

**POLICY ISSUE  
NOTATION VOTE**

July 7, 2011

SECY-11-0089

FOR: The Commissioners

FROM: R. W. Borchardt  
Executive Director for Operations

SUBJECT: OPTIONS FOR PROCEEDING WITH FUTURE LEVEL 3  
PROBABILISTIC RISK ASSESSMENT ACTIVITIES

PURPOSE:

In response to staff requirements memorandum (SRM) M100218 (ML100780578), this paper (1) provides the Commission with potential future uses for Level 3 probabilistic risk assessments (PRAs) for nuclear power plants (NPPs), (2) provides the Commission with three primary options for proceeding with future Level 3 PRA activities<sup>1</sup> including resource estimates, (3) informs the Commission of the internal coordination efforts and external stakeholder engagement activities in which the staff participated to formulate its plan and scope for future Level 3 PRA activities, and (4) seeks Commission approval for the staff's recommendation to proceed with focused research to address identified gaps in existing PRA technology before performing a full-scope comprehensive site Level 3 PRA for an operating NPP<sup>2</sup>.

SUMMARY:

During a February 2010 Commission meeting on research programs, the staff proposed a scoping study that would evaluate the feasibility of performing a new full-scope comprehensive site Level 3 PRA. This proposal was based on technical advances since the last U.S. Nuclear

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<sup>1</sup> This SECY paper and its enclosures distinguish between "Level 3 PRA activities" and "Level 3 PRAs." The latter refers to a PRA that includes specific technical elements or analyses to assess the public risk from an NPP, while the former refers to activities (e.g., research and development) specifically related to or in support of Level 3 PRAs.

<sup>2</sup> As used in this SECY paper and its enclosures, a full-scope comprehensive site Level 3 PRA is a PRA that includes a quantitative assessment of the public risk from accidents involving all site reactor cores and spent nuclear fuel that can occur during any plant operating state, and that are caused by all initiating event hazards (internal events, fires, flooding, seismic events, and other site-specific external hazards).

Regulatory Commission (NRC)-sponsored Level 3 PRAs were performed in the late 1980s and an interest in enhancing the scope of previous and current PRAs to include an assessment of the risk from accidents involving additional site radiological sources (e.g., spent nuclear fuel and multiple units<sup>3</sup>). This SECY paper summarizes the staff's response to SRM M100218 in which the Commission expressed conditional support for Level 3 PRA related activities and directed the staff to provide various options for proceeding with Level 3 PRAs. This paper also summarizes the staff's approach including scoping study objectives and internal coordination and external stakeholder engagement activities. In addition, this paper discusses potential future uses for Level 3 PRAs and presents three primary options for proceeding with future Level 3 PRA activities, including resource estimates. Finally, based on challenges created by the existing budget climate and the additional estimated resources needed, this SECY paper provides the staff's recommendation to proceed with conducting focused research to address identified gaps in existing PRA technology before performing a full-scope comprehensive site Level 3 PRA for an operating NPP.

This SECY paper includes two enclosures. The first enclosure provides more detailed information on (1) the basis for originally proposing a scoping study to evaluate the feasibility of performing a new full-scope comprehensive site Level 3 PRA for an NPP, (2) potential future uses for Level 3 PRAs, (3) the three primary options for proceeding with future Level 3 PRA activities, and (4) the activities that supported development of items 2 and 3. The second enclosure provides more detailed information on the structure and evolution of PRA and risk-informed regulation that led to the staff's original proposal for a scoping study to evaluate the feasibility of performing a new full-scope comprehensive site Level 3 PRA.

#### BACKGROUND:

In 1995, the Commission established the current framework for risk-informed regulation by issuing a PRA Policy Statement<sup>4</sup> that stated the use of PRA technology should be increased in all regulatory matters to the extent supported by the state-of-the-art and in a manner that complements NRC's deterministic approach and traditional defense-in-depth philosophy.

PRA is a structured, analytical process that provides both qualitative insights and quantitative estimates of risk by (1) identifying potential sequences that can challenge system operations and lead to an adverse event, (2) estimating the likelihood of these sequences, and (3) estimating the consequences associated with these sequences, if they were to occur. By prioritizing significant risk contributors<sup>5</sup> and characterizing key sources of uncertainty and their impact on results, PRA serves as a useful decisionmaking tool that can help focus thinking and limited agency resources to ensure safety. Moreover, a full-scope comprehensive site Level 3 PRA that includes an assessment of accidents involving the reactor core as well as accidents involving other site radiological sources (e.g., spent fuel pools [SFPs], dry storage casks, and multiple units) can provide valuable insights into the relative importance of various risk contributors. These insights can be used to enhance regulatory decisionmaking and to help

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<sup>3</sup> As used in this SECY paper and its enclosures, a unit refers to a reactor core and, if applicable, an associated spent fuel pool.

