

HIGHLIGHTS OF MAJOR RISK-INFORMING ACTIVITIES

The following paragraphs highlight the major risk-informing activities that the staff has completed over the past 6 months and that are scheduled to be conducted over the next 6 months. This includes 12 of the activities in the risk-informed regulation implementation plan (RIRIP) (Enclosure 3)—5 related to “safety,” 6 related to “effectiveness,” and 1 related to “openness.”

SAFETY (Primary Fiscal Year (FY) 2004–2009 Strategic Plan Goal)

- 1. Industry Trends Support Program (SA-3):** The U.S. Nuclear Regulatory Commission’s (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.

As part of ITP support, the Office of Nuclear Regulatory Research (RES) continued development of the baseline risk index for initiating events (BRIIE), an industrywide risk-informed performance indicator for initiating events. RES will address stakeholder comments on a draft report and will work with the Office of Nuclear Reactor Regulation (NRR) to finalize the methodology and details of implementation, 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). The goal is to present BRIIE results and thresholds in the FY 2006 ITP paper (to be used in early calendar year (CY) 2007) and to incorporate BRIIE into the ITP and formally use BRIIE results as an ITP indicator in the FY 2007 ITP paper (to be issued in early CY 2008).

- 2. Accident Sequence Precursor (ASP) Program (SA-5):** The ASP Program evaluates risk associated with operational events and/or degraded conditions 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 probabilistic risk assessment (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.

In November 2006, RES will provide results on the number of significant precursors in FY 2005 to the ITP and the annual Performance and Accountability Report to Congress. By April 2007, RES will provide a preliminary assessment of FY 2006 events to support the Agency Action Review Meeting.

3. Risk Management of Technical Specifications (RMTS) (SA-10): The staff continues to work on the RMTS initiatives to add a risk-informed component to the standard technical specifications (STS). The following summarizes the major planned activities in this area:

- 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 Technical Specification Task Force (TSTF)-423 for boiling-water reactor (BWR) plants was made available via the Consolidated Line Item Improvement Process (CLIIP) on March 23, 2006. The safety evaluation report for the Babcock & Wilcox (B&W) topical report was noticed for comment in May 2006 and was approved in August 2006. The Babcock & Wilcox Owners Group is preparing TSTF-431 to implement the B&W topical report. The Westinghouse topical report was submitted in September 2005 and is under review.
- Initiative 4b, “Risk-Informed Completion Times”: The overall objective of this initiative is to modify the technical specification (TS) to reflect a configuration risk management approach that is more consistent with the approach of the maintenance rule in Title 10, Section 50.65(a)(4), of the *Code of Federal Regulations* (10 CFR 50.65(a)(4)). The proposal involves a combination of the current TS completion times (CTs), a quantified risk assessment based on 10 CFR 50.65(a)(4) to determine CT extension feasibility, and CT backstop limits. The CT backstop limits ensure that low-risk safety functions are not permitted to be inoperable for an indefinite period of time. Industry submitted a risk management guidance document in August 2006. The South Texas Project and Fort Calhoun Station (Combustion Engineering (CE)) pilot plants are to be approved in FY 2007.
- Initiative 5b, “Surveillance Frequency Control Program”: The goal of this initiative is to develop a risk-informed process that would establish surveillance intervals based on risk insights, equipment availability and reliability factors, performance history, etc., to determine an “optimum” surveillance requirement frequency. Upon development and approval of this process, the intent is to retain the existing surveillance requirements in the technical specifications but to remove the equipment-specific surveillance test intervals to a licensee-controlled document. Industry submitted a revised process/methodology document in July 2006. The process/methodology document and Limerick pilot plant were approved in September 2006.
- Initiative 6, “Modification of Limiting Condition for Operation (LCO) 3.0.3, ‘Actions and Completion Times’”: The CE TSTF-426 safety evaluation was published in the *Federal Register*, with a request for public comment, as part of the CLIIP on July 20, 2006. The CE TSTF-426 is scheduled to become available for adoption via CLIIP in January 2007.
- Initiative 7, “Non-TS Support System Impact in TS System Operability”: This initiative would permit a risk-informed delay time before entering LCO actions for inoperability attributable to a loss of support function provided by equipment

outside of technical specifications. For example, TSTF-427 addresses hazard barrier inoperability. The safety evaluation for TSTF-427 was noticed for comment on June 2, 2006, and became available via CLIP in September 2006.

4. **Fire Protection for Nuclear Power Plants (SA-11):** The staff completed the rulemaking to endorse an alternative performance-based and risk-informed fire protection rule for operating nuclear power plants. The staff worked with the National Fire Protection Association (NFPA) to develop NFPA Standard 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants," 2001 Edition. The final rule to incorporate NFPA Standard 805, 2001 Edition, into 10 CFR 50.48c) appeared in the *Federal Register* in June 2004 and became effective on July 16, 2004. The Nuclear Energy Institute (NEI) developed an implementation guide, NEI 04-02, Revision 1, "Guidance for Implementing a Risk-Informed, Performance-Based Fire Protection Program Under 10 CFR 50.48c)." In May 2006, the NRC issued Regulatory Guide 1.205, "Risk-Informed, Performance-Based Fire Protection for Existing Light-Water Nuclear Power Plants." This regulatory guide endorsed NEI-04-02. To date, 40 operating nuclear power plants have indicated a desire to adopt this alternative rule.
5. **Assessing Performance of Steam Generator Tubes and Other Reactor Coolant System (RCS) Components During Severe Accidents (SA-18):** The staff has developed 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 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 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.

