March 18, 1999

FOR: The Commissioners

FROM: William D. Travers /s/
Executive Director for Operations

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

PURPOSE:

To report the status of the Probabilistic Risk Assessment (PRA) Implementation Plan (PIP) for the period July 1 to December 31, 1998.

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 progress reports were sent to the Commission quarterly beginning on March 26, 1996, with most recent update provided as SECY-98-186, dated July 31, 1998. Because of the need to meet high priority staff commitments to actions identified in the Chairman's tasking memorandum, the present PIP report covers a six-month period from July 1 to December 31, 1998.

DISCUSSION:

The principal staff accomplishments in executing the various elements of the PIP are summarized below. Detailed scheduling information, including changes with explanatory notes, is included as Attachment 1 .

It should be noted that the format of this plan is based on the organizational structure in effect as of December 31, 1998, and does not reflect the assimilation of AEOD into other parts of the NRC.

Section 1: Reactor Regulation

A number of milestones have been reached since the PRA Implementation Plan was last updated, and they are discussed below individually. In addition, a number of other items were completed which are described in the staff's response to the Chairman's tasking memorandum dated August 7, 1998. Perhaps the most significant of these items was submission of a paper (SECY-98-300) to the Commission that describes high-level options and a two-phased implementation strategy for modifying regulations in 10 CFR Part 50 to make them risk-informed and delineates associated policy issues. The staff is currently awaiting Commission guidance with respect to these options. After the Commission establishes requirements for the staff, the staff will prepare a plan for satisfying the Commission's requirements and incorporate the plan into the PRA Implementation Plan.

1.1 Standard Review Plans for Risk-Informed Regulation

As noted in the staff requirements memorandum (SRM) for SECY-98-067, the Commission approved issuance of the final version of the application-specific regulatory guides (RGs) and standard review plans (SRPs). The final version of the risk-informed guidance documents for Inservice Testing (RI-IST), Technical Specifications (RI-TS) and Graded Quality Assurance (RI-GQA) were published in September 1998 (reference 63 FRN 48771, September 11, 1998). The final draft for trial use versions of the risk-informed guidance documents for Inservice Inspection (RI-ISI) were published in October 1998 (reference 63 FRN 57331). These guidance documents are now available for industry utilization in support of risk-informed licensing actions.

1.2 Pilot Applications for Risk-Informed Regulatory Initiatives

The staff issued the safety evaluation report (SER) on the Comanche Peak RI-IST program on August 14, 1998. The SER is consistent with the RI-IST guidance published in RG 1.175 and SRP Section 3.9.7. Publication of this SER marks the completion of the staff's pilot activities in support of RI-IST programs.

By letter dated December 17, 1998, Arizona Public Service Company (APS), the licensee for the Palo Verde Nuclear Generating Station (PVNGS), withdrew as a pilot plant for risk-informed IST. APS withdrew based on minimal potential safety and cost benefits of a RI-IST program as compared to other risk-informed applications. APS believes that a risk-informed IST program, as described in Regulatory Guide 1.175, would have little safety or cost benefit at PVNGS.

On the other hand, other licensees (i.e., South Texas Project (STP) and San Onofre (SONGS)) have recently submitted RI-IST applications. The STP application is limited in scope, and is intended to provide flexibility in testing schedules for twenty-four check valves. The SONGS application is a full scope application and the licensee states that the program will be beneficial in outage management.

The staff has completed reviews and issued safety evaluations for RI-ISI program change requests for the following pilot plants:

- Surry, Units 1&2;
- Vermont Yankee;
- Arkansas Nuclear One, Unit 2 (ANO-2).

A request from ANO-1 is currently under review and scheduled to be completed by the end of July 1999.

Browns Ferry Unit 2 recently submitted an application which would combine the intergranular stress corrosion cracking augmented program inspections with the ASME Section Xl inspection. The staff is working with industry to determine how, and if, the augmented programs can be included within the risk-informed program.

A standardized RI-ISI submittal format is being developed with input from industry and NEI. The standard format will minimize requests for additional information (RAIs) and expedite the review and approval of future submittals.