<sup>4</sup> 60 FR 42622, "Use of Probabilistic Risk Assessment Methods in Nuclear Regulatory Activities" (August 16, 1995).

<sup>5</sup> As used in this SECY paper and its enclosures, risk contributors include: radiological sources (e.g., reactor core, spent nuclear fuel); initiating event hazards (e.g. internal events, fires, flooding, seismic events, other site-specific external hazards); POSs; accident sequences; failure of structures, systems, and components; and operator actions.

focus limited agency resources on issues most directly related to the agency's mission to protect public health and safety.

Using information from Level 3 PRAs performed in the NUREG-1150 study<sup>6</sup>, the staff determined that the reactor-specific risk metrics core damage frequency (CDF) and large early release frequency (LERF) can be used respectively as surrogates for the latent cancer risk and prompt fatality risk quantitative health objectives defined in the Commission's Safety Goal Policy Statement<sup>7</sup>. Therefore, instead of using Level 3 PRAs, the staff compares the results from Level 1 and limited-scope Level 2 PRAs to subsidiary numerical objectives based on CDF and LERF for regulatory decisionmaking involving plant-specific applications<sup>8</sup>. Although Level 3 PRAs have since been performed to some extent within both the United States and international nuclear industries, NRC has not sponsored development of a Level 3 PRA since NUREG-1150.

The staff has identified several compelling reasons for proceeding with a new full-scope comprehensive site Level 3 PRA. In the more than two decades that have passed since the NUREG-1150 Level 3 PRAs were performed, numerous technical advances have been made that were not reflected in the NUREG-1150 PRA models. Examples of such technical advances include (1) modifications to enhance NPP operational performance, safety, and security (e.g., development and implementation of risk-informed regulations; improved operational, maintenance, and training practices; implementation of severe accident management guidelines [SAMGs]; and implementation of extensive damage mitigation guidelines [EDMGs] or B.5.b mitigation strategies<sup>9</sup>); (2) significantly improved understanding and modeling of severe accident phenomena; and (3) advances in PRA technology (e.g., improved methods, models, analytical tools, and data through research and operating experience). The staff has also identified additional scope considerations not previously considered that could be addressed by performing a new full-scope comprehensive site Level 3 PRA. Examples include (1) consideration of multi-unit site effects and (2) consideration of other site radiological sources (e.g., SFPs, dry storage casks, and multiple units). NRC has never sponsored a site Level 3 PRA that includes an assessment of both accidents involving the reactor core of a single unit and accidents involving other site radiological sources. The incorporation of these technical advances and additional scope considerations into a new full-scope comprehensive site Level 3 PRA could yield new and improved risk insights to enhance regulatory decisionmaking and to help focus limited agency resources on issues most directly related to the agency's mission to protect public health and safety.

During the Annual Commission Meeting on Research Programs, Performance, and Future Plans on February 18, 2010, the staff proposed a scoping study to evaluate the feasibility of performing a new full-scope comprehensive site Level 3 PRA. In SRM M100218 dated March 19, 2010, the Commission expressed conditional support for Level 3 PRA related activities and directed the staff to (1) continue internal coordination efforts and engage external stakeholders

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<sup>6</sup> NUREG-1150, "Severe Accident Risks: An Assessment for Five U.S. Nuclear Power Plants" (December 1990).

<sup>7</sup> 51 FR 30028, "Safety Goals for the Operations of Nuclear Power Plants" (August 21, 1986).

<sup>8</sup> Regulatory Guide (RG) 1.174, Rev. 2, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis" (May 2011).

<sup>9</sup> EA-02-026, "Order for Interim Safeguards and Security Compensatory Measures" (February 25, 2002). Section B.5.b requires licensees to adopt mitigation strategies using readily available resources to maintain or restore core cooling, containment, and SFP cooling capabilities to cope with the loss of large areas of the facility due to large fires and explosions from any cause, including beyond-design-basis aircraft impacts. These requirements were formalized through rulemaking in 10 CFR 50.54(hh)(2).

in formulating a plan and scope for future actions and (2) provide the Commission with various options for proceeding that include costs and perspectives on future uses for Level 3 PRAs. The remainder of this SECY paper summarizes the staff's response to the SRM and provides the staff's recommendation for proceeding.

