

POLICY ISSUE INFORMATION

October 31, 2012

SECY-12-0149

FOR: The Commissioners

FROM: Brian W. Sheron, Director
Office of Nuclear Regulatory Research

SUBJECT: ANNUAL UPDATE OF THE RISK-INFORMED AND
PERFORMANCE-BASED PLAN

PURPOSE:

This paper provides the Commission with an annual update on activities contained in the Risk-Informed and Performance-Based Plan (RPP), including a summary of the recent accomplishments and near-term anticipated accomplishments. This paper does not address any new commitments or associated resource implications.

BACKGROUND:

On June 1, 2006, the Commission issued a staff requirements memorandum (SRM) (Agencywide Documents Access and Management System [ADAMS] under Accession No. ML061520304) that directed the U.S. Nuclear Regulatory Commission (NRC) staff to improve upon the Risk-Informed Regulation Implementation Plan (RIRIP) by developing an integrated master plan for activities designed to help NRC achieve its goal of a holistic, risk-informed, and performance-based regulatory structure. The Commission also directed the staff to seek ways to communicate more transparently to the public and stakeholders on the purpose and use of Probabilistic Risk Assessment (PRA) in the agency's reactor, materials, and waste regulatory programs. SECY-07-0074, "Update on the Improvements to the Risk-Informed Regulation Implementation Plan," dated April 26, 2007 (ADAMS Accession No. ML070890396), conveyed that plan, which the staff retitled as the "Risk-Informed and Performance-Based Plan."

CONTACT: Brian Wagner, RES/DRA
301-251-7595

To meet the Commission's expectations for both a risk-informed and a performance-based regulatory structure, Enclosure 1 to SECY-07-0074 included explicit criteria for the staff's review and consideration of performance-based approaches to determine which initiatives should be both risk-informed and performance based. SECY-07-0191, "Implementation and Update of the Risk-Informed and Performance-Based Plan," dated October 31, 2007 (ADAMS Accession No. ML072700587), discussed the staff's progress in implementing the RPP and included an updated set of objectives, bases, and goals for the reactor, materials, and waste regulatory arenas. In November 2007, the staff completed its commitment to make all aspects of the RPP available to the general public via the agency's public web site. The most recent version of the plan was provided as SECY-11-0151, "Annual Update of the Risk-Informed and Performance-Based Plan," dated October 27, 2011 (ADAMS Accession No. ML112620701).

DISCUSSION:

This Commission paper contains summary information on risk-informed and performance based activities. More comprehensive and detailed information appears on the NRC's public Web site at <http://www.nrc.gov/about-nrc/regulatory/risk-informed/rpp.html>. The Web site provides a readily accessible overview and current status of the agency's risk-informed and performance-based regulatory activities.

The full list of risk-informed initiatives is assembled on the Web site. This paper continues to report on the regulatory initiatives listed below, which are expected to be of Commission interest, with more details in the enclosure:

- Fire Protection for Nuclear Power Plants
- Risk-Informed Technical Specifications
- Develop an Alternative Risk-Informed Approach to Special Treatment Requirements
- NRC Risk Network
- Risk-Informed Rulemaking and Related Activities Currently in Progress
- Risk-Informed Regulatory Guidance for New Reactors
- Human Reliability Analysis
- Human Reliability Analysis Development for Fire PRA
- Standardized Plant Analysis Risk (SPAR) Model Development Program and Systems Analysis Program for Hands-On Integrated Reliability Evaluations (SAPHIRE)
- Risk-Related Generic Issues
- Use of Risk Insights to Enhance Safety Focus of Small Modular Reactor Reviews
- Revised Fuel Cycle Oversight Process
- Extended Storage and Transportation of Spent Nuclear Fuel
- Draft Regulatory Basis to Support Rulemaking for Potential Reprocessing Facilities
- Risk-Informed Emergency Action Levels

In addition, the staff has added the following initiatives to the enclosure:

- Glossary of Risk-Related Terms. The NRC is developing a glossary of risk-related terms to identify and define terms used in risk-informed activities related to commercial nuclear power plants. By providing a single source of the terms, the glossary is intended to reduce ambiguity and facilitate communication on risk-informed activities. In June 2012, a preliminary draft of the glossary was made publicly available in draft NUREG-2122,

“Glossary of Risk-Related Terms in Support of Risk-Informed Decisionmaking” (ADAMS Accession No. ML121570620). The final glossary is expected to be published by the end of calendar year 2012, following resolution of public comments.

