility accident management (A/M) programs at selected plants.	* 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)	12/98	NRR/RES	Changed (Note 1.9)
1.10 IPE FOLLOW-UP ACTIVITIES	Evaluate specific improvements and analyses proposed as basis for resolution of generic safety issues at specific plants.	*Evaluate analyses of issues requested in Generic Letter 88-20	5/99	NRR/RES	New (Note 1.10a)
		*Evaluate other issues (e.g., SGTR induced severe accident)	5/99	NRR/RES	New (Note 1.10a)
		*Evaluate unsolicited analyses of selected generic issues submitted by licensees.	12/99	NRR/RES	New (Note 1.10a)
	Use results from the staff review of IPEs to identify potential safety issues and determine an appropriate course of action to address these potential issues.	* Recommendations to Commission regarding Follow up on accident management programs and licensee-stated actions.	9/98	NRR/regions	Changed (Note 1.9)
		*Assess reduction in risk associated with facility modifications.	5/99	NRR/RES	New (Note 1.10b)
		* Identify plant improvements implemented by licensees	12/98	NRR/RES	New (Note 1.10b)

		*Determine in accordance with the backfit rule if additional plant-specific or generic plant improvements that would further reduce the risk of severe accidents are warranted.	12/99	NRR/regions	New (Note 1.10c)
		*Define use for information, clarify "regulatory use," and assess the most effective methods for data collection	5/98	NRR	Completed
	Determine appropriate approach for tracking the regulatory uses of IPE/IPEEE results.	*If appropriate, develop approach for linking IPE/IPEEE databases	12/98	NRR/RES	

2.0 REACTOR SAFETY RESEARCH

Regulatory Activity	Objectives	Methods	Target Schedule	Lead Office(s)	Status (this quarter)
2.1 REGULATORY GUIDES	Develop RGs to provide a basis for the industry to use in risk-informed regulation.	*Transmit draft PRA RGs to the Commission for approval to issue for public comment:		RES/NRR	
		General	C		
		IST	C		
		ISI	C		
		GQA	C		
		TS	C		
*Transmit final PRA RGs to the Commission for approval:					
General	1/98C	Completed (Note 1.1a)			
IST	3/98C				
ISI	6/98				
GQA	3/98C				
TS	3/98C				
*Update and revise annually PRA RGs:					
General	6/99	New (Note 1.1b)			
IST	8/99				
GQA	8/99				
TS	8/99				
2.2 TECHNICAL SUPPORT	Provide technical support to NRC staff using risk assessment in risk-based regulation activities and technical reviews; issue risk assessments and statistical analyses; and develop guidance for agency uses of risk assessment.	*Continue to provide ad hoc technical support to agency PRA users	Continuing	RES	
		*Expand the use of PRA models available; expand the scope of available models to include external,	Continuing		

		low-power, and shutdown events; 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		
		*Load plant-specific PRAs in SAPHIRE to support various risk-informed regulatory activities, e.g., pilot applications, resolution of generic issues, and Maintenance Rule inspections.	Ongoing		New (Note 2.2)
2.3 SUPPORT FOR NRR STANDARD REACTOR PRA REVIEW					Subsumed by Section 1.8, "Advanced Reactor Reviews"
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 incorporating aging effects into PRAs.	10/98	RES	
		*Develop and demonstrate methods for incorporating human errors of commission in PRAs.	9/98		Completed (Note 2.4a)
		*Conduct application of ATHENA for fire risk assessment	7/99		New
		*Develop and demonstrate methods to incorporate organizational performance into PRAs	FBD		Changed (Note 2.4b)
		*Identify and prioritize key areas to improve fire risk analysis	9/98		
		*Develop and demonstrate improved methods for selected areas			
		*Develop and demonstrate methods for assessing reliability/risk of digital systems	9/00		Changed (Note 2.4c)
2.5 IPE AND IPEEE REVIEWS	Evaluate IPE/IPEEE submittals to obtain reasonable assurance that the licensees have adequately analyzed plant design and operations to discover vulnerabilities; and document significant safety insights resulting from IPE/IPEEEs.	*Complete the reviews of the three outstanding IPE submittals: Susquehanna Crystal River Draft SER for Browns Ferry 3	6/98 6/98 6/98	RES	Completed (Note 2.5a)
		*Continue regional IPE presentations.	12/97C		
		*Issue IPE insights report for public comment.	10/96C		
		*Issue final IPE insights report	12/97C		
		* Issue preliminary IPEEE insights report	1/98C		
		*Initiate review of eight additional IPEEE submittals	6/98		Completed
		*Complete contractor evaluations of	6/98		Completed