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 decisionmaking process requires consistency in the quality, scope, methodology, and data used in such analyses. 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 decisionmaking. Based on updates to the standards and guidance documents issued by the American Society of Mechanical Engineers and the 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 December 2006. Future revisions of Regulatory Guide 1.200 will address PRA quality standards for fire,

external events, and low power and shutdown operations risk assessments. The staff is also preparing a related guidance document, "Treatment of Uncertainties," and will issue a draft NUREG for public review and comment in December 2006.

2. **Develop Structure for Advanced Reactor Licensing (EF-6):** The staff developed a plan for a regulatory structure for advanced reactor licensing (i.e., non-light water reactors). In the plan, the staff proposed to create a new 10 CFR Part 53 which will constitute a new set of risk-informed requirements. In an SRM, dated March 22, 2006, the Commission approved the staff's plans. The staff issued the advance notice of proposed rulemaking in April 2006 and simultaneously placed the latest version of the technology-neutral framework on the RuleForum Web site. The staff will provide the Commission with a recommendation on whether to proceed with rulemaking in May 2007.
3. **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 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 on how to improve regulatory activities associated with 10 CFR Part 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater Than Class C Waste," and (c) analytical tools that can be used to implement future waste safety goals and risk-informed regulatory activities. The staff presented the results of the final pilot PRA to the Advisory Committee on Nuclear Waste in July 2006..
4. **Reactor Oversight Process Support (EF-20):** 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, while 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.

In April 2006, RES provided to NRR data and guidance to help resolve issues concerning requirements for PRA quality to support MSPI implementation and provided input to the agency's document on these PRA requirements. RES also participated in staff review teams to review licensees' submittals of MSPI basis documents and provided input to the NRC's review findings and documents on the licensee submittals.

In June 2006, RES documented 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 completed trial use of the guidelines and updated them (as needed) 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

developed analysis guidelines for trial use for external events (internal fire, internal flooding, seismic, and high wind) during power operations.

5. **Standardized Plant Analysis Risk (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 enable 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. The staff is currently developing models for internal initiating events during low-power and shutdown operations, for calculating large early release frequency, and for external initiating events (fires, floods, seismic events, high winds, etc.).

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

The staff is currently using SPAR models to support the development of the state-of-the-art reactor consequence analysis of severe accidents at nuclear power plants. Based on insights resulting from this activity, the staff plans to update the SPAR models, as appropriate, based on current plant capabilities and safety enhancements. Initially, the plants to be evaluated will be the six lead (pilot) plants in the state-of-the-art reactor consequence analysis project. In addition, the staff will update the SPAR models, as appropriate and on a plant-by-plant basis, to include plant safety enhancements resulting from Phases 1, 2 and 3 Section B.5.b assessments as the engineering and risk information on the pertinent systems become available to the staff as part of normal NRC regulatory activities.

6. **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 would 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 Commission issued the proposed rule 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.

Public workshops took place on February 16, June 28, and August 17, 2006, to discuss the language of the draft-final rule. The staff expects to deliver the draft final rule to the Commission by February 2007.

In support of 50.46 rulemaking, the staff conducted an expert elicitation process to improve its understanding of the LOCA frequency as a function of the break size. 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. The staff accepted public comments on NUREG-1829 through November 2005 and is now evaluating these comments to determine whether adjustments to the methodology are necessary. The draft-final version of the NUREG is expected by November 2006. The staff plans to discuss the report with the Advisory Committee on Reactor Safeguards in the fall of 2006 and, following that, plans to publish it by December 2006.

OPENNESS (Primary FY 2004–2009 Strategic Plan Goal)

1. **Improve PRA communication to stakeholders (OP-1):** Staff from the Offices of NRR, RES, and Public Affairs (OPA) are working together to develop a range of communication approaches to reach the agency's diverse body of stakeholders. The interoffice team expects to complete two activities in the next 6 months.

First, a redesign of the NRC public Web site is underway to make information on the purpose and use of PRA applications easier for the public to find and understand. This redesign will not only allow interested parties to access the latest information quickly, but it will also draw the attention of the casual Internet browser to the agency's risk-informed activities. Updates to the public Web site will replace Enclosure 3 of the next update of the RIRIP.

Second, the staff will rewrite fact sheets related to risk (currently "Probabilistic Risk Assessment" and "Nuclear Reactor Risk") to improve clarity and will update them to include the latest risk-informed initiatives. OPA commonly uses these fact sheets as reference material to respond to questions from the media and other stakeholders. The fact sheets are also available in a prominent location on the agency's public Web site ("Fact Sheets and Brochures" link from the main page), which makes them easily accessible.