- Risk-Informed Construction Significance Determination Process Pilot. The NRC is conducting a Construction Reactor Oversight Process (cROP) assessment and enforcement pilot to apply the proposed new construction assessment and enforcement programs described in SECY-10-0140, “Options for Revising the Construction Reactor Oversight Process Assessment Program,” dated October 26, 2010.
- Level 3 Probabilistic Risk Assessment Project. In the Staff Requirements Memorandum related to SECY-11-0089 (ADAMS Accession No. ML112640419), the Commission directed the staff to conduct a full-scope site Level 3 PRA. The full-scope site Level 3 PRA will address all internal and external hazards, all plant operating modes, and all reactor units, spent fuel pools, and dry cask storage. The staff provided the Commission current information on the Level 3 PRA project in SECY-12-0123, “Update on Staff Plans to Apply the Full-Scope Site Level 3 PRA Project Results to the NRC’s Regulatory Framework,” (ADAMS Accession No. ML 12202B170). The Level 3 PRA project is currently scheduled to be completed in March 2016.

The staff has added the following initiatives to the Web site:

- Spent Fuel Transportation Risk Assessment. NMSS staff initiated the Spent Fuel Transportation Risk Assessment (SFTRA) project to produce an updated and refined assessment of the spent fuel shipment risks. This assessment considers new or additional factors and produces explanatory materials to enhance the NRC’s related outreach efforts on public health and safety. Staff plans to complete the project and issue a final NUREG report in the first half of 2013.
- Risk Informing Security Workshop. The staff plans to conduct a workshop on risk-informing security. This workshop would be a followup to the September 2010 workshop conducted at Sandia National Laboratories. It will focus on the recommendations of the Sandia workshop and provide additional insights into the areas of security that might benefit from developing and implementing risk-informed approaches.

Two important and related staff efforts are currently underway. In SRM-SECY-11-0093, “Near-Term Report and Recommendations for Agency Actions Following the Events in Japan,” dated August 19, 2011 (ADAMS Accession No. ML112310021), the Commission directed staff to provide a notation vote paper on the disposition of Near-Term Task Force (NTTF) Recommendation 1 by February 2013. This effort is being prepared by the NTTF Recommendation 1 Task Force. Additionally, the Chairman’s Memorandum, “Evaluating Options Proposed for a More Holistic Risk-Informed, Performance-Based Regulatory Approach,” dated June 14, 2012, clarified the SRM-SECY-11-0093 staff direction to include consideration of the regulatory framework recommendations for power reactors provided in NUREG-2150, “A Proposed Risk Management Framework.”

In addition, the Chairman’s Memorandum directed the staff to provide a paper to the Commission that would identify options and make recommendations for the Commission’s

consideration regarding the potential development of a policy statement. The staff has initiated actions to address the second task in the Chairman's memorandum. As directed, the staff will produce a Commission paper six months after the SRM that follows the February 2013 notation vote paper. The rapidly evolving work of these staff efforts will be reported via their separate Commission papers, rather than in this RPP paper.

COORDINATION:

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

/RA/

Brian W. Sheron, Director
Office of Nuclear Regulatory Research

Enclosure:
As stated

Recent Accomplishments and Near-Term Anticipated Accomplishments – 2012

This summary highlights the major risk-informed and performance-based initiatives that the staff of the U.S. Nuclear Regulatory Commission (NRC) is currently working on or has recently completed in 2012.

1. Fire Protection for Nuclear Power Plants

In 2004, the Commission approved a voluntary risk-informed and performance-based fire protection rule for existing nuclear power plants. The rule endorsed National Fire Protection Association (NFPA) consensus standard, NFPA 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants." In addition, the Nuclear Energy Institute (NEI) developed NEI 04-02, "Guidance for Implementing a Risk-Informed, Performance-Based Fire Protection Program under 10 CFR 50.48(c)," dated September 30, 2005, that the staff endorsed in Regulatory Guide (RG) 1.205, "Risk-Informed, Performance-Based Fire Protection for Existing Light-Water Nuclear Power Plants," issued May 2006. To date, nearly half of the U.S. operating nuclear power units, including those that participated in the pilot program, have committed to transition to NFPA 805 as their licensing basis.

The Oconee and Shearon Harris plants were the pilot plants for 10 CFR 50.48(c). In June 2010, a safety evaluation approved the Shearon Harris NFPA 805 pilot application. A safety evaluation in December 2010 approved the Oconee NFPA 805 pilot application.

NEI 04-02 was revised (Revision 2) in April 2008 and the staff revised RG 1.205 (Revision 1) in December 2009 to reflect lessons learned from the pilot reviews. The staff developed NUREG-800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition," Chapter 9, "Auxiliary Systems," Section 9.5.1.2, "Risk-Informed, Performance-Based Fire Protection Program Review Responsibilities," issued December 2009, to provide staff guidance for the review of licensee applications to transition to NFPA 805. Additionally, the NRC developed a Frequently Asked Question (FAQ) process to review and establish a preliminary staff position on application, review, and implementation issues.