		twelve IPEEE submittals.			
		*Complete reviews of IPEEE submittals.	12/99		Changed (Note 2.5b)
		* Issue draft IPEEE insights report for comment	3/00		Changed (note 2.5b)
		* Issue final IPEEE insights report	7/00		Changed (Note 2.5b)
2.6 GENERIC SAFETY ISSUES PROGRAM	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 safety issues	Continuing	RES	
2.7 NEI INITIATIVE TO CONDUCT "WHOLE PLANT" RISK STUDY	Review NEI initiative to conduct three pilot "whole plant" risk-informed studies of requirements vs. risk and cost.	*Agree on ground rules for study	TBD	RES/NRR	
		*Complete study	TBD		
2.8 PRA STANDARDS DEVELOPMENT	Work with industry to develop national consensus standard for PRA scope and quality.	*Initiate activity	9/97C	RES	
		* Issue initial ASME draft standard	7/98		New (Note 2.8)
		* Issue draft standard for select public comment	11/98		
		*Finalize standard	TBD		
2.9 LOW POWER AND SHUTDOWN BENCHMARK RISK STUDY	Collect studies of LP&S risk as a benchmark for assessing the need for further staff activities.	*Collect and review existing LP&S risk information (domestic and foreign)	9/98	RES	
		*Initiate additional work	10/98		
2.10 SAFETY GOAL REVISION	Assess need to revise Commission's Safety Goal to make core damage frequency a fundamental goal and make other changes.	*Initiate discussion with ACRS	2/98C	RES	
		* Make recommendation to Commission	4/98		Completed (Note 2.10)
		*Provide information paper	12/31/98		Note 2.10
		*Provide final recommendations	3/31/99		Note 2.10
2.11 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	Ongoing	RES/NRR	
		* Apply method to assess reduction in risk	Ongoing		

		* Evaluate resulting effectiveness of station blackout and ATWS rules and Unresolved Safety Issue A-45	12/98		
		* Propose modifications to resolution approaches, as needed (SBO rule implementation and RCP seal issue)	TBD		
		* Identify other issues for assessment if appropriate	ongoing		
2.12 REVIEW OF AGENCY PROGRAMS AND PROCESSES	Perform a broad review of the agency's process to search for opportunities to make these activities more risk informed	TBD	TBD	RES/NRR/AEOD	New (Note 2.12)

3.0 ANALYSIS AND EVALUATION OF OPERATING EXPERIENCE, AND TRAINING

Regulatory Activity	Objectives	Methods	Target Schedule	Lead Office	Status (this quarter)
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	12/98	AEOD	
		*Trend performance of risk-important systems	12/98		
		*Trend frequency of risk-important initiating events	7/98		
		*Trend human performance for reliability characteristics	TBD		
	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		
	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	C		
		*Develop special software and databases (e.g., common-cause failure) for use in trending analyses and PRA studies	C (Periodic updates)		
3.2 ACCIDENT SEQUENCE PRECURSOR	Identify and rank risk significance of operational events.	*Screen and analyze LERs, AITs, IITs, and events	Ongoing	AEOD	

(ASP) PROGRAM		identified from other sources to obtain ASP events		
		*Perform licensee and NRC staff peer review of each ASP analyses	Annual report, Ongoing	AEOD
		*Complete quality assurance of Revision 2 of the simplified plant-specific models	C	RES
		*Complete feasibility study for low-power and shutdown models	C	RES
		*Complete initial containment performance and consequence models.	C	RES
		*Complete development of the Level 2 and 3 models	7/99	RES
		*Complete Revision 3 of the simplified plant-specific models	11/01	RES
		*Complete external event models for fire and earthquake	TBD	RES
		*Complete low-power and shut down models	TBD	RES
		Provide supplemental information on plant-specific performance.	*Share ASP analyses and insights with other NRC offices and regions	Annual report
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 to integrate NRR, RES, and AEOD activities using design and operating experience to assess the implied level of risk and how it is changing	C	AEOD
		*Update plan for risk-based analysis of reactor operating experience		
		*Implement program plan elements to include plant-specific models and insights from IPEs, component and	6/99	

