

POLICY ISSUE
(Information)

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SECY-06-0089

FOR: The Commissioners

FROM: Luis A. Reyes
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SUBJECT: UPDATE OF THE RISK-INFORMED REGULATION IMPLEMENTATION PLAN

PURPOSE:

To present the Commission with the latest update of the Risk-Informed Regulation Implementation Plan (RIRIP), in accordance with the staff requirements memorandum (SRM #M001117B), dated January 4, 2001.

SUMMARY:

This paper summarizes the agency's significant risk-informing accomplishments since the previous version of the RIRIP (Enclosure 1), and provides the latest update of the RIRIP (Enclosure 2), which details activities designed to support the agency's Strategic Plan and the Probabilistic Risk Assessment (PRA) Policy Statement. The priorities of activities included in this RIRIP update were determined through the Fiscal Year (FY) 2007 Planning, Budgeting, and Performance Management (PBPM) process. The resources for these activities are budgeted in FY 2006.

This paper also summarizes the significant risk-informing activities to be conducted over the next 6 months. These activities are in the areas of industry trends program support; accident sequence precursor program support; risk management of technical specifications; fire protection for nuclear power plants; steam generator tube performance; PRA quality and standards; pressurized thermal shock; structure for new plant licensing; advanced reactor PRA;

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dry cask storage; reactor oversight process support; standardized plant analysis risk (SPAR) model development program; and changes to the requirements for emergency core cooling systems for light-water nuclear power reactors (10 CFR 50.46).

BACKGROUND:

In a January 2000 memorandum to the Commission, the staff outlined a strategy for implementing risk-informed regulation. That strategy evolved into the initial RIRIP, which the staff provided to the Commission in March 2000. The Commission reviewed the plan and, after a briefing by the staff in March, directed the staff in April 2000 to include in the next RIRIP update an internal communications plan, staff training requirements, and a discussion of internal and external factors that may impede risk-informed regulation. The staff issued the first complete version of the RIRIP in October 2000.

In the SRM dated January 4, 2001, the Commission directed the staff to provide a more detailed communication plan, prioritize activities, identify necessary resources and tools, address how performance-based regulatory approaches would be integrated into the process of risk-informing regulations, and identify critical-path activities and their cross-cutting dimensions.

In response to that SRM, the staff's December 2001 update of the RIRIP (specifically Part 2) included expanded chapters describing the staff's progress in prioritizing the various implementation activities and identifying the necessary resources and tools, as well as activities that have cross-cutting dimensions.

DISCUSSION:

The RIRIP is structured around the five goals of the NRC's Strategic Plan for FY 2004–2009: safety, security, openness, effectiveness, and management. Toward that end, this RIRIP update lists the primary and secondary performance goals (including their respective priorities) and strategies identified in the Strategic Plan, as they relate to each activity in the RIRIP. The specific priority associated with each activity was determined through the NRC's PBPM common prioritization process for FY 2007.

Enclosure 1 to this paper is a table of accomplishments, which describes the agency's risk-informing accomplishments since the previous update of the RIRIP. Enclosure 2 is the latest update of the RIRIP, which discusses the efforts to risk-inform the agency's regulatory activities and describes each activity identified as supporting the goals and strategies of the NRC's Strategic Plan and the PRA Policy Statement. The updated RIRIP is divided into two parts:

- Part 1 describes the plan's relationship to the PRA Policy Statement. It also discusses key features of the traditional deterministic approach that should be preserved in establishing risk-informed regulatory programs, since the NRC will use risk information to complement the traditional approach.
- Part 2 describes the staff's risk-informed regulatory activities, with a chapter addressing activities that have "safety" as their primary goal and a chapter addressing activities that have "effectiveness" as their primary goal (again as defined in the NRC's Strategic Plan for FY 2004–2009). Each chapter describes the implementation activities for each

strategy and identifies selected milestones, training, and communications-related considerations for each activity.

- As noted below (in discussion of activity EF-6), in an SRM dated March 22, 2006, the Commission approved the staff's recommendation to issue an advanced notice of proposed rulemaking (ANPR) on approaches for making technical requirements for power reactors risk-informed, performance-based, and technology neutral. Included in this ANPR is a request for comment regarding options for continuing to risk-inform the current 10 CFR Part 50. The staff will consider the need to restructure the RIRIP based on Commission decisions resulting from this ANPR.