Lessons learned from the pilot applications indicated that the staff and the industry underestimated the complexity and resources necessary to complete the reviews. In a staff requirements memorandum (SRM) to SECY-11-0033, "Proposed NRC Staff Approach to Address Resource Challenges Associated with Review of a Large Number of NFPA 805 License Amendment Requests," dated April 20, 2011, the Commission approved the staff's recommendation to increase resources to review NFPA 805 applications, develop a staggered review process, and to modify the current enforcement policy. The NRC sent the revised enforcement policy to the Commission in SECY-11-0061, "A Request to Revise the Interim Enforcement Policy for Fire Protection Issues on 10 CFR 50.48(c) to Allow Licensees to Submit License Amendment Requests in a Staggered Approach," dated April 29, 2011 and approved in SRM-SECY-11-0061, dated June 10, 2011. To enhance the efficiency and effectiveness of the NFPA 805 application reviews, the industry developed an application template and the staff developed a safety evaluation template. To date, the staff received 10 applications; and expects another six by the end of calendar year (CY) 2012.

Enclosure

2. Risk-Informed Technical Specifications

The staff continues to work on the risk-informed technical specifications (RITS) initiatives to add a risk-informed component to the standard technical specifications (STS). The following summaries highlight the major accomplishments in this area:

- Initiative 1, “Modified End States,” would allow licensees to repair equipment during hot shutdown rather than cold shutdown. The topical reports supporting this initiative for boiling-water reactor (BWR), Combustion Engineering (CE), Babcock & Wilcox (B&W), and Westinghouse plants have been approved, and revisions to the BWR, CE, B&W, and Westinghouse STS are available.
- Initiative 4b, “Risk-Informed Completion Times,” modifies technical specification completion times to reflect a configuration risk management approach that is more consistent with the approach described in the Maintenance Rule, as specified in Title 10 of the *Code of Federal Regulations* (10 CFR) 50.65(a)(4). As reported previously in SECY-07-0191, “Implementation and Update of the Risk-Informed and Performance-Based Plan,” dated October 31, 2007, the staff issued the license amendment for the first pilot plant, South Texas Project, in July 2007. In July 2010, Southern Nuclear Company (SNC) submitted a letter of intent for Vogtle (for Units 1 and 2) to implement RITS Initiative 4b. The NRC granted the associated fee waiver request and received a pilot application in September 2012. The associated Technical Specification Task Force guidance (TSTF-505) to revise the STS became available in March 2012.
- Initiative 6, “Add Actions to Preclude Entry into LCO 3.0.3,” modifies technical specification action statements for conditions that result in a loss of safety function related to a system or component included within the scope of the plant technical specifications. The staff approved the industry’s topical report for CE nuclear power plants (Revision 2 to WCAP-16125-NP-A, “Justification for Risk-Informed Modifications to Selected Technical Specifications for Conditions Leading to Exigent Plant Shutdown”) in August 2010. The associated Technical Specification Task Force guidance (TSTF-426 Revision 5) to revise the CE STS was submitted for NRC review in November 2011. Based on the approved CE topical report, the industry also has submitted requests to revise the B&W STS (TSTF-538 Revision 0) and the BWRs STS (TSTF-540 Revision 0) in March 2012 and May 2012, respectively. The staff is currently reviewing all three of these applications.

3. Develop an Alternative Risk-Informed Approach to Special Treatment Requirements

In 1998, the Commission decided to consider issuing new regulations that would provide an alternative risk-informed approach for special treatment requirements in the current regulations for power reactors. The NRC published the final rule (10 CFR 50.69, “Risk-Informed Categorization and Treatment of Structures, Systems and Components [SSCs] for Nuclear Power Reactors”) in the *Federal Register* on November 22, 2004 (69 FR 68008). The NRC staff issued Regulatory Guide (RG) 1.201, “Guidelines for Categorizing Structures, Systems, and Components in Nuclear Power Plants According to Their Safety Significance,” Revision 1, on May 2006.

The staff completed its review of Westinghouse topical report WCAP-16308-NP (Revision 0, July 2006), "Pressurized Water Reactor Owners Group 10 CFR 50.69 Pilot Program – Categorization Process – Wolf Creek Generating Station," and issued its final safety evaluation on March 26, 2009 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML090260674). By letter dated December 6, 2010, the Southern Nuclear Company (SNC) informed the NRC of its intent to submit a license amendment request for implementation of 10 CFR 50.69 for Vogtle Units 1 and 2 and requested pilot plant status and a waiver of review fees. By letter dated June 17, 2011, the staff informed SNC that the NRC has granted the fee waiver request for the proposed licensing action in accordance with 10 CFR 170.11(b). SNC submitted the licensing action request on August 31, 2012. Following the initial pilot application, lessons learned from the application review will be used to revise the associated industry guidance and RG 1.201.

In addition, the NRC staff issued draft Inspection Procedure 37060, "10 CFR 50.69 Risk-Informed Categorization and Treatment of Structures, Systems, and Components Inspection," on February 16, 2011. NEI and one licensee provided comments on the procedure. The NRC staff addressed the comments and issued the revised inspection procedure in 2011. The NRC will focus its inspection efforts on the most risk significant aspects related to implementation of 10 CFR 50.69 (i.e., proper categorization of SSCs and treatment of Risk-Informed Safety Class (RISC)-1 and RISC-2 SSCs). Additionally, the inspections are expected to be performance-based, with SSCs of lower safety significance (e.g., classified RISC-3) not receiving a major portion of inspection focus unless adverse performance trends are observed.