		system reliability data, and other risk-important design and operational data in an integrated framework to periodically evaluate industry trends			
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.	<p>*Identify new or improved risk-based PIs which use component and system reliability models and human and organizational performance evaluation methods</p> <p>*Develop and test candidate PIs/performance measures</p> <p>*Implement risk-based PIs with Commission approval</p>	<p>C</p> <p>9/00</p> <p>1/01</p>	AEOD	
3.5 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.	<p>*Manage and maintain SCSS and the PI data base, provide oversight and access to NPRDS/EPIX, obtain INPO's SSPI, compile IPE failure data, collect plant-specific reliability and availability data</p> <p>*Develop, manage, and maintain agency databases for reliability/availability data (equipment performance, initiating events, CCF, ASP, and human performance data)</p> <p>*Determine need to revise LER rule to eliminate unnecessary and less safety-significant reporting</p> <p>*Determine need to revise reporting rules and to better capture ASP, CCF, and human performance events</p> <p>*Publish revised LER rule</p>	<p>Ongoing</p> <p>Ongoing</p> <p>6/98</p> <p>6/98</p> <p>1/00</p>	AEOD	<p>Completed</p> <p>Completed</p>

3.6 STAFF TRAINING	Present PRA curriculum as presently scheduled for FY 1998.	*Continue current contracts to present courses as scheduled	Ongoing	AEOD
		*Maintain current reactor technology courses that include PRA insights and applications	Ongoing	
		*Improve courses via feedback	Ongoing	
		*Review current PRA course material to ensure consistency with Appendix C	Complete	
	Develop and present Appendix C training courses.	*Prepare course material based on Appendix C	C	RES/AEOD
		*Present courses on Appendix C	C	
	Determine staff requirements for training, including analysis of knowledge and skills, needed by the NRC staff.	*Review JTAs performed to date	C	AEOD
		*Perform representative JTAs for staff positions (JTA Pilot Program)	C	
		*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	C	
		*Analyze the results of the JTA Pilot Program and determine requirements for additional JTAs	C	
		*Complete JTAs for other staff positions as needed	C	
		*Solicit a review of the proposed training requirements	C	
		*Finalize the requirements	C	
	Revise current PRA curriculum and develop new training program to fulfill identified staff needs.	*Prepare new courses to meet identified needs	Ongoing	AEOD
*Revise current PRA courses to meet identified needs		Ongoing		

		*Revise current and new PRA course to include RG and SRP information	9/97C	
		*Revise current reactor technology courses as necessary to include additional PRA insights and applications	Ongoing	
Present revised PRA training curriculum.		*Establish contracts for presentation of new PRA curriculum	Ongoing	AEOD
		*Present revised reactor technology courses	Ongoing	
		*Improve courses based on feedback	Ongoing	

4.0 NUCLEAR MATERIALS AND LOW-LEVEL WASTE SAFETY AND SAFEGUARDS REGULATION

Regulatory Activity	Objectives	Methods	Target Schedule	Lead Office(s)	Status (this quarter)
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 misadministration for the gamma stereotactic device (gamma knife).	*Hold a workshop consisting of experts in PRA and HRA to examine existing work and to make recommendations for further methodological development	8/94 C	NMSS	
		*Examine the use of Monte Carlo simulation and its application to relative risk profiling	9/95 C		
		*Examine the use of expert judgement in developing error rates and consequence measures	9/95 C		
	Continue the development of the relative risk methodology, with the addition of event tree modeling of the brachytherapy remote after loader.	*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 after loader.		*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 judgment.	*Conduct enhanced participatory rulemaking to establish radiological criteria for decommissioning nuclear sites; technical support for rulemaking, including comprehensive risk-based assessment of residual contamination	8/94 C Final rule published 7/97 C	RES/NMSS	
		*Develop guidance for implementing the radiological criteria for license termination	3/98C		