The staff approved the Westinghouse Owner's Group (WOG) RI-ISI topical report on December 14, 1998. The Electric Power Research Institute (EPRI) topical review was delayed until EPRI submitted responses to a June 12, 1997, RAI in November 1998. The SER on the EPRI topical report is on schedule for completion in September 1999.

The staff has completed reviews and issued safety evaluations for the following RI-TS pilot and non-pilot license amendment requests:

- North Anna, Units 1&2 Emergency Diesel Generator (EDG) Allowed Outage Time (AOT);
- Oyster Creek proposal on EDG online testing;
- San Onofre Units 2&3 EDG AOT extension request;
- Combustion Engineering Owners Group (CEOG) safety injection tank AOT extension request;
- Comanche Peak Charging pump AOT extension request.

Completion of the San Onofre and CEOG reviews marks the end of risk- informed technical specification pilot activities.

The Risk-Informed Licensing Panel held a public meeting on Wednesday, February 18, 1999, to hear industry's proposal on alternatives to adding the configuration risk management program (CRMP) to the technical specifications (TS). The industry representatives proposed numerous alternatives to placing the CRMP in the TS. The panel discussed these alternatives and decided that a concise interim guidance document (until the maintenance rule is finalized) should be developed for CRMP placement which considers a spectrum of alternatives ranging from the TS administrative controls to some form of licensee commitment. The staff is currently drafting the interim guidance.

On September 28, 1998, the staff completed its review and issued its safety evaluation report regarding the ANO, Units 1&2, request for relief from the staff position in NUREG-0737 on timing of initiation of hydrogen monitoring. This request had been made as a part of "Task Zero" of the Risk-Informed, Performance-Based Pilot Program ("Whole Plant Study") proposed by NEI. Relating to another facet of the Whole Plant Study, the staff is continuing its review of the San Onofre request to remove hydrogen recombiners from the scope of the regulations. The staff expects to complete this review by the end of July 1999.

Approval had been granted on November 6, 1997, for South Texas to implement their graded quality assurance (QA) program. By letter dated October 14, 1998, the licensee informed the staff of some impediments to full implementation of their risk-informed approach. These impediments, and strategies for dealing with them, are discussed in Attachment 1 to SECY-98-300. In submitting SECY-98-300, the staff seeks, among other things, Commission approval to work further with South Texas in a pilot mode to resolve these impediments.

1.3 Inspections

The staff completed the last operating plant Maintenance Rule baseline inspection in the first week of July 1998. A total of 71 Maintenance Rule Baseline Inspections (68 operating plant sites and 3 decommissioning status plant sites) were completed since the Maintenance Rule went into effect on July 10, 1996. This included inspections 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).

Previous efforts to improve inspection program guidance (reported in the last PRA Implementation Plan update) have been superceded by a new

initiative which began in the fall of 1998. This initiative will make the inspection program more risk-informed in a manner similar to the recent improvements to the licensee performance assessment and enforcement processes. The previously identified task to evaluate methods for presenting risk analysis results in a form most useful to inspectors is subsumed by this current initiative. Detailed implementation plans and schedules for this initiative were separately reported to the Commission as a transition plan in SECY-99-007 . When an SRM is received on this plan, it will be incorporated into the PIP.

A new subtask has been added to review the final IPEEE insights report for insights that should be incorporated into inspection program guidance. This task will be completed six months after completion of the final IPEEE insights report which is due in July 2000. The commitment to perform this task is part of the plan for closure of Generic Issue 178, "Effects of Hurricane Andrew on Turkey Point."

The staff met with the Committee to Review Generic Requirements (CRGR) on December 8, 1998, to discuss the proposed inspection procedure (IP) for risk-informed graded quality assurance programs. The CRGR identified several concerns with the IP, and ultimately concluded that the proposed IP should not be issued. The staff is considering the CRGR comments and will develop an approach to address the CRGR concerns.