The staff recognizes the need for an effective, stable, and predictable regulatory climate for the implementation of 10 CFR 50.69. The NRC views inspection guidance developed with industry stakeholder input as an efficient vehicle for reaching a common understanding of what constitutes an acceptable treatment program for SSCs since specific treatment plans are not reviewed as part of a licensee's application to implement 10 CFR 50.69. During the pilot application review, the staff expects to continue to work with the industry and pilot licensees to modify the inspection procedure to reflect lessons learned and information gleaned from the pilot's proposed treatment program.

4. NRC Risk Network

The NRC staff uses a suite of risk tools to support oversight of nuclear reactors such as risk assessment software, Standardized Plant Analysis Risk (SPAR) models, databases, guidance for the Significance Determination Process (SDP), and associated training. The Risk Network project, established in February 2010, represents the outcome of a structured assessment involving internal stakeholders in the Office of Nuclear Reactor Regulation (NRR), Office of Nuclear Regulatory Research (RES), and each Region to define, prioritize, and implement enhancements to risk tools used by risk analysts, inspectors and their management. The goal of the Risk Network project is to ensure the availability of high quality, technically sound NRC risk analysis tools and to ensure adequate training for the staff to use these tools.

A comprehensive review of the Risk Network Project was conducted in 2012. Of the 79 tasks generated as a result of the Risk Network, the staff completed 41 tasks. Thirteen tasks were placed under normal agency processes such as the User-Need process and the Reactor Oversight Program Feedback process. For the remaining tasks, Division of Risk Assessment

technical leads in NRR have been identified and the tasks are on track to be completed by 2014.

5. Risk-Informed Rulemaking and Related Activities Currently in Progress

The staff continues to work on several risk-informed rulemaking initiatives. The summary below highlights the major accomplishments.

The staff prepared a proposed rule containing emergency core cooling system evaluation requirements that could be used as an alternative to the current requirements in 10 CFR 50.46, "Acceptance Criteria for Emergency Core Cooling Systems (ECCS) for Light-Water Nuclear Power Reactors." That proposed rulemaking is designed to redefine the large-break loss-of-coolant accident requirements to provide a risk-informed alternative maximum break size. In October 2006, the staff produced a draft final rule and briefed the Advisory Committee on Reactor Safeguards (ACRS). In response, ACRS recommended that the Commission should not issue the proposed rule in its present form. As a result, the staff prepared SECY-07-0082, "Rulemaking To Make Risk-Informed Changes to Loss-of-Coolant Accident Technical Requirements: 10 CFR 50.46a, 'Alternative Acceptance Criteria for Emergency Core Cooling Systems for Light-Water Nuclear Power Reactors,'" dated May 16, 2007, to provide a plan (including resource and schedule estimates) for responding to the ACRS recommendation and related comments. Then, in SRM-SECY-07-0082, dated August 10, 2007, the Commission agreed with the staff's recommendation that completing the rulemaking should be assigned a medium priority. Nonetheless, the SRM also directed the staff to continue to make progress on the 10 CFR 50.46a rulemaking and to apply resources to the effort in fiscal year (FY) 2008.

On April 1, 2008, the Executive Director for Operations provided the staff's schedule for completing the final rule to the Commission. Following Commission approval, the NRC published a supplemental proposed rule, "Performance-Based Emergency Core Cooling System Acceptance Criteria" (74 FR 40765, August 13, 2009) for public comment. The public comment period ended in January 2010. After reviewing public comments, and after making changes to address these comments and ACRS comments, the staff submitted a final rulemaking package to the Commission for approval on December 10, 2010, in SECY-10-0161 Final Rule: Risk-Informed Changes to Loss-Of-Coolant Accident Technical Requirements (10 CFR 50.46a).

On April 20, 2012, the staff requested withdrawal of the 10 CFR 50.46a final rule from Commission consideration to review the rule and ensure compatibility with the ongoing regulatory framework activities under Recommendation 1 of the Fukushima Near-Term Task Force (NTTF) report. The Commission approved the staff's request in SRM-SECY-10-0161, dated April 26, 2012. The staff does not plan to publish a notice in the *Federal Register* withdrawing the 10 CFR 50.46a final rule. The staff intends to resubmit the draft final rule for Commission consideration after receiving Commission direction in conjunction with NTTF Recommendation 1.

6. Risk-Informed Regulatory Guidance for New Reactors

The staff continues to address the issue of risk-informed regulatory guidance for new light-water reactors (LWRs). A Commission briefing was held on the topic on October 14, 2010. Subsequently, on March 2, 2011, the Commission issued SRM to SECY-10-0121, "Modifying the Risk-Informed Regulatory Guidance for New Reactors" (ADAMS Accession No. ML110610166), to direct the staff to continue to use the existing risk-informed framework, including current regulatory guidance, for licensing and oversight activities for new plants, pending additional analysis.