		*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)	Ongoing		
4.3 DEVELOP GUIDANCE FOR THE REVIEW OF RISK ASSOCIATED WITH WASTE REPOSITORIES.	Develop a branch technical position on conducting a performance assessment of an LLW disposal facility.	*Solicit public comments	5/97 C	NMSS/RES	
		*Publish final Branch Technical Position	TBD, dependent on resources		
4.4 ASSESS 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.	*Develop and demonstrate methods for determining the risk associated with industrial gauges containing cesium-137 and cobalt-60	9/98		
	The assessment should allow for modification based on changes in regulatory requirements. Use empirical data as much as practicable.	*Issue final report as a NUREG	12/98		
	Develop and demonstrate risk assessment methods for application to medical and industrial licensee activities.	*Through working group with contractor assistance, identify and document a technical basis for a risk-informed approach to the regulation of nuclear byproduct material, and develop plans for a graded approach to nuclear byproduct material regulation based on risk information	12/98		
4.5 USE OF PRA IN REGULATING NUCLEAR MATERIALS	Develop a framework for applying PRA to nuclear material uses, similar to the one developed for reactor regulation (SECY-95-280), where appropriate.	* Provide plan for developing framework	6/98	NMSS	Completed (Note 4.5)
		*Complete scoping effort	12/98		New
		* Complete framework	TBD		

5.0 HIGH-LEVEL NUCLEAR WASTE REGULATION

Regulatory Activity	Objectives	Methods	Target Schedule	Lead Office(s)	Status (this quarter)
5.1 REGULATION OF HIGH-LEVEL WASTE	Develop guidance for the NRC and CNWRA staffs in the use of performance assessment (PA) to evaluate the safety of HLW programs.	*Assist the staff in pre-licensing activities and in license application reviews	Ongoing	NMSS	
		*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			
	Identify significant events, processes, and parameters affecting total system	*Perform sensitivity studies of key technical issues using iterative PA (IPA)	Ongoing	NMSS	

	performance.				
	Use PA and PSA methods, results, and insights to evaluate proposed changes to regulations governing the potential repository at Yucca Mountain.	*Assist the staff in maintaining and refining the regulatory structure in HLW disposal regulations that pertain to PA	Ongoing	NMSS	
		*Apply IPA analyses to advise EPA in its development of a Yucca Mountain regulation			
		*Apply IPA analyses to develop a site-specific regulation for a Yucca Mountain site			
	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	Ongoing	NMSS	
		*Compare results of NRC's iterative performance assessment to DOE's Viability Assessment (VA) to identify major differences/issues			
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5.2 PRA APPLICATION TO SPENT FUEL STORAGE FACILITIES	Demonstrate methods for PRA of spent fuel storage facilities.	*Prepare user needs letter to RES	4/97C	RES/NMSS	
		*Conduct PRA of dry-cask storage	TBD		
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5.3 CONTINUAL 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	6/01	NMSS	
		*Revalidate the results of NUREG-0170 for spent fuel shipment risk estimates	12/99		

6.0 REACTOR ENFORCEMENT

Regulatory Activity	Objectives	Methods	Target Schedule	Lead Office(s)	Status (this quarter)
6.1 CONSIDERATION OF RISK IN THE ENFORCEMENT PROCESS	Ensure the consistent Application of the Enforcement Policy in the Area of Risk Informed Enforcement Actions.	*Prepare an enforcement guidance memorandum (EGM)	6/ 97C	OE	
		*Update the Enforcement Manual to reflect the guidance developed in the EGM	8/98	OE	Ongoing
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6.2 RISK INSIGHTS DURING WEEKLY ENFORCEMENT PANELS	Ensure risk-informed decisions are made in developing enforcement actions.	*Include regional senior reactor analyst evaluation on paneled enforcement cases when warranted	Ongoing	OE	
<hr/>					
6.3 CHANGE THE ENFORCEMENT POLICY SUPPLEMENTS TO INCLUDE ADDITIONAL EXAMPLES OF HOW RISK SHOULD INFLUENCE SEVERITY LEVEL	Provide the staff with more useful guidance for determining the Severity Level of Violations.	*Interface with NRR (SPSB) to consider additional examples for the policy supplements	Fall 98	OE	

NOTES

1.1a The proposed trial versions of the draft RG and SRP for ISI were sent to the Commission in SECY-98-139, dated June 11, 1998.

