POLICY ISSUE
INFORMATION

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FOR: The Commissioners

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SUBJECT: STATUS OF THE PLAN FOR THE IMPLEMENTATION OF THE COMMISSION'S PHASED APPROACH TO PROBABILISTIC RISK ASSESSMENT QUALITY

PURPOSE:

To inform the Commission of the status of the plan for the implementation of the Commission's phased approach to probabilistic risk assessment (PRA) quality. The paper does not address any new commitments or resource implications.

BACKGROUND:

On December 18, 2003, the Commission issued Staff Requirements Memorandum (SRM) COMNJD-03-0002, "Stabilizing the PRA Quality Expectations and Requirements" (Agencywide Document Access and Management System (ADAMS) Accession No. ML033520457). In the SRM, the Commission approved implementation of a phased approach to achieving an appropriate level of quality for PRAs associated with U.S. Nuclear Regulatory Commission (NRC) risk-informed regulatory decisionmaking. An enclosure to the SRM described the

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phased approach and directed the staff to develop an action plan that would define a practical strategy for its implementation. The staff submitted the plan to the Commission in SECY-04-0118, "Plan for the Implementation of the Commission's Phased Approach to Probabilistic Risk Assessment Quality," on July 13, 2004 (ADAMS Accession No. ML041470505), and received approval in an SRM dated October 6, 2004 (ADAMS Accession No. ML042800369).

Central to the plan is the development and staff endorsement of national consensus Level 1 (core damage frequency (CDF)) and limited Level 2 (large early release frequency (LERF)) PRA standards and associated industry guidance documents, such as peer review guidance. The PRA scope addressed in these guidance documents includes internal initiating events (including internal flooding), internal fires, and external initiating events, for full power and for low-power and shutdown operations.

The staff based its schedule for the implementation of the plan on the best information available at the time regarding the projected completion dates for the various national consensus PRA standards and industry guidance documents. An important milestone is the completion of Task 1.7, the development guidance for Phase 3 of the phased approach, by December 31, 2008. The Phase 3 guidance will be an umbrella document that, for each current and anticipated application, identifies the corresponding guidance documents and supporting documents. In particular, it will include guidance related to assessing the quality of the PRAs addressing the scope identified above, i.e., Level 1 and limited Level 2 PRAs for internal initiating events (including internal flooding), internal fires, and external initiating events, for full power and for low-power and shutdown operations, and thus will rely heavily on the published PRA standards and their endorsement in Revision to Regulatory Guide (RG) 1.200, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," which is discussed more fully in the next section.

STATUS:

While, as discussed below, significant progress has been made towards the development of national consensus PRA standards, it has taken longer than expected. The additional time has resulted in part because of the complex technical nature of the subject matter, and also because the preparation of national consensus standards relies to a large extent on volunteers to serve as members of writing committees, draft documents, and attend meetings. It should be noted that the NRC sponsored contractors to help develop these standards. Table 1 in the enclosure provides an updated schedule for the completion of the remaining standards and related guidance based on a letter from the American Society of Mechanical Engineers (ASME) and the American Nuclear Society (ANS) dated November 7, 2006 (ADAMS Accession No. ML070100082), and on a January 18, 2007, discussion with the ANS Risk Informed Standards Committee Chairman.

The NRC issued RG 1.200 for trial use in February 2004. This version endorsed Addendum A of the ASME Standard for Probabilistic Risk Assessment for Nuclear Power Plant Operations, which addresses internal initiating events at full power for Level 1 and limited Level 2 PRAs, and the NEI Probabilistic Risk Assessment Peer Review Process Guidance. The NRC issued Revision 1 of RG 1.200 (ADAMS Accession No. ML070240001) in January 2007, which endorses the Level 1/LERF Addendum B to the ASME full power internal initiating events PRA standard (ASME RA-Sb-2005, ADDENDA to ASME RA-S-2002 Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications, December 30, 2005) and Revision 1 of the NEI peer review process (ADAMS Accession Nos. ML063390589 and ML063480076). Revision 1 of RG 1.200 also incorporates revisions resulting from the lessons learned during the pilot applications of RG 1.200 (ADAMS Accession No. ML051590519).