Since the issuance of the SRM, the staff has held nine public meetings with stakeholders. The ACRS subcommittee on Reliability and Probabilistic Risk Assessment (PRA) was briefed on September 20, 2011 and on March 7, 2012, and the full ACRS was briefed on April 12, 2012. On June 6, 2012, SECY-12-0081, "Risk-Informed Regulatory Framework for New Reactors" (ADAMS Accession No. ML12117A012) was submitted to the Commission. This SECY contains an overview of the tabletop exercises and presented options for Commission consideration to address the different risk metrics used during new reactor licensing. Additionally, the staff recommended an option in which the staff identifies appropriate changes to the ROP to augment the existing risk-informed guidance with deterministic backstops to ensure an appropriate regulatory response for the new reactor designs. The ACRS provided its comments on the staff's recommendations in letters dated April 26, 2012, and July 17, 2012. The staff is working to respond to SRM-SECY-12-0081, dated October 17, 2012.

In addition, in response to the SRM on SECY-10-0121, the staff has created a summary-level public communication brochure regarding new reactor safety performance, NUREG/BR-0356, "New Reactors: Striving for Enhanced Safety," dated November 2011 (ADAMS Accession No. ML11343A026).

7. Human Reliability Analysis

The staff is addressing issues associated with the differences in human reliability analysis (HRA) methods available for quantifying human failure events in a PRA. In addition to supporting the agency's plan to enhance PRA quality, the staff is also following up on SRM-M061020, dated November 8, 2006.

The Commission directed ACRS in SRM-M061020 to "work with the staff and external stakeholders to evaluate the different human reliability models in an effort to propose a single model for the agency to use or guidance on which model(s) should be used in specific circumstances." Subsequently, the staff has interacted frequently with ACRS to incorporate its input on all facets of the work, including the technical approach and its development, implementation and deployment process. Moreover, the staff has initiated efforts to address SRM-M090204B, dated February 18, 2009 to collect data and test HRA methods using U.S. nuclear plant operating crews.

The staff supported and participated in the International HRA Empirical Study, an experimental study performed collaboratively by approximately a dozen regulatory and industry organizations and members of the Halden Reactor Project (HRP). This study involves the collection of reactor operator crew performance observations and comparison with the results of different HRA

methods used to evaluate the actions involved in simulated scenarios. The NRC published the results of the study in NUREG/IA-0216, "International HRA Empirical Study-Phase 1 Report," Volume 1, issued November 2009 and Volume 2, issued August 2011. Volume 1 documents the pilot study, and Volume 2 documents the results of SGTR scenarios. Volume 3, to be published by December 2012, will document the results of loss of feedwater scenarios. The overall lessons learned from the study are expected to be published as a separate NUREG (NUREG-2127) by December 2012.

Using the results from the international HRA study and previous HRA method evaluations, the staff is performing technical work to address SRM-M061020. The approach aims to address (1) the issue of variability in HRA through the adoption of a formalization process that guides the identification of potential human failures, (2) the use of an explicit human performance framework for establishing causal relationships of human failures to underlying failure mechanisms, and (3) the use of the current understanding of cognitive psychology as a technical basis for postulating failure events, failure mechanisms, and underlying performance drivers. It also intends to use a mathematical formulation consistent with the overall PRA framework to estimate failure probabilities. The staff believes that this approach will result in a single architecture for HRA that improves consistency and adequacy for HRA applications. This work is being performed collaboratively with the Electric Power Research Institute (EPRI) under a Memorandum of Understanding (MOU) to address the issue of variability in HRA. The staff completed the development of the new HRA method, Integrated Decision-tree Human Event Analysis System (IDHEAS).

As part of the direction in SRM-M090204B to collect data and test HRA methods using U.S. nuclear plant operating crews, the staff has established an MOU with a U.S. utility and has initiated a new study to evaluate a specific set of HRA methods used in regulatory applications through a comparison of HRA predictions to crew performance in simulator experiments performed in a U.S. nuclear power plant. In collaboration with this utility, the staff has performed an empirical study using U.S. crews and simulators. The results of this study will be used to determine the potential limitations of data collected in non-U.S. simulators when used to evaluate U.S. applications and to improve the insights developed from the International HRA Empirical Study. The staff expects to complete the work in September 2013.

In regard to HRA data, RES signed an agreement with a U.S. utility in March 2011 to collaborate on the collection of human performance information on the utility's training programs for HRA. The information sources include the licensed operator simulator training, job performance measures, and emergency drills. To aid in the collection, the staff developed the Scenario Authoring, Characterization and Debriefing Analysis (SACADA) tool. The staff is currently seeking both US and international collaboration in use of this tool for data collection.

The staff developed a prototype event timeline tool to assist NRC inspectors in the conduct of event inspections. Additionally, the staff visited H.B. Robinson to collect the human performance information on its March 28, 2010, fire event.