## DISCUSSION:

### **APPROACH AND ACTIVITIES**

In response to SRM M100218, the staff developed a three-phased approach to planning and conducting future Level 3 PRA activities. The first phase consisted of a scoping study that began in April 2010 and ended upon submission of this SECY paper to the Commission. This scoping study was conducted by staff from the Office of Nuclear Regulatory Research (RES) with support from staff from the Office of Nuclear Material Safety and Safeguards (NMSS), Office of New Reactors (NRO), Office of Nuclear Reactor Regulation (NRR), and Office of Nuclear Security and Incident Response (NSIR). The objectives and activities associated with this scoping study are discussed in more detail below and in Enclosure 1. The second phase would consist of proceeding with either one of the options developed by the staff as part of the scoping study or any other option directed by the Commission following the submission of this SECY paper. Based on the results and insights from the second phase, the staff would then assess the need for follow-on Level 3 PRA activities and then provide the Commission with additional options and recommendations for proceeding.

Based on Commission tasking in SRM M100218, the staff identified the following main objectives for the Level 3 PRA scoping study (1) identify potential future uses for Level 3 PRAs; (2) develop various options for proceeding with future Level 3 PRA activities that include objectives, scope, PRA technology to be used, site selection considerations<sup>10</sup>, and resource estimates; (3) determine the feasibility of proceeding with each of the developed options; (4) continue internal coordination efforts to identify the staff's recommendation for proceeding; and (5) engage external stakeholders to obtain their views on the staff's approach, potential future uses for Level 3 PRAs, options for proceeding with future Level 3 PRA activities, and recommendation for proceeding.

Throughout the scoping study, the staff participated in numerous internal coordination and external stakeholder engagement activities. Internal coordination efforts included workshops, coordination and alignment meetings, and internal stakeholder briefings. External stakeholder engagement activities included Advisory Committee on Reactor Safeguards (ACRS) subcommittee and full committee briefings, Regulatory Information Conference presentations, and a Category 2 public meeting with representatives from nuclear industry, vendor, research, interest group, and public media organizations. Overall, stakeholders supported proceeding with a new full-scope comprehensive site Level 3 PRA. Some expressed concern about the resources needed and the agency's ability to complete such a comprehensive study in a reasonable period of time. ACRS proposed a phased approach and schedule that would enable

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<sup>10</sup> Because the Commission expressed only conditional support and directed the staff to provide various options for proceeding, the staff did not include selection of a site to participate in a future Level 3 PRA as one of the objectives of the scoping study. Instead, the staff identified various site selection considerations related to the quality and availability of relevant information that could impact the cost of a future Level 3 PRA. These considerations, which are provided in Enclosure 1, can inform future site selection activities if the Commission directs the staff to proceed with a Level 3 PRA.

the staff to complete such a study while minimizing the near-term resource impact<sup>11</sup>. Enclosure 1 and the public meeting summary (ML111400179) provide more detailed information.

### **POTENTIAL FUTURE USES FOR LEVEL 3 PRAs**

In identifying potential future uses for Level 3 PRAs, a logical first step was to identify how the results and risk insights from the NUREG-1150 PRAs were used. In addition, the staff considered potential enhancements that could be made to the use of PRA in the existing risk-informed regulatory framework. In this way, the staff developed a set of potential uses meant to apply to future Level 3 PRAs in general and not specifically to the full-scope comprehensive site Level 3 PRA proposed as Option 3 (the use of which would ultimately depend on its scope and applicability to the larger population of NPP sites). Potential future uses for Level 3 PRAs include (1) confirm the acceptability of the agency's current use of PRA in risk-informed regulatory decisionmaking (e.g., the use of Level 1 and limited-scope Level 2 reactor PRAs to support regulatory applications and the use of RG 1.174 subsidiary numerical objectives based on the reactor-specific risk metrics CDF and LERF); (2) verify or revise regulatory requirements and guidance, particularly those based on NUREG-1150 information (e.g., RG 1.174 and the regulatory analysis guidelines<sup>12</sup> and technical evaluation handbook<sup>13</sup> used by the staff to evaluate the costs and benefits of proposed backfits<sup>14</sup>); (3) support specific risk-informed regulatory applications (e.g., provide the technical basis for risk-informing the regulation of spent fuel storage and handling, siting, and emergency preparedness, and focus the Reactor Oversight Process); (4) develop and pilot test PRA technology, standards, and guidance; (5) prioritize generic safety issues and nuclear safety research programs; (6) develop in-house PRA technical capability and support PRA knowledge management and risk communication activities; and (7) support future risk-informed licensing of new and advanced reactor designs (e.g., resolving issues with small modular reactor (SMR) designs, using risk insights to enhance the safety focus of SMR reviews, and modifying risk-informed regulatory guidance for new reactors)<sup>15</sup>. Enclosure 1 provides more detailed information including specific examples.