- 1.1b In the Staff Requirements Memorandum (SRM) dated June 29, 1998, the Commission directed the staff to "perform annual reviews and update the guidance documents, considering the experience gained from risk-informed programs, which should be tracked in the PRA implementation plan."
- 1.2a The staff has completed its safety evaluation report (SER) on the Comanche Peak risk-informed inservice testing (RI-IST) program. The SER reflects TU Electric's revised RI-IST Program Description dated May 21, 1998, and TU Electric's request to use ASME Code Case OMN-1 to respond to NRC Generic Letter 96-05, "Periodic Verification of Design-Basis Capability of Safety-Related Motor-Operated Valves" (TU Electric relief request V-8) dated June 23, 1998. The SER is currently being reviewed by management and the Office of the General Counsel and should be sent to the Commission in the near future.
Arizona Public Service (APS) recently informed the staff verbally of its intention to withdraw Palo Verde as an RI-IST pilot plant.
- 1.2b The staff received a supplemental amendment request for the TS lead plant, San Onofre Nuclear Generating Station (SONGS), in early January 1998 and issued the amendment for the safety injection tanks and low-pressure safety injection system on June 19, 1998. This is a change from the previous date of May 1998.
- 1.2c In a letter dated March 2, 1998, the licensee for Arkansas Nuclear One (ANO), Units 1 and 2, requested relief from the staff's position in NUREG-0737 for hydrogen monitoring. The request was made in accordance with "Task Zero" of the Risk-Informed, Performance-Based Regulation Pilot Program ("Whole Plant Study") proposed by NEI. A license amendment request will be required to implement this change, which the staff anticipates will have been received and reviewed by September 30, 1998.
- 1.3a Completed (as noted in SECY-98-096, revisions to two core inspection procedures will be completed after further review by the responsible technical branches and are being tracked by the PIPB Action Item Tracking System). These changes are intended primarily to stress the use of Inspection Manual Chapter 2515 Appendix C "Use of Insights Derived From Probabilistic Risk Assessment (PRA)" in the selection of inspection items. Further efforts to incorporate a risk-informed basis within the inspection program are being made as part of an overall reassessment of the inspection program.
- 1.3b The schedule for issuance of the draft and final GQA inspection procedures has been revised. The staff expects to issue the draft GQA inspection guidance by September 1998 and the final guidance by December 1998. This schedule change was necessitated because key personnel were assigned to higher priority tasks, such as conducting allegation-related inspections, working on licensing actions, working on a rulemaking petition for 10 CFR 50.59(a), and supporting AP600 design certification.
- 1.3c Independent of this item, the Office of Nuclear Reactor Regulatory Research initiated a cooperative agreement (No. NRC-04-97-064) with the University of Wisconsin to, in part, explore issues involved in communicating risk to decisionmakers (especially regulators) and to develop guidance on how to communicate risk. The expected completion date of this activity is December 98. The target schedule date has been delayed to allow incorporation of the results of this study.
- 1.6 Activity 1.6, "Use of PRA in Resolution of Generic Safety Issues," has been moved to Section 1.10 "IPE Follow-Up Activities" since many licensees used their IPE insights to close generic safety issues.
- 1.8 In the SRM for SECY-94-182, the Commission instructed the staff to develop a rule that would require COL applicants and holders to maintain, update, and use a PRA for the life of the facility. In the last few Rulemaking Activity Plan updates sent to the Commission, we stated this rulemaking activity is on hold. Since we do not now see any significant interest by a U.S. utility in requesting a COL for an evolutionary LWR design, we are giving this task a low priority. This activity will be tracked in the Rulemaking Activity Plan.
- 1.9 The staff intends to evaluate licensee implementation of accident management at a limited number of plants and to subsequently establish an approach for confirming the adequacy of implementation at the balance of plants. Plans for performing these evaluations have been communicated to the Commission as part of the periodic updates on the Status of the Integration Plan for Closure of Severe Accident Issues (SECY-97-132 and SECY-96-088), and were recently reaffirmed in SECY-98-131 (June 8, 1998). The staff had characterized these evaluations as inspections against licensee commitments, but upon further consideration of the voluntary nature of this program, has concluded that such evaluations would more appropriately be conducted as audits. The objective of the audits will be to assess how licensees have evaluated and implemented enhancements to their accident response capabilities according to the formal industry position on accident management. Key areas to be evaluated include the licensee's development of plant-specific severe-accident management guidance (SAMG), integration of SAMG with the emergency operating procedures and emergency plan, and implementation of severe-accident training consistent with the systems approach to training. The extent to which the licensee has evaluated plant-specific risk insights for possible inclusion in its SAMG will also be assessed. Upon completion of the audits, the staff will report to the Commission on audit findings and recommendations for remaining actions to achieve closure. We anticipate completing the audits by early 1999, and reporting to the Commission within the first quarter of CY1999.
- 1.10a An NRR Action Plan for IPE follow-up activities has been drafted and is currently undergoing management review. The activities described in the plan develop the details for the IPE follow-up framework sent to the Commission in SECY-98-012.
- 1.10b In order to help assure that plant design modifications and procedure changes credited in the IPE and IPEEE to limit the consequences of severe accidents and resolve generic safety issues actually were implemented adequately at plants, the NRC will identify and evaluate commitments to make these changes, and if they have not been followed through, will consider whether it is prudent to seek the changes under the backfit rule.
- 2.2 The Office of Nuclear Regulatory Research has an ongoing effort of developing plant-specific input decks (i.e., loading into SAPHIRE plant-