8. Human Reliability Analysis Development for Fire PRA

Under an MOU, RES and EPRI have embarked on a cooperative program to improve the state-of-the-art in fire risk studies. This program produced a joint document, NUREG/CR-6850/EPRI

1011989, "EPRI/NRC-RES Fire PRA Methodology for Nuclear Power Facilities," issued September 2005 (ADAMS Accession Nos. ML052580075 and ML052580118) that addresses fire risk for at-power operations. Because this joint NRC/EPRI report does not describe a methodology for developing best-estimate human failure probabilities, a new effort is underway to develop such a methodology and associated guidance, including peer review and testing. The results of this HRA methodology development effort support the NFPA 805 transition initiative and the possible resolution of other regulatory issues, such as multiple spurious operation and operator manual actions.

In 2008, a peer review was performed and testing on selected plants was completed. In May 2009, feedback from both of these efforts was reviewed and addressed, resulting in a revised NUREG-1921/EPRI 1019196, "EPRI/NRC-RES Fire Human Reliability Analysis Guidelines," in November 2009. The NRC internally reviewed the revised draft, and an overview was presented to the ACRS HRA subcommittee in June 2009. Following some additional revisions, the report was issued as a draft for public comment in December 2009. This work is one input to the work being done under SRM-M061020 and related research.

The public comment period for the draft report closed in March 2010. Comments were received from four reviewers. In addition, the PWR Owners Group provided feedback in a pilot application of the fire HRA guidelines. The joint EPRI/NRC-RES team completed the final report in July 2012 (ADAMS Accession No. ML12216A104, EPRI 10232001). In addition, the joint team is presenting the fire HRA module for the third time (July 16-20, 2012 and September 24-28, 2012) in the Joint EPRI/NRC-RES Fire PRA training course.

9. Standardized Plant Analysis Risk Model Development Program and Systems Analysis Program for Hands-On Integrated Reliability Evaluations

SPAR models are plant-specific PRA models that treat accident sequence progression, plant systems and components, and plant operator actions. The standardized models represent the as-built and as-operated plant. As such, they permit the staff to perform risk-informed regulatory activities by independently assessing the risk of events or degraded conditions at operating nuclear power plants. In addition, the NRC staff continues to maintain and improve the SAPHIRE Version 8 software to support risk-informed programs. The staff provided the Commission with an update of these activities in SECY-12-0133, "Status of the Accident Sequence Precursor Program and the Standardized Plant Analysis Risk Models," dated October 04, 2012.

10. Glossary of Risk-Related Terms

A glossary of risk-related terms is being developed to identify and define terms used in risk-informed activities related to commercial nuclear power plants. By providing a single source where the terms can be found, the glossary is intended to reduce ambiguity and facilitate communication on risk-informed activities. In June 2012, a preliminary draft of the glossary was made publically available in draft NUREG-2122 (ADAMS Accession No. ML121570620). The final glossary is expected to be published by the end of 2012.

11. Risk-Related Generic Issues

The Generic Issues Program (GIP) is an agency-wide program to address challenging, potential safety or security issues that do not clearly fit in other NRC programs or processes. While all generic issues are addressed using a risk-informed approach, several active generic issues involve significant probabilistic risk analysis.

- GI-191, Assessment of Debris Accumulation on PWR Sump Performance: This generic issue concerns the possibility that, following a loss of coolant accident in a PWR, debris accumulating on the emergency core cooling system sump screen may result in clogging and restrict water flow to the pumps. As a result of this generic issue and the related generic letter (GL 2004-02), all PWR licensees increased the size of their containment sump strainers, significantly reducing the risk of strainer clogging. An associated issue, which needs to be resolved to close GI-191, is the potential for debris to bypass the sump strainers and enter the reactor core. In 2008, the NRC staff determined that additional industry-sponsored testing was necessary to support resolution of this issue. Some testing was performed and found acceptable to the staff. Industry has proposed additional testing to address concerns by industry about the test results and related generic applicability and operability issues. The industry is also performing additional testing to support the risk-informed aspects being proposed and to address related NRC staff concerns. In SRM-SECY-10-0113, "Closure Options for Generic Safety Issue – 191, Assessment of Debris Accumulation of Pressurized Water Reactor Sump Performance," dated December 23, 2010, the Commission determined that it was prudent to allow the nuclear industry to complete testing on in-vessel effects and zone of influence in 2011, and to develop a path forward by mid-2012. The SRM directed the staff to evaluate alternative approaches, including risk-informed approaches, for resolving GSI-191 and to present them to the Commission by mid 2012. In SECY-12-0093, "Closure Options for Generic Safety Issue – 191, Assessment of Debris Accumulation of Pressurized Water Reactor Sump Performance," dated July 9, 2012, the staff recommended options for resolving GSI-191. Among the recommended options are a risk-informed approach that is being developed by the South Texas Project and a risk-informed treatment of in-vessel effects. The Commission has not yet voted on SECY-12-0093.
- GI-199, Implications of Updated Probabilistic Seismic Hazard Estimates in Central and Eastern United States on Existing Plants: Note that GI-199 has been incorporated into the resolution of Recommendation 2.1 (seismic hazards) of the Japan Lessons-Learned Action Items and Long Term Evaluations. The Commission is updated periodically on the status of this and other items in papers such as SECY-12-0095, "Tier 3 Program Plans and 6-Month Status Update in Response to Lessons Learned from Japan's March 11, 2011, Great Tohoku Earthquake and Subsequent Tsunami."
- GI-204, Flooding of Nuclear Power Plant Sites Following Upstream Dam Failure: Note that GI-204 has been incorporated into the resolution of Recommendation 2.1 (flooding hazards) of the Japan Lessons-Learned Action Items and Long Term Evaluations. The Commission is updated periodically on the status of this and other items in papers such as SECY-12-0095.