### **OPTIONS FOR PROCEEDING WITH FUTURE LEVEL 3 PRA ACTIVITIES**

This section presents summary descriptions of the three primary options deemed by the staff to best frame the choices from a feasibility and cost-benefit perspective and their relative advantages and disadvantages. Enclosure 1 provides more detailed descriptions. Estimated resources for each option are provided below in the "RESOURCES" section.

#### **Option 1: Maintain Status Quo – Continue Evolutionary Development of PRA Technology**

This option maintains the status quo in ongoing activities related to the development and implementation of PRA technology and risk-informed regulation. Ongoing and planned research to develop and improve upon existing PRA methods, models, tools, and data would continue on a resource-available basis as driven by program office user need requests (UNRs), Commission tasking, and the agency's long-term research plan (LTRP). As part of its strategic

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<sup>11</sup> Letter from Said Abdel-Khalik to The Honorable Gregory B. Jaczko, "Draft SECY Paper, "Options for Proceeding with Future Level 3 Probabilistic Risk Assessment Activities"" (June 22, 2011).

<sup>12</sup> NUREG/BR-0058, Rev. 4, "Regulatory Analysis Guidelines of the U.S. Nuclear Regulatory Commission" (September 2004).

<sup>13</sup> NUREG/BR-0184, "Regulatory Analysis Technical Evaluation Handbook" (January 1997).

<sup>14</sup> Title 10 Section 50.109, of the *Code of Federal Regulations* (10 CFR 50.109). Backfitting.

<sup>15</sup> Although future Level 3 PRAs would not be developed in time to inform the staff's current activities related to these efforts, they could be used to inform related follow-on activities.

LTRP efforts, the staff has identified Level 2 and Level 3 PRA as areas that would benefit from examination of advanced methods, and is performing limited research in these areas. The staff also would continue to monitor relevant developments within both the United States and international nuclear industries.

**Advantages**

- Is consistent with the current fiscal climate by focusing limited staff and contract support resources on mission-critical work driven by program office UNRs, Commission tasking, and the agency's LTRP.

**Disadvantages**

- Insights that could be gained by conducting a full-scope comprehensive site Level 3 PRA to enhance regulatory decisionmaking would not be realized.
- Can result in inconsistent and more costly treatment of potential future issues by developing the necessary PRA technology on an ad-hoc basis.

**Option 2: Conduct Focused Research to Address Identified Gaps in Existing PRA Technology Before Performing a Full-Scope Comprehensive Site Level 3 PRA**

This option involves near-term focused research aimed at addressing identified gaps in existing PRA technology over the next 2 years. The primary objective of this research would be to ensure important technical gaps related to the expanded scope and differing degrees of sophistication in the existing PRA technology used to analyze the risk from various risk contributors are addressed before developing a new full-scope comprehensive site Level 3 PRA. Selection of Option 2 would require separate Commission direction in the future before proceeding with a new full-scope comprehensive site Level 3 PRA.

Examples of gaps in existing PRA technology that could be addressed include modeling of consequential (linked) multiple initiating events; modeling of multi-unit dependencies; post-core damage and external events human reliability analysis (HRA); spent fuel PRA technology; modeling of aqueous transport and dispersion of radioactive materials through surface water, sediments, soils, and groundwater; and Level 2 and Level 3 PRA uncertainty analysis.

**Advantages**

- Focuses limited available staff and contract support resources on mission-critical work driven by program office UNRs, Commission tasking, and the agency's LTRP.
- Focuses additional staff and contract support resources that have already been requested to support future Level 3 PRA activities on research needed to address identified gaps in existing PRA technology.
- Produces results and insights that would advance the state-of-practice in specific PRA technical elements and thereby enhance NRC's PRA capability in those technical areas.