specific PRAs) which are used to explore "what if" questions and to assess issues of a plant-specific or generic nature. For example, SAPHIRE models were used in the development of guidance for risk-informed IST, ISI, GQA, and TS, the ranking and resolution of generic issues, and in Maintenance Rule inspections.

- 2.4a An international peer review on ATHEANA, "A Technique for Human Event Analysis" was performed, June 11-12, 1998. ATHEANA is a next-generation human reliability analysis (HRA) method being developed by RES to more completely and accurately assess human reliability. The meeting also afforded an opportunity for other interested parties to learn about the method, including representatives from Spain, France, Japan, and the Netherlands and from several national laboratories. The review comments from the peer reviewers, along with feedback from others who have reviewed or used the HRA method, were supportive of the method and will be incorporated into a revision of NUREG-1624, "Technical Basis and Implementation Guidelines for A Technique for Human Event Analysis (ATHEANA)." The draft NUREG-1624 has been issued for public comment.
- 2.4b In its SRM dated June 29, 1998, the Commission directed the staff to eliminate any FY1998 "resource expenditures specifically directed at developing a systematic method of inferring management performance," and disapproved the use of any FY1999 and FY2000 resources for these purposes. Therefore, efforts for developing and demonstrating methods to incorporate organizational performance into PRAs have been terminated.
- 2.4c Methods developed in this area is deferred until FY2000 because of budget constrains in FY1999
- 2.5a The staff has reviewed all of the 76 IPE submittals and issued staff evaluation reports (SERs) on its findings to each licensee. The staff has reissued the SERs for Crystal River Unit 3 and Susquehanna Units 1 and 2 concluding that the revised IPEs meet the intent of Generic Letter (GL) 88-20. The SER for Browns Ferry Unit 3 (BF3), stating that the staff was unable to conclude that the BF3 IPE meets the intent of GL 88-20, was issued to the licensee during this quarter; the staff is planning to meet with the licensee in the near future.
- 2.5b The target schedule for completing the reviews of all IPEEE submittals has been changed from June 1999 to December 1999. Correspondingly, changes were made to the target schedules for issuing the draft and final IPEEE insights reports. A number of factors contributed to revising the IPEEE review schedule. Among these were that (1) many submittals needed a review beyond the initial screening review to determine whether or not they met the intent of Supplement 4 to Generic Letter 88-20; (2) not all of the submittals were received on time; (3) it took longer than originally anticipated to issue requests for additional information (RAIs) to the licensees; (4) many licensees requested additional time (typically an additional 60 days) to respond to the RAIs; and (5) staff resources were needed to complete other high priority NRC work (e.g., risk-informed regulatory guides).
- 2.8 ASME has formed a task group, which includes a representative from the staff, to develop PRA standards. The task group had a first draft ready by July 15, 1998, and is scheduled to have a draft ready for the ASME review and comment process by November 4, 1998. Although the staff continues working with ASME in this activity, it has some concerns in regard to the scope and quality of the group's work. These concerns will be discussed with ASME after completion of the staff's review of the July 15 draft and, if not resolved, could cause reconsideration of the staff's continued participation in this activity.
- It is noted that the current draft standard only covers a Level 1 and 2 PRA for internal events (except fire) with the reactor at power. Standards for a Level 3, fire, external events, and low-power and shutdown PRAs are scheduled for a later date, to be determined.
- 2.10 The Commission approved the staff's recommendations in SECY-98-101, to modify the Safety Goal Policy Statement and to defer the initiation of this modification for a calendar year. The Commission asked the staff to prepare an information paper by December 31, 1998, and make final recommendations by March 31, 1999.
- 2.12 Review of Agency Programs and Processes (new item)
- As a result of a July 21, 1998 memorandum from Chairman Jackson to J. Funches, a new item has been added to reflect improving the effectiveness and efficiency of agency programs and to search for opportunities to make these activities more risk informed. The work under this new task will be directed by the Steering Committee for the PRA Implementation Plan. Specific tasks and schedules will be developed in the near future and reported in the next Implementation Plan update.
- 4.4 The staff now plans to report its results to the Commission in a SECY paper. The new schedule reflects the change from September 1998 to December 1998.
- 4.5 The staff's plan was forwarded to the Commission by SECY-98-138 on June 11, 1998. The first step is a scoping effort in which the staff will (1) complete a preliminary association of appropriate risk assessment methods with regulated uses of nuclear materials and (2) as appropriate, for each regulated use and in coordination with the Agreement States, identify how these associated risk assessment methods can best be used in a risk-informed regulatory framework for materials.