12. Use of Risk Insights to Enhance Safety Focus of Small Modular Reactor Reviews

SRM-SECY-11-0024, "Use of Risk Insights to Enhance the Safety Focus of Small Modular Reactor Reviews," dated May 11, 2011, directs the staff to provide the Commission with a paper that explores the feasibility (e.g., regulatory infrastructure changes, resource requirements, and timing for implementation) of including risk information in categorizing SSCs as safety-related and nonsafety-related for the design-specific small modular reactor (SMR) review plans in both the short and long-term. SRM-SECY-11-0024 directs the staff to consider stakeholder input, as appropriate and to consult with the Office of the General Counsel on the Commission paper to determine whether legal obstacles to this approach would require a rule change. Consequently, a Feasibility Study Team was established to respond to the SRM.

As requested as part of this exploration, the team reviewed previous Commission policies on the spectrum of new and advanced reactor policy issues that may have used "safety-related" or "nonsafety-related" SSC classification as part of the policy resolution.

The team also explored the potential application of risk insights to the overall regulatory framework rather than limit it to SMRs. Based on the feasibility review, the staff prepared and submitted SECY-11-0156, "Feasibility of Including Risk Information in Categorizing Structures, Systems, and Components as Safety-Related or Nonsafety-Related," dated November 2, 2011, to the Commission. The paper explored the feasibility of including risk information in categorizing SSCs. The staff concluded that in the short term, the best approach is to continue with the current guidance that has been used for advanced reactor reviews. The staff also concluded that a new approach would not be feasible without significant modifications to the current regulations and associated guidance. In the longer term, the staff plans to develop recommendations that will address a new risk-informed and performance-based regulatory structure.

13. Risk-Informed Construction Significance Determination Process Pilot

As documented in a January 5, 2012 memorandum (ADAMS Accession No. ML113120211), the NRC is conducting a Construction Reactor Oversight Process (cROP) assessment and enforcement pilot to apply the proposed [new construction assessment and enforcement programs](#) described in Commission paper [SECY-10-0140](#), "Options for Revising the Construction Reactor Oversight Process Assessment Program" (ADAMS Accession No. ML102500499).

The pilot program began on January 1, 2012 and will be a 12-month effort conducted and evaluated in accordance with the guidance in the "[Construction Reactor Oversight Process \(cROP\) Assessment and Enforcement Programs Pilot](#)" document (ADAMS Accession No. ML112700583). Subsequent to the successful completion of the pilot program, pilot plants will continue to be inspected under the new assessment and enforcement programs unless major changes to the proposed assessment and enforcement programs are needed. In that case, if significant changes are needed, they will be implemented following conclusion of the pilot for the subsequent assessment cycle. This pilot program includes a risk-informed construction significance determination process, IMC 2519P (ADAMS Accession No. ML113180355).

The pilot is being conducted at Vogtle Electric Generating Plant Units 3 and 4 and Virgil C. Summer Units 2 and 3.

14. Revised Fuel Cycle Oversight Process

The staff submitted SECY-10-0031, "Revising the Fuel Cycle Oversight Process," dated March 19, 2010, to the Commission for its consideration and approval of the plan to revise the fuel cycle oversight process. The Commission was briefed on SECY-10-0031 on April 29, 2010. Following the April 29 briefing, the staff received SRM-M100429, dated May 12, 2010 and SRM-SECY-10-0031, dated August 4, 2010. In response to these memoranda, the staff developed and discussed with the ACRS on December 15, 2010, a paper comparing integrated safety analyses (ISAs) for fuel cycle facilities and PRAs for reactors. ACRS provided a letter to the Commission with comments on this paper and recommendations on the fuel cycle oversight program. SRM-SECY-10-0031 also directs the staff to work on specific elements of the oversight program. The staff submitted SECY-11-0140, "Enhancements to the Fuel Cycle Oversight Process," dated October 7, 2011, to the Commission to address these tasks and to provide the Commission with recommendations for next steps to enhance the fuel cycle oversight process.