Based on the latest information received from the ASME and ANS standards committees (ADAMS Accession No. ML070100082), the committees intend to have the PRA quality standards addressing the remaining risk contributors (i.e., internal fires, external initiating events, and low-power and shutdown modes of operation) available for staff endorsement by December 2007. This schedule would support a December 2008 date for staff endorsement (in Revision 2 of RG 1.200) and the completion of the Phase 3 guidance. However, the plan for the phased approach to PRA quality envisioned that both the NRC-endorsed guidance and its use by licensees would be in place by December, 2008. The action plan attached to SECY-04-118 states that, “For a licensee to achieve Phase 3, the PRA must have been developed and a peer review performed using those quality standards as a basis.” As discussed below, the implementation of the action plan will likely not be completed by most licensees until December 2009 in the areas of external events, internal fires and low power and shutdown modes of operation. This therefore represents a delay in the schedule included in the July 13, 2004, plan for the phased approach to PRA quality. The implications of this delay are discussed below. The enclosure summarizes the status of the remaining tasks identified in the plan.

DISCUSSION:

The phased approach to PRA quality allows licensees up to 1 year following NRC endorsement to implement the NRC-endorsed PRA standards for the various elements of the PRA (i.e., internal initiating events, internal fires, external initiating events, and low-power and shutdown modes of operation). In establishing the implementation period, the NRC recognized that additional licensee time and effort would be necessary after the NRC endorsed a particular PRA standard in order to develop and/or revise the licensee’s PRA, perform a peer review, and address any significant findings related to compliance with the requirements of the applicable standard. During the implementation period for a newly endorsed standard, the staff would review a risk-informed license amendment submittal consistent with past practice with respect to the elements of the PRA associated with the license amendment application. Following the 1-year implementation period, the NRC will expect all risk-informed license amendment

submittals to be supported by a PRA that implements the appropriate revision of RG 1.200 for all aspects of the PRA that could impact the outcome of the licensing decision.

The NRC issued RG 1.200 for trial use in February 2004. The staff originally intended that the implementation period for applying Revision 1 of RG 1.200 would commence with the completion of the pilot applications of RG 1.200. However, as a result of the lessons learned from a pilot application of the ASME standard to an industry peer review of a licensee PRA in June 2003, and the staff objections documented in RG 1.200, ASME decided to develop Addendum B to the standard. This development took place at the same time as the RG 1.200 pilot reviews. The NRC staff has endorsed Addendum B in Revision 1 of RG 1.200, issued January 2007. Based on these developments, and the experience with updating their PRAs to address PRA quality issues related to the implementation of the Mitigating Systems Performance Index (MSPI) program, many licensees have recognized that they need considerably more resources than originally planned to be able to upgrade their PRAs to meet the guidelines for PRA quality established in RG 1.200. Therefore, the staff will use its current practices to review routine, limited-scope risk-informed licensing applications (such as a request for an extension of the outage time allowed by a technical specification), that are submitted during 2007, for those licensees that have not verified that their PRAs conform to the standard. However, for broad-scope applications, such as the implementation of Title 10, Section 50.69, "Risk-Informed Categorization and Treatment of Structures, Systems and Components for Nuclear Power Reactors," of the *Code of Federal Regulations* (10 CFR 50.69) or Technical Specification Initiative 4b, "Risk Managed Technical Specifications," submitted during this 1-year phasing-in period, the staff expects that the submittal will include an assessment of the technical adequacy of the PRA using Revision 1 of RG 1.200. This approach is consistent with the industry guidance documents supporting these applications. To support all applications received after December 2007, the staff will expect a licensee to demonstrate the technical adequacy of its PRA using Revision 1 of RG 1.200.

The development and endorsement by the staff of a fire PRA standard is critical to the staff's ability to process industry submittals to implement 10 CFR 50.48(c), National Fire Protection Association (NFPA) Standard 805. The industry anticipates completing the PRA standard for internal fires, and the associated peer review guidance in October 2007, which would support NRC review and endorsement in Revision 2 of RG 1.200 in December 2008. Therefore, allowing for a phasing-in period of 1 year, the staff would apply Revision 2 of RG 1.200 to assess the technical adequacy of the fire PRAs in support of NFPA 805 after December 2009, although earlier licensee implementation of RG 1.200 will expedite staff review. The staff intends to assess the impact of this delay in implementation on the 3-year moratorium period for enforcement actions allowed for those licensees electing to submit NFPA 805 applications.