The following paragraphs highlight the major risk-informing activities to be conducted by the NRC over the next 6 months. These discuss 12 of the activities in the RIRIP (Enclosure 2) - 5 related to "safety" and 7 related to "effectiveness."

SAFETY (Primary FY 2004–2009 Strategic Plan Goal)

1. **Industry Trends Support Program (SA-3):** The NRC's Industry Trends Program (ITP) monitors trends in indicators of industry performance to confirm that the safety of operating power reactors is being maintained. If any long-term indicators show statistically significant adverse trends, the NRC evaluates them and takes appropriate regulatory action using existing processes for resolving generic issues and issuing generic communications.

The NRC Office of Nuclear Regulatory Research (RES) supports the ITP by analyzing the operating experience data in RES databases. This includes updating trends for initiating events, component and systems reliabilities, common-cause failures, and fire events, and then providing this information on the RES internal and public Web sites.

As part of ITP support, RES began to develop the Baseline Risk Index for Initiating Events (BRIIE), an industry wide risk-informed performance indicator for initiating events. RES will address stakeholder comments on a draft report that was written and will work with the Office of Nuclear Reactor Regulation (NRR) to finalize the methodology and implementation details – including addressing differences between the BRIIE calculations and the comparable Mitigating Systems Performance Index (MSPI) methodology being developed to support the Reactor Oversight Process (ROP).

2. **Accident Sequence Precursor (ASP) Program (SA-5):** The risk associated with operational events and/or degraded conditions is evaluated under the ASP Program by systematically reviewing and evaluating operating experience to identify precursors to potential severe core damage sequences, documenting precursors, categorizing them by plant-specific and generic implications, and providing a measure of trends in nuclear plant core damage risk. The objectives of the ASP Program are to determine the safety significance of events and their regulatory implications; provide feedback to improve PRA models; and provide NRC Strategic Plan performance measures and the ASP occurrence rate trends for the NRC's annual Performance and Accountability Report to Congress. Since its inception, the ASP Program has evaluated more than 650 precursors, which are maintained in the ASP Events database.

By April 2006, RES will provide an assessment of all FY 2005 and significant first quarter FY 2006 ASP events to support the Agency Action Review Meeting (AARM). In addition, in September 2006, RES will provide to the Executive Director for Operations (EDO) the annual Commission (SECY) paper on the status of the ASP and SPAR model development programs.

3. Risk Management of Technical Specifications (RMTS) (SA-10): The staff continues to work on the RMTS initiatives to risk-inform the standard technical specifications (STS) and make them more consistent with the Maintenance Rule [10 CFR 50.65(a)(4)]. The major planned activities in this area are summarized below:

- Initiative 1, “Modified End States”: This initiative would allow (following a risk assessment) some equipment to be repaired during hot shutdown rather than cold shutdown. The safety evaluation report for the Babcock & Wilcox (B&W) topical report is scheduled to be issued in July 2006. The Technical Specification Task Force (TSTF)-423 for boiling-water reactor (BWR) plants was completed in March 2006 and will be made available via the Consolidated Line Item Improvement Process (CLIIP).
- Initiative 6, “Modification of Limiting Condition for Operation (LCO) 3.0.3, ‘Actions and Completion Times’”: The Combustion Engineering TSTF-426 safety evaluation will be published in the *Federal Register*, requesting public comment, as part of the CLIIP in June 2006.
- Initiative 7, “Non-TS Support System Impact in TS System Operability”: This initiative would permit a risk-informed delay time prior to entering LCO actions for inoperability attributable to a loss of support function provided by equipment outside of technical specifications. For example, TSTF-372 addresses snubber inoperability and TSTF-427 addresses hazard barrier inoperability. The staff approved and issued the safety evaluation for TSTF-372 in September 2004, and TSTF-372 was made available via the CLIIP in May 2005. The safety evaluation for TSTF-427 was completed in March 2006 and TSTF-427 is scheduled to be made available via CLIIP in June 2006.