In SRM-SECY-11-0140, dated January 5, 2012, the Commission approved the staff's recommendation to enhance the fuel cycle oversight process with additional direction. The Commission directed the staff to develop a publicly available resource loaded project plan and three Notation Vote Papers, and provide annual progress updates. On July 17, 2012, the staff provided the Commission with the first annual progress update and published the project plan (ADAMS Accession No. ML12167A166). The staff is implementing the project plan.

15. Extended Storage and Transportation of Spent Nuclear Fuel

In SECY-11-0029, "Plan for the Long-Term Update to the Waste Confidence Rule and Integration with the Extended Storage and Transportation Initiative," dated February 28, 2011, the staff provided the Commission with a plan to update the waste confidence decision and rule and to enhance the technical and regulatory basis of the existing regulatory framework for the regulation of spent nuclear fuel for extended periods. This plan incorporates work initiated under SRM-COMSECY-10-0007, "Project Plan for Regulatory Program Review to Support Extended Storage and Transportation of Spent Nuclear Fuel," dated December 6, 2010, which directs the staff (1) to continue efforts to enhance the process for licensing and inspection of spent fuel storage, (2) to continue current research activities that support long term storage, and (3) to complete the extended storage and transportation gap assessments identified as Phase 1 of the project. The Office of Nuclear Material Safety and Safeguards and RES are coordinating the gap assessment and technical research. The efforts to enhance the technical and regulatory basis of the existing regulatory framework for the regulation of spent nuclear fuel for extended periods will include the use of risk information and performance-based approaches in the regulatory bases. These efforts include the technical gap assessment, directed research on significant technical issues, and incorporation of this approach in future revisions to guidance and possible changes in regulations. The draft Gap Assessment Report was published for comment in May 2012.

16. Draft Regulatory Basis to Support Rulemaking for Potential Reprocessing Facilities

In SRM-SECY-07-0081, "Regulatory Options for Licensing Facilities Associated with the Global Nuclear Energy Partnership," dated June 27, 2007, the Commission directed the NRC staff to proceed with a regulatory gap analysis and to identify changes in the regulatory requirements necessary to license a potential reprocessing facility. As part of a regulatory gap analysis, the staff identified the need to develop quantitative risk insights for the variety of chemical-radiological operations that might occur at potential spent nuclear fuel reprocessing facilities. Staff from RES and the Office of Nuclear Material Safety and Safeguards collaborated to develop analytical tools that can account for potential hazards at reprocessing facilities and provide quantitative insights on the radiological risks associated with fission product and actinide separations. The staff described its approach to use risk information in the draft regulatory basis (SECY-11-0163). In SRM-SECY-11-0163, dated August 30, 2012, the Commission directed the staff to provide, within one year, a notation vote paper providing staff's assessment of the current state of activity and U.S. Department of Energy and industry plans regarding reprocessing, its recommendations regarding the need for continued effort to develop a rule, the anticipated schedule and resources required to complete the rule, as well as an appropriate range of options.

17. Risk-Informed Emergency Action Levels

The staff received direction in SRM-COMDEK-08-005 to quantify the protection provided by Emergency Planning (EP) and codify it in a transparent, objective, and measurable manner. RES received a user need from the Office of Nuclear Security and Incident Response (NSIR) (NSIR-2010-002) in May 2010. In response to the user need, RES staff worked with NSIR staff to explore the feasibility of using a PRA approach to evaluate the consistency of emergency action levels and enhance guidance through risk related information. The work was completed and documented in a draft NUREG/CR entitled "Risk Informing Emergency Preparedness Oversight: Evaluation of Emergency Action Levels—A Pilot Study of Peach Bottom, Surry and Sequoyah," which management is currently reviewing. The NRC expects to publish the final version by the end of CY2012.

This study is the first effort to apply PRA methodology to emergency preparedness. Peach Bottom, Surry, and Sequoyah were selected as pilot plants for analysis. Threshold conditions from Peach Bottom, Surry, and Sequoyah emergency action levels were mapped as scenarios into the plant-specific SPAR models. The conditional core damage probability was used as the risk metric to evaluate each scenario. The results of this study determined that the emergency classification scheme approved by the NRC is generally logical in that public risk increases as the emergency classification severity increases.

18. Level 3 Probabilistic Risk Assessment Project

In SECY-11-0089 (ADAMS Accession No. ML11090A039), the staff proposed various options for proceeding with Level 3 PRA activities. In the SRM to SECY-11-0089 (ADAMS Accession No. ML112640419), the Commission approved a modified version of Option 3 to conduct a full-scope site Level 3 PRA. The full-scope site Level 3 PRA will address all internal and external hazards, all plant operating modes, and all reactor units, spent fuel pools, and dry cask storage.

In March 2012, the staff provided the Commission with the initial Level 3 PRA project plan (ADAMS Accession No. ML121320310). Subsequently, in September 2012, the staff provided the Commission with a paper detailing the staff plans to apply the Level 3 PRA project results to the NRC's regulatory framework (SECY-12-0123 [ADAMS Accession No. ML12202B170]). The Level 3 PRA project is currently scheduled to be completed in March 2016.