1.10 IPE Follow-up Activities

Work on IPE follow-up activities has been deferred pending receipt of the Commission's SRM regarding SECY-98-300, which proposes options for risk-informed revisions to 10 CFR Part 50. If the Commission accepts the staff's recommended course of action and directs the staff to proceed with rulemaking, the staff believes the goals and objectives of IPE follow-up activities could be achieved within the context of the revised regulations for those licensees who choose the risk-informed alternative. IPE followup could then be limited to plants not following the "risk-informed" Part 50 alternative. If the Commission decides to make no change to Part 50, the staff will revisit its plan for IPE follow-up activities in light of other risk-informed activities identified in the response (COMSECY 98-024) to the Chairman's tasking memorandum and establish new schedules for IPE follow-up activities.

Section 2: Reactor Safety Research

2.1 Regulatory Guides

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), and risk-informed GQA (RG 1.176) were approved by the Commission for issuance June 29,1998 and published in final form. The guidance documents for risk-informed ISI, RG 1.178 (formerly DG-1063) and SRP 3.9.8, were also published for trial use.

2.4 Methods Development and Demonstration

Work on developing improved fire risk assessment methods, tools, and data was initiated in early June 1998. The areas for improvement were identified by the staff in late 1997 and include, for example, modeling of initiating event frequency and models of fire growth and propagation and methods for analyzing human reliability. In October 1998, the staff forwarded SECY-98-230 to the Commission. This paper, prepared in response to the SRM for SECY-98-058, summarized the findings of NRC's past fire protection research efforts and highlighted a number of areas where fire risk improvements are needed. The current status of the fire risk assessment research program was reviewed in a briefing of the ACRS Subcommittee on Fire Protection on January 21, 1999. It was noted that an early product of the research program (including an analysis of heat loss factors) has been useful in supporting the completion of IPEEE reviews.

2.5 IPE and IPEEE Reviews

An SER was issued on the IPE for Brown's Ferry 3 (in May 1998) which concluded that the IPE did not meet the intent of Generic Letter 88-20. The licensee has subsequently provided additional information and RES is preparing a revised SER. This SER will be the last to be issued for the IPE program.

The staff completed its review of an additional seven IPEEE submittals (bringing the total to 10) and issued the SERs for these plants. The staff concluded that all these submittals met the intent of Supplement 4 to GL 88-20. In addition, the staff completed preliminary reviews of the last five of the 75 IPEEE submittals .

The target schedule for completing the reviews of all IPEEE submittals has been changed from December 1999 to April 2000. 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) there was a delay in receiving responses from industry on generic fire requests for additional information (RAIs), (2) many licensees requested additional time to respond to plant specific RAIs, and (3) staff resources were needed to complete other high priority NRC work.

2.8 Standards Development

ASME's project team, which includes an RES member and was supported by other RES and NRR staff and contractors, completed a draft "Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications." ASME issued this draft for public comment in January 1999. ASME will hold a public workshop on March 16, 1999. This standard (Phase 1) covers PRA Level 1 and a limited Level 2 PRA analysis, the latter permitting calculation of a large, early release frequency (LERF) for internal events, excluding internal fires. Initiation of work on Phase 2 of the standard has not yet been scheduled by the ASME. Phase 2 would cover internal fires, external events and low power and shutdown conditions. The ANS has expressed to the ASME their interest in providing the lead for Phase 2. The staff intends to support such standards development work, whether led by ASME or ANS, presuming timely initiation of the work.

2.12 Review of Agency Programs and Processes

As noted above, the RES and NRR staff have provided a paper to the Commission (SECY-98-300) that describes options and an implementation strategy for modifying 10 CFR 50 to make it more risk-informed. When the staff receives Commission guidance on these options, more detailed plans will be

developed and incorporated into the PIP.

The PRA Steering Committee met on 5 occasions between July 1, 1998 and December 31, 1998. Guidance to the staff was provided on items such as the following:

- The charters of the PRA Steering Committee and the Risk-Informed Licensing Panel
- The study undertaken by the Center for Strategic and International Studies (CSIS) on risk informed regulation
- Approaches for risk-informed 10 CFR 50 (subsequently described in SECY-98-300) and
- A framework for risk-informing NMSS activities

In addition, the Steering Committee met with the NEI's PRA Steering Committee on

November 16, 1998. This meeting included discussions on:

- Charters of the two steering committees
- On-going risk-informed pilot programs
- Potential new pilot activities and
- Risk-informed 10 CFR 50.