ANS expects to publish Revision 1 of its external events PRA standard in March 2007 and its low-power and shutdown PRA standard in December 2007. These will also be endorsed in

Revision 2 to RG 1.200. Therefore, the staff currently expects that after December 2009 licensees will use Revision 2 of RG 1.200 to address PRA quality for considering the risk from external events or low-power and shutdown modes of operation.

During a September 28, 2006, public meeting, NEI and several industry representatives stated that they were currently focusing their resources predominantly on the development of fire PRAs and on updating the internal events PRAs to bring them into conformance with the RG 1.200 guidance. They further indicated that they considered the development of external initiating event and low-power and shutdown PRAs to be a lower priority. Therefore, the staff anticipates that, although the Phase 3 guidance will be in place by December 31, 2008, many licensees will delay their implementation of the external events and low power and shutdown PRA standard beyond December of 2009. Consequently, these licensees may need to restrict the scope of implementation of risk-informed initiatives to that supported by the internal initiating events and internal fire PRAs.

For new reactor applications, the delay in the Phase 3 implementation date will have only a minimal effect. While the staff expects significant benefits in terms of PRA quality, resource savings, review timeliness, safety focus, and regulatory stability for those areas where NRC-endorsed PRA standards are used, we have long understood that the first round of Combined License applications and the next few Design Certification applications would be received before the original December 2008 completion date for the final elements of Phase 3. The delay in the Phase 3 completion date will therefore not significantly alter the staff's review plans for near-term application. In addition, the anticipated delay should have no affect on PRA use and PRA up-dates during plant operation for new reactors (e.g., for Maintenance Rule implementation, Performance Indicators, the Reactor Oversight, Significance Determination Process, and Risk-Informed License Amendments) since they will occur long after the completion of Phase 3.

CONCLUSION:

Overall, significant progress has been made towards achieving the goal of establishing the framework to support Phase 3 of the Commission's phased approach to PRA quality by December 31, 2008. While it is expected that the Phase 3 guidance will be completed by December 31, 2008, because of delays in the development of the national consensus PRA standards for individual scope items, full implementation by the industry of both Revision 1 and Revision 2 of RG 1.200 is delayed from the dates proposed in the July 13, 2004, plan. In the interim, the staff will continue using its current practices to review those aspects of the base PRA needed to support an application.

COORDINATION:

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

/RA/

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Enclosure:
Status of Tasks in the Plan for the
Implementation of the Commission's
Phased Approach to Probabilistic
Risk Assessment Quality

STATUS OF TASKS IN THE PLAN FOR THE IMPLEMENTATION OF THE COMMISSION'S PHASED APPROACH TO PROBABILISTIC RISK ASSESSMENT QUALITY

The plan for the implementation of the Commission's phased approach to probabilistic risk assessment (PRA) quality identified three tasks:

(1) Task 1—Implementation of the Phased Approach
(2) Task 2—Identification and Resolution of Technical Issues
(3) Task 3—Development of a Communication Plan

The plan defined subtasks within Tasks 1 and 2. The following provides the status of each subtask.

Task 1—Implementation of the Phased Approach

Task 1.1: Identification of Current Risk-Informed Applications

Status: Complete (Agencywide Document Access and Management System (ADAMS) Accession No. ML042440885)

The objective of this task was to develop a list of the currently envisioned applications of PRA in the reactor arena. The list served as input to Task 1.2.

Task 1.2: Specification of the Risk-Informed Application PRA Needs

Status: Complete (ADAMS Accession No. ML043350083)

The objective of this task was, for each application type and based on the role of the PRA results in decisionmaking, to specify the scope and level of detail of the base PRA needed to support that role. The staff working on this task concluded that, for the majority of application types, the categorical definition of these issues is not possible because the nature of each specific application under an application type varies in terms of which elements of a PRA are affected and how. Furthermore, the significance of the different contributors to risk varies with plant design and location. Therefore, it is not appropriate, a priori, to conclude that any of the PRA standards is less important than another. Consequently, standards are needed for each item within scope, namely, internal initiating events, internal fires, and external initiating events, for the full-power and low-power and shutdown modes of operation.

Task 1.3: Phase 2 Guidance Document Schedule

Status: Updated

The objective of this task is to provide a schedule for developing the guidance necessary to transition to Phase 2 for each application type. The plan noted that the schedule would be

modified as necessary. Because the schedule depends on when the American Society of Mechanical Engineers (ASME), the American Nuclear Society (ANS), and the Nuclear Energy Institute (NEI) complete work on the standards and other guidance documents, the staff has updated the schedule as shown in Table 1.