4. Fire Protection for Nuclear Power Plants (SA-11): The staff issued Regulatory Issue Summary (RIS) 2004-03 on March 2, 2004, to discuss risk-informing the post-fire safe-shutdown electrical circuit inspection process. The staff revised the inspection procedure, and held another public workshop in October 2004 to discuss how the post-fire safe-shutdown circuit analysis inspections will be risk-informed. In December 2004, a revision to RIS 2004-03, which included the risk-informed inspection process and notification that circuit analysis inspections would resume in January 2005, was issued. Subsequently, the staff issued a second RIS for public comment in May 2005 to clarify compliance expectations with regard to circuit analysis.

The staff completed the rulemaking to endorse an alternative performance-based and risk-informed fire protection standard for nuclear power plants. The staff worked with the National Fire Protection Association (NFPA) to develop NFPA Standard 805, which was issued in April 2001. The final rule to incorporate NFPA 805 into 10 CFR Part 50

was published in the *Federal Register* in June 2004. The staff is working with industry to develop implementing guidance (NEI 04-01, Revision 1) for 10 CFR 50.48(c), which the NRC will endorse in a new regulatory guide scheduled to be issued in April 2006.

5. **Assessing Performance of Steam Generator Tubes and Other Reactor Coolant System (RCS) Components During Severe Accidents (SA-18):** The staff is developing an improved PRA model for use in determining the frequency of pressurized-water reactor (PWR) containment bypass events that result from steam generator tube (SGT) failures induced by severe accident conditions. This work utilizes PRA, thermal-hydraulic analyses, and analyses of SGT and non-SGT RCS components. The staff has recently developed a prototype risk-informed model and has used this model to perform a preliminary evaluation of a sample Westinghouse 4-Loop plant to calculate the frequency of severe accident containment bypass events attributable to SGT failures at that plant. The staff is currently evaluating the prototype model and the results of its application to the sample plant to determine the nature and extent of expansions and improvements needed in the model. Based on the results of that evaluation, the staff will determine the scope and schedule for the remainder of this project. This planning effort should be completed by the third quarter of FY 2006.

EFFECTIVENESS (Primary FY 2004–2009 Strategic Plan Goal)

1. **Develop PRA Standards and Related Guidance with National Standards Committees and Industry Organizations (EF-2):** The increased use of PRAs in the NRC's regulatory decision-making process requires consistency in the quality, scope, methodology, and data used in such analyses. These requirements apply to PRAs developed by industry to support risk-informed licensing actions, as well as PRAs developed by NRC staff to analyze technical issues or to support Commission decisions. To achieve this objective, professional societies, industry, and the staff have undertaken initiatives to establish consensus standards and guidance on the use of PRA in regulatory decision-making. Based on updates to the standards and guidance documents issued by the American Society of Mechanical Engineers (ASME) and the Nuclear Energy Institute (NEI), the staff is revising Regulatory Guide 1.200, "An Approach for Determining the Technical Adequacy of PRA Results for Risk-Informed Activities," and will issue Revision 1 for public review and comment in September 2006. A related guidance document, Treatment of Uncertainties, is being developed by the staff. A draft NUREG will be issued for public review and comment in September 2006.
2. **Develop Structure for New Plant Licensing (EF-6):** The staff has developed and implemented a plan to develop a regulatory structure for new plant licensing. In an SRM dated September 14, 2005, the Commission directed the staff "to develop . . . an [advance notice of proposed rulemaking(ANPR)]" and "incorporate into the ANPR the formal program to risk-inform Part 50." SECY-06-0007, issued on January 9, 2006, included the staff's recommended ANPR with the formal program plan for Commission consideration. In the plan, the staff proposed to create a new 10 CFR Part 53 which will constitute a new set of risk-informed requirements for both light-water reactor (LWR) and non-LWR designs. In an SRM, dated March 22, 2006, the Commission approved the staff's plans to issue the ANPR in April 2006 and simultaneously place the latest version of the technology-neutral framework on the RuleForum Web site.