RES also completed a report on *Options for Incorporating Risk Insights into the 10 CFR 50.59 Process*. Recommendations regarding these options will be provided as part of the process of modifying 10 CFR 50 to be risk-informed.

Section 3: Analysis of Operating Experience and Training

3.1 Risk-Based Trends and Patterns Analysis

Administrative Letter 98-04 was issued in July 1998 announcing the availability of the cause failure database (CCF) database. The database was sent to all nuclear utilities for their use. To date about 35 utilities have installed and activated the software. The supporting technical reports were published in July 1998 as NUREG/CR-6268 and distributed. The CCF database was used to estimate CCF parameters contained in NUREG/CR-5497, which was published in October 1998. NUREG/CR-5485, *Guidelines on Modeling Common-Cause Failures in Probabilistic Risk Assessment*, was published in November 1998.

The auxiliary feedwater system study, *Reliability Study: Auxiliary Feedwater System, 1987-1995*, NUREG/CR-5500, Volume 1, was issued and distributed in July 1998. The major findings of this study were summarized in the previous PIP update (SECY-98-186). The General Electric reactor protection system study draft report was completed and sent out for review. Comments have been received from NRC offices and from the external peer reviews by industry.

The initiating event study was completed and will be published as NUREG/CR-5750. The transmittal letter providing pertinent findings was sent out in January 1999, and the final report will be printed in February 1999. This is the first major analysis and update of initiating event frequency estimates since 1985. Also, this report is the first significant effort to update LOCA pipe break frequencies since 1975 when WASH-1400, *Reactor Safety Study*, was issued. Major findings of the study include the following: (1) combined initiating events frequencies for all initiators are lower than the frequencies used in NUREG-1150, *Severe Accident Risks: An Assessment for Five U.S. Nuclear Power Plants*, and IPEs by a factor of five and four, respectively; (2) the least risk-significant transients constitute 77% of all initiating events while events that pose a more severe challenge to the plant's mitigation systems constitute the remaining 23%; (3) the overall initiating event frequency decreased by a factor of two to three during the nine-year span; (4) most risk-significant (with respect to core damage frequency) initiators frequencies (such as total loss of feedwater flow, loss of instrument or control air, inadvertent closure of all main steam isolation valves, and total loss of condenser heat sink for BWRs) decreased at a faster rate than the overall initiating event frequency; and (5) loss-of-coolant accident frequencies are lower than those used in NUREG-1150 and industry-wide IPEs.

The NRC hosted the seventh meeting of the International Common Cause Data Exchange (ICDE) Project in September 1998. The ICDE Project operates under the auspices of OECD/NEA and includes representatives from Sweden, Finland, Germany, France, Switzerland, Great Britain, Spain, and the United States. The group has defined guidelines to facilitate CCF information exchange among the participating countries. The first exchange of information involved pump CCF events. The pump report was finalized and forwarded to NEA for publication.

3.2 Accident Sequence Precursor (ASP) Program

All final analyses of the 1997 precursors have been completed. There were only five precursors for 1997, all with CCDP values less than 10^{-4}. The 1997 data are consistent with the previously noted trends of a decreasing rate of occurrence of ASP events and a decreasing trend in the annual ASP index. The final report was issued in December 1998 as NUREG/CR-4674, Volume 26. The annual report to the Commission on the status of the ASP Program was issued as SECY-98-298 in December 1998. Preliminary analysis of the 1998 events continues.

3.4 Risk-Based Performance Indicators

In response to the Chairman's tasking memorandum, a draft program plan for the development of risk-based performance indicators was developed. AEOD participated in the preparation and conduct of the Performance Assessment Workshop held September 28 through October 1, 1998. The risk-based performance indicators will be consistent with the principles developed during the workshop. The contract to help develop and implement the risk-based PIs was placed in November 1998.