Table 1
Schedule for the Completion of Standards and Related Guidance
and U.S. Nuclear Regulatory Commission (NRC) Endorsement

PRA Standard or Related Guidance	Responsible Organization	Anticipated Completion	Anticipated NRC Endorsement
Internal initiating Events Level 1/LERF Standard, Addendum B	ASME	Completed (December 2005)	Completed (January 2007)
External Events Standard, Revision 1 (1)	ANS	March 2007	December 2008
Low-Power and Shutdown Standard	ANS	December 2007	December 2008
Internal Fire Standard	ANS	October 2007	December 2008
Integrated PRA Standard	ASME/ANS	December 2007	December 2008
Level 1/LERF Peer Review and Self-Assessment Guidance (2)	NEI	Completed (November 2006)	Completed (January 2007)
Internal Fire Peer Review Guidance (3)	Owners' Groups	Early 2007	October 2008
External Events Peer Review Guidance	(4)	--	--
Low-Power and Shutdown Peer Review Guidance	(4)	--	--

NOTES:
(1) Revision 0 of the ANS External Events PRA Standard was issued in March 2003, and endorsed by the staff in August 2004 in draft regulatory guide (DG) 1138. Revision 1 of the ANS External Events PRA Standard (to be published) resolves the majority of the staff objections in DG 1138.
(2) Peer reviews have been completed on all licensee PRAs using the NEI peer review process. However, to date, not all licensees have resolved the peer review comments or completed their self-assessments. This may not be completed until required to support a risk-informed application.
(3) Although guidance may be completed in early 2007, this date does not include the time period for performing the peer review.
(4) No organization has initiated an effort to develop this guidance.

Task 1.4: Development of Guidance Documents

Status: Ongoing

The objective of this task is to develop the guidance documents for the applications identified in Task 1.2. The staff has been and continues to be active on the various consensus committees and writing groups supporting the development of the standards and guidance documents for specific applications.

Task 1.5: Development of Prioritization Process for Staff Review

Status: Nearing completion

The objective of this task is to establish a process for the prioritization and scheduling of staff reviews of licensee risk-informed submittals, particularly in the interim period before the achievement of Phase 3. The Commission directed that, once Phase 3 is achieved, the staff should give low priority to, or return, any submittal not in conformance with Phase 3 guidance. The staff has developed a prioritization process that considers the following factors:

- staff resources required to review the PRA results for those significant scope items not addressed by the use of standards (will differ if standards exist and have not been used, or if they have not been developed and endorsed)

- the safety benefit of the application
- the potential benefit to the licensee (e.g., economic, schedule for plant modification, refocusing of resources to maximize benefits)

- whether the application is furthering the state of practice

- whether the application is a pilot for an application

The staff is currently incorporating this prioritization process into LIC-101, “License Amendment Review Procedures” (ADAMS Accession No. ML040060258). To accommodate submittals that further the development of risk-informed approaches that have potentially significant safety and/or economic benefit, the staff has created a new category of submittals that is not subject to the normal time metrics.

Task 1.6: Phase 2 Implementation Schedule

Status: Updated

The objective of this task is to develop a schedule for submittals to meet Phase 2 requirements. The staff recognized that an implementation period is necessary between the completion of the PRA standards and associated guidance documents and the time by which the agency expects

each application to conform with those documents. The significant delay in developing the standards for the individual scope items has impacted the implementation schedule. As discussed in the memorandum, following the issuance of Revision 1 of Regulatory Guide (RG) 1.200, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," in January 2007, the staff will use its current practices for a limited period, not to exceed 1 year, to review routine, limited-scope applications, such as a request for an extension of the outage time allowed by a technical specification. However, for broad-scope applications, such as the implementation of Title 10, Section 50.69, "Risk-Informed Categorization and Treatment of Structures, Systems and Components for Nuclear Power Reactors," of the *Code of Federal Regulations* (10 CFR 50.69) or Technical Specification Initiative 4b, "Risk-Managed Technical Specifications," submitted during this phasing-in period, the staff expects that the submittal will include an assessment of the technical adequacy of the PRA using Revision 1 of RG 1.200. This is consistent with the industry guidance documents supporting these applications. For all applications received after December 2007, the staff will expect a licensee to demonstrate the technical adequacy of its PRA to support an application using Revision 1 of RG 1.200.