3. **PRA Review of Advanced Reactor Applications (EF-10):** The staff has developed a PRA plan for the development of methods, data, and tools needed for reactor-specific PRAs to support the evaluation of the design and operational characteristics of advanced reactors that are different from those of current reactors. The PRA plan considers such things as the quantification of initiating events, likely accident phenomena, accident progression, containment/confinement performance, passive systems, digital instrumentation and control systems, uncertainties, internal flooding, external events (fires and seismic events), and multiple reactor modules on a site. Work is continuing on the generic PRA aspects for advanced reactors and on design-specific reviews [e.g., the Economic Simplified Boiling-water Reactor - ESBWR). In addition, a draft report documenting all PRA work completed to date on the Advanced CANDU Reactor (ACR-700) was completed in September 2005 and a report on PRA modeling of an ESBWR passive system is expected to be completed by April 2006.
4. **Probabilistic Risk Assessment of Dry Cask Storage Systems (EF-14):** In support of the Commission's policies on risk-informing the regulatory process and performance goals, the staff is currently developing PRA methods and quantifying the risk associated with dry cask storage of spent nuclear fuel. This study is intended to provide (a) methods to quantify the risk of dry cask storage of spent nuclear fuel, (b) insights into decision-making and how to improve regulatory activities associated with 10 CFR Part 72, and (c) analytical tools that can be used to implement future waste safety goals and risk-informed regulatory activities. RES revised the draft pilot PRA of dry cask storage for a specific cask design. The staff plans to present the results of the final pilot PRA to the Advisory Committee on Nuclear Waste (ACNW) by September 2006 and to issue the final pilot PRA as a NUREG-series report by March 2007.
5. **Reactor Oversight Process (ROP) Support (EF-20):** The NRC's ROP uses a variety of tools to monitor and evaluate the performance of commercial nuclear power plants – by focusing on those plant activities that are most important to safety. RES supports the ROP by developing and piloting the MSPI and developing models and guidelines for the Risk Assessment Standardization Project (RASP).

The MSPI monitors risk associated with changes in performance of selected mitigating systems, accounting for plant-specific design and performance data. Toward that end, the MSPI enhances the safety of nuclear plants by addressing known problems with the existing Safety System Unavailability Performance Indicator and providing a measure of both system reliability and availability.

The RASP will improve coordination among various NRC programs that perform risk analyses of licensee performance deficiencies; reduce the time required to perform risk analyses; improve the NRC's internal and external risk communications; provide solutions to technical issues associated with risk assessments and operating events; and provide NRC risk analysts with sufficient information to assess the quality of licensees' risk analysis results.

In April 2006, RES will provide to NRR data and guidance to help resolve issues concerning requirements for PRA quality to support MSPI implementation and provide input to the agency's document on these PRA requirements. RES will also participate in

staff review teams to review licensees' submittals of MSPI basis documents and provide input to the NRC's review findings and documents on the licensee submittals.

In June 2006, RES will document both the results of the technical analyses used to guide and focus MSPI reviews and the database used to support the technical analyses.

In July 2006, as part of RASP support, RES will complete trial use of and will update (as needed) guidelines for the expert elicitation process to be used in plant operating event analysis. In addition, in September 2006, also as part of RASP support, RES will develop analysis guidelines for trial use for external events (internal fire, internal flooding, seismic, and high wind) during power operations.

- 6. SPAR Model Development Program (EF-21):** RES is developing plant-specific PRA (known as SPAR models) that model accident sequence progression, plant systems and components, and plant operator actions. These models are easy-to-use tools that permit the NRC staff to perform risk-informed regulatory activities by independently assessing the risk of events or degraded conditions at operating nuclear power plants. SPAR models for internal initiating events during full-power operation are available for all 72 plant sites in the United States. Models for internal initiating events during low-power and shutdown (LP/SD) operations, for calculating large early release frequency (LERF), and for external initiating events (fires, floods, seismic events, high winds, etc.) are currently being developed.