3.5 Operating Experience Data

The contract to develop the Reliability and Availability Data System (RADS) was placed in July 1998 after approval was obtained from the Information Technology Business Council. The RADS Coordination Group met in September to review the preliminary design document. A prototype of the system was reviewed in January 1999.

The Office of the Chief Information Officer (OCIO) provided access to the new EPIX system maintained by INPO. Selected NRC staff members have successfully accessed EPIX and tested the interface system. OCIO plans to have a permanent interface in place by the end of next quarter. Following evaluation of the EPIX system, AEOD intends to incorporate EPIX data into the NRC Reliability and Availability Data System (RADS). EPIX is expected to be one of the major data sources supporting the development of the risk-based performance indicators that was discussed earlier.

AEOD attended the second meeting of the Ad Hoc EPIX Users Group at INPO on December 8, 1998, and gave a presentation on RADS to the group. INPO provided NRC a sample of the EPIX data that will be submitted under the voluntary approach to providing reliability data. The first complete set of EPIX data will be sent to NRC in March 1999. This represents a two quarter slip in providing the reliability data to NRC that the utilities were due to provide INPO in July 1998. Following evaluation of the EPIX system, AEOD intends to incorporate EPIX data into the NRC Reliability and Availability Data System (RADS). EPIX is expected to be one of the major data sources supporting the development of the risk-based performance indicators that was discussed.

AEOD started rulemaking to revise the event reporting rules (10 CFR 50.72 and 10 CFR 50.73) to better align the reporting requirements with the NRC's current reporting needs, including a better focus on reporting safety- or risk-significant events. An advance notice of proposed rulemaking was published on July 23, 1998, a public meeting was held on August 21,1998, and a public workshop was held on September 1, 1998. Public comments were received by September 21, 1998. An additional public meeting (table-top exercise) was held on November 13, 1998, to test key aspects of the rules and guidance for clarity and consistency by discussing how reportability decisions could be made for example events. The rulemaking plan schedule was extended five weeks to accommodate the industry's request for this additional meeting.

3.6 Staff Training

The 2-week PRA Technology and Regulatory Perspectives course (P-111) was offered four times during 1998. A total of 85 resident inspectors attended the course; all but three sites were represented. The course will continue to be presented each quarter to meet anticipated needs. To date, all presentations have been at the Technical Training Center. During FY 1999, courses are scheduled at Region I, Region II and Region III.

The 4-day PRA Basics for Regulatory Applications course (P-105) was offered 9 times during 1998. A total of 181 staff members attended the training. Nine more presentations are planned for FY 1999 to meet the staff's needs.

The 3-day PRA for Technical Managers course (P-107) was offered 7 times during 1998. A total of 147 managers attended the training. The staff's goal of having two-thirds of the agency's technical managers complete it by the end of FY 1998 was met. Four additional presentations are planned for FY 1999.

More staff received PRA training during FY 1998 than any previous year. A total of 507 staff attended training. The PRA curriculum continues to be updated as the agency gains experience with respect to risk-informed regulation.

Procurement actions were completed for acquiring risk-monitor software. The NRC now has a site license for use of SCIENTECH'S Safety Monitor. Technical training staff in HR are working to integrate the Safety 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 Safety Monitor will be used to demonstrate the capabilities and limits of this and similar tools as they are being used by the industry.

Section 6: Enforcement

The Office of Enforcement (OE) has worked with NRR in the development of additional guidance for the utilization of risk insights in the enforcement process. These interactions have included joint efforts with the Inspection Program Branch of NRR to assure that risk-informed enforcement activities align with the changes to the reactor oversight process currently underway. In addition to working with NRR, OE has held several public meetings with stakeholders in order to gather input on how risk should be incorporated into the Enforcement Policy.

The response to the Chairman's tasking memorandum provides OE's current schedule for development of risk-informed changes to the Enforcement Policy. These changes are anticipated to be presented to the Commission in March 1999. Following receipt of an SRM, this item will be included in the PIP.

COORDINATION

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

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Attachment: As stated