Similarly, the staff expects licensees to use Revision 2 of RG 1.200 to address PRA quality for consideration of the risk from internal fires, external events, and low-power and shutdown modes of operation beginning in late 2009.

Task 1.7: Development of Phase 3 Guidance

Status: To be performed

The objective of this task is to develop the Phase 3 guidance document. This umbrella document will identify and link all the documents related to current and anticipated applications, including application guidance documents and those related to assessing the appropriate quality of the PRAs addressing the scope items identified in the memorandum. This document will include Revision 2 of RG 1.200. Revision 1 of RG 1.200 only addresses a Level 1/large early release frequency (LERF) PRA for internal events (excluding internal fire) for full-power operation. Revision 2 will address PRAs for internal fire, external events, and low-power and shutdown modes of operation.

Task 1.8: Continued Monitoring of PRA Quality

Status: Ongoing

The objective of this task is to use opportunities provided by the risk-informed license application reviews and other activities to gain insights into the technical adequacy of licensee PRAs. One significant activity that led to a step change in the overall quality of licensee PRAs, was the implementation of the Mitigating Systems Performance Index (MSPI). The implementation of the MSPI required resolving the peer review comments that were identified as having a potential impact on the MSPI index and addressing any outlier behavior revealed by an industry cross-comparison and comparison with the results of the simplified plant analysis risk models.

Task 2—Identification and Resolution of Technical Issues

Status: Ongoing

The objective of this task is to identify and resolve new technical issues that emerge as the various guidance documents are developed, updated, and implemented. The plan discussed three specific issues identified by the Commission (see Tasks 2.1 through 2.3 below). The plan specifically mentioned the pilot testing of RG 1.200 and the use of the standardized plant analysis risk (SPAR) models as vehicles for identifying new technical issues. The activities associated with establishing that the licensee PRAs were of sufficient quality to support the implementation of the MSPI involved comparing the results of the licensee models with those of the SPAR models and provided another forum for identifying and discussing a number of technical issues. As a result of these activities, the staff has identified a number of issues and is evaluating the need for additional guidance. The Electric Power Research Institute is addressing two potentially significant issues, namely the modeling of support system initiating events and the modeling of the loss of offsite power initiating event.

Task 2.1: Model Uncertainty

Status: Ongoing

The objective of this task is to develop guidance on the treatment of model uncertainties and alternate methods in the decisionmaking process. The agency will issue NUREG-1855, "Guidance on the Treatment of Uncertainties and Alternate Methods in Risk-Informed Decisionmaking," as a draft for public comment in early 2007.

Task 2.2: Treatment of Seismic and Other External Events

Status: Updated

The objective of this task is to support the development of the ANS external events standard and to provide the staff position in an appendix to RG 1.200. In December 2003, ANS issued Revision 0 of ANS-58.21, "External Events—PRA Methodology," and the staff issued draft regulatory guide DG-1138, "NRC Regulatory Position on ANS External Hazards PRA Standard," endorsing the standard in August 2004. The NRC postponed its finalization of this draft guide when ANS decided to develop a revision to the external events standard that would address the majority of the staff's concerns expressed in the draft guide. The technical concerns of some members of the ANS standards committee have delayed the approval of this revision by the committee. A concerted effort has been made to resolve the negative ballots, and the revision is expected to be approved and published in early 2007. The staff plans to update DG 1138 and incorporate it into Revision 2 of RG 1.200.

Task 2.3: Human Performance Issues

Status: Ongoing

This task is covered by the Human Reliability Analysis (HRA) Research Program in the Office of Nuclear Regulatory Research. Three notable publications issued since the initiation of the plan are NUREG-1792, "Good Practices for Implementing Human Reliability Analysis (HRA)," issued April 2005; NUREG-1842, "Evaluation of Human Reliability Analysis Methods Against Good Practices," issued March 2006, and NUREG/CR-6903, "Human Event Repository and Analysis (HERA) System," issued July 2006. In addition, the staff has initiated a project to benchmark several HRA tools.

Task 3—Development of a Communication Plan

Status: Complete (ADAMS Accession No. ML053070320)

The objective of this task was to develop a communication plan to (1) explain staff activities to stakeholders, (2) describe the staff's approach, and (3) provide a structure for communicating the messages to stakeholders.