ABBREVIATIONS

ABWR	advanced boiling-water reactor
AEOD	Office for Analysis and Evaluation of Operational Data

ACRS	Advisory Committee on Reactor Safeguards
AFW	auxiliary feedwater
AIT	augmented inspection team
ANO	Arkansas Nuclear One
AOT	allowed outage time
A/M	accident management
APS	Arizona Public Service
ASME	American Society of Mechanical Engineers
ASP	accident sequence precursor
ATWS	anticipated transient without scram
BF3	Browns Ferry Unit 3
C	completed
COL	combined construction and operating license
CCF	common-cause failures
CFR	<i>Code of Federal Regulations</i>
CRGR	Committee to Review Generic Requirements
CY	calendar year
CNWRA	Center for Nuclear Waste Regulatory Activities
DOE	Department of Energy
EDG	emergency diesel generator
EGM	Enforcement Guidance Memorandum
EP	emergency preparedness
EPA	Environmental Protection Agency
EPIX	Equipment Performance and Information Exchange
FY	fiscal year
HLW	high-level waste
HRA	human reliability analysis
GSI	generic safety issue
GQA	graded quality assurance
JTA	job task analysis
IE	initiating event
IMC	inspection manual chapter
INPO	Institute of Nuclear Power Operations
IP	inspection procedure
IPA	iterative performance assessment
IPE	individual plant examination
IPEEE	individual plant examination, external events
IIT	incident inspection team
IST	inservice testing
ISI	inservice inspection
LAN	local area network
LER	licensee event report
LOSP	loss of offsite power
LLW	low-level waste
LP&S	low power and shutdown
MACCS	MELCOR Accident Consequence Code System

MR	Maintenance Rule
NEI	Nuclear Energy Institute
NOED	notice of enforcement discretion
NPRDS	nuclear plant reliability data system
NRR	Office of Nuclear Reactor Regulation
NMSS	Office of Nuclear Material Safety and Safeguards
OCIO	Office of the Chief Information Officer
OE	Office of Enforcement
OGC	Office of the General Counsel
PA	performance assessment
PI	performance indicator
PIP	PRA Implementation Plan
PIPB	Inspection Program Branch, NRR
PM	project manager
PRA	probabilistic risk assessment
RAI	request for additional information
RCP	reactor coolant pump
RES	Office of Nuclear Regulatory Research
RG	regulatory guide
SAMG	severe-accident management guidance
SAPHIRE	Systems Analysis Programs for Hands -on Integrated Reliability Evaluations
SBO	station blackout
SECY	Office of Secretary of the Commission
SER	safety evaluation report
SGTR	steam generator tuber rupture
SONGS	San Onofre Nuclear Generating Station
SPSB	Probabilistic Safety Assessment Branch
SCSS	sequence coding and search system
SRP	standard review plan
SRA	senior reactor analysts
SRM	staff requirements memorandum
SSPI	Safety System Performance Indicator
TBD	to be determined
TTD	Technical Training Division
TS	technical specifications
TU	Texas Utilities
FY	Fiscal Year
VA	viability assessment

1. See Abbreviations Table at the end of this report

2. C = Task previously completed