SPAR models are used to: (1) evaluate the risk significance of inspection findings in Significance Determination Process (SDP) Phase 3 analyses; (2) evaluate risk associated with operational events and degraded conditions in the ASP Program; (3) identify risk-significant modeling issues and rank these issues as part of the PRA quality efforts (e.g., as part of RG 1.200); (4) support generic safety issue resolution (e.g., GSI-189 and GSI-191) by screening (or prioritizing), performing detailed analysis to determine if licensees should be required to make changes to their plants, assessing whether the NRC should modify or eliminate an existing regulatory requirement, and conducting flexible and quick analyses using minimum resources to perform generic studies; (5) perform analyses in support of the staff's risk-informed review of license amendments [e.g., tech spec changes, notices of enforcement discretion (NOEDs), fire protection requirements]; and (6) independently verify the MSPI.

In April 2006, RES will provide NRR and the regions with a semi-annual progress report for enhanced Revision 3 SPAR model accomplishments (including cut set level revisions for 24 additional models) as part of the RASP support.

In FY 2007, RES and NRR will determine the mitigation strategies -- arising from the requirements of Section B.5.b of the February 25, 2002 orders and from the plant specific mitigation strategy assessments (both relating to mitigating the effects of loss of large areas of plants due to fires and explosions) -- to be modeled and integrated into SPAR models, ROP/SDP Notebooks and other appropriate PRA tools. The strategies that are (or will be) in the licensing bases or covered by licensee commitments and that affect core damage frequency, containment failure frequency, or early fission product release to the environment will be incorporated into the models, as appropriate.

7. **Changes to Technical Requirements of 10 CFR 50.46 (EF-22):** The Commission's SRM on SECY-02-0057, dated March 31, 2003, approved most staff recommendations regarding possible changes to loss-of-coolant accident (LOCA) requirements and also directed the staff to prepare a proposed rule that would provide a risk-informed alternative maximum break size. The Commission subsequently provided additional direction in an SRM dated July 1, 2004. In response, the staff prepared a proposed rule containing emergency core cooling system (ECCS) evaluation requirements as an alternative to those specified in 10 CFR 50.46, "Acceptance Criteria for Emergency Core Cooling Systems (ECCS) for Light-Water Nuclear Power Reactors." These alternative requirements would be codified in a new regulation, 10 CFR 50.46a (The existing 10 CFR 50.46a is to be redesignated as 10 CFR 50.46b), and could be used in lieu of the requirements in 10 CFR 50.46 by current nuclear power reactor licensees. The proposed rule was issued for public comment in November 2005. The proposed rule affords licensees flexibility to establish quantitative acceptance criteria for maintenance of "coolable geometry" for breaks that are beyond the design basis, as specified in the new 10 CFR 50.46a.

In support of the new regulation, the staff is preparing a draft regulatory guide, which the staff plans to present to the ACRS in meetings to be scheduled through July 2006. The final regulatory guide is expected by December 2006.

The expert elicitation process, discussed in draft NUREG-1829, "Estimating Loss-of-Coolant Accident (LOCA) Frequencies Through the Elicitation Process," provides preliminary LOCA frequency estimates developed using an expert elicitation process to consolidate service history data, insights from probabilistic fracture mechanics studies with the knowledge of plant design, operation, and material performance. Public comments on NUREG-1829 were received through November 2005. The staff is evaluating comments received to determine whether adjustments to the methodology are necessary. The final version of the NUREG is expected by September 2006.

RESOURCES:

In response to the Commission's direction regarding the October 2000 version of the RIRIP, the updated plan lists the priority rating of each risk-informed regulation implementation activity. These priorities were determined through the FY 2007 PBPM process, according to a common prioritization methodology developed by the program offices and used to derive a prioritized listing of planned activities. Resources for RIRIP activities – except those activities noted as being deferred (i.e., "on hold") – have been budgeted in FY 2006 and for FY 2007 (as was done for FY 2006) since the presidential budget has been released. In addition, future resources needed for RIRIP activities will be obtained through the PBPM process; in particular FY 2008 resources will be considered in the FY 2008 PBPM process.

COMMITMENTS:

Contained within the enclosures are commitments associated with the effort required to support completion of the various risk-informing activities discussed.

COORDINATION:

The Office of the Chief Financial Officer has reviewed this paper for resource implications and has no objections. The Office of the General Counsel has also reviewed this paper and has no legal objections.

/RA/

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Enclosures:

1. Table of Accomplishments
2. Risk-Informed Regulation Implementation Plan

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