**Disadvantages**

- Delays insights that could be gained by conducting a full-scope comprehensive site Level 3 PRA to enhance regulatory decisionmaking.

**Option 3: Conduct a Full-Scope Comprehensive Site Level 3 PRA**

This option involves planning for and performing a new full-scope comprehensive site Level 3 PRA for an operating NPP. The objectives of this PRA would be to (1) extract new and

improved risk insights to enhance regulatory decisionmaking and to help focus limited agency resources on issues most directly related to the agency's mission to protect public health and safety; (2) enhance PRA capability, expertise, and documentation; and (3) demonstrate the technical feasibility and evaluate the realistic cost of developing new Level 3 PRAs. The scope of this PRA would include (1) site radiological sources—reactor cores, spent fuel pools, and dry storage casks on site; (2) initiating event hazards—internal events, fires, flooding, seismic events, and other site-specific external hazards; (3) plant operating states (POSS)—at-power and low-power/shutdown. The only factors specifically excluded from the scope would be radiological sources involving fresh nuclear fuel and radiological waste, and initiating events involving deliberate malevolent acts (e.g., terrorism and sabotage). Enclosure 1 includes a detailed discussion of PRA technology and site selection considerations.

Research identified in Option 2 also would be conducted as part of this option, but on an accelerated schedule to support the completion of a full-scope comprehensive site Level 3 PRA within 3 years. Option 2 and Option 3 differ only in terms of timing, sequencing, near-term use of resources, and relative advantages and disadvantages.

### ***Advantages***

- Provides new and improved risk insights earlier to enhance regulatory decisionmaking and to help focus limited agency resources on issues most directly related to the agency's mission to protect public health and safety.
- Enhances PRA capability, expertise, and documentation earlier to address potential future issues.

### ***Disadvantages***

- Is resource-intensive, requiring more staff and contract support resources than currently budgeted.
- Requires reallocation of qualified risk analysts from other ongoing important activities, potentially resulting in delays to reviews of National Fire Protection Association (NFPA) Standard 805<sup>16</sup> license amendments, refinement of Standardized Plant Analysis Risk (SPAR) models, and reviews of PRAs in support of combined license applications.

### **Other Options**

The Commission has considerable flexibility in selecting an option for proceeding with future Level 3 PRA activities. In addition to the three primary options presented above, for example, the staff also considered additional options, such as performing limited-scope Level 3 PRAs to address specific issues, performing full-scope Level 3 PRAs for new or advanced reactor designs (e.g., future SMR designs), and developing Level 3 PRAs based on existing information (e.g., fire PRAs developed to support transition to NFPA 805, State-of-the-Art Reactor Consequence Analysis [SOARCA] project analyses, existing PRAs developed by licensees). In the latter case, missing PRA technical elements could be developed to complete a Level 3 PRA of suitable scope and level of detail. Likewise, similar to Option 2, the staff could conduct specialized projects to facilitate development of a Level 3 PRA by a volunteer licensee. In this case, the staff could obtain the desired risk insights and PRA capability by working closely with licensee personnel in performing the Level 3 PRA. These options, which are essentially derivatives of the three primary options, would allow the staff to move forward with a Level 3

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<sup>16</sup> NFPA 805, "Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants."

PRA sooner without disrupting other high priority work that requires the near-term attention of a limited number of qualified risk analysts. Regardless of which option is selected, the staff will develop a detailed project and resourcing plan to accomplish the Commission's direction.

Where appropriate, the staff plans to use advanced tools such as the MELCOR severe accident analysis code and the MELCOR Accident Consequence Code System Version 2 (MACCS2) that were used in the SOARCA project, to support future Level 3 PRA activities. The staff recognizes the potential benefits of both PRA and SOARCA methods and tools that should be considered within overall agency resources. PRA can provide greater breadth in modeling an NPP site to capture accident sequences of possible importance while the SOARCA methods and tools can provide details about why the sequence is important as well as mitigation options for the more important accident sequences revealed by a PRA model. This SECY paper provides the staff's evaluation of potential benefits and estimated costs for proposed options for proceeding with future Level 3 PRA activities. A separate evaluation of the potential benefits and costs for further SOARCA-type analyses will be submitted to the Commission in a paper at the conclusion of the SOARCA project in fiscal year (FY) 2012.

#### RECOMMENDATIONS:

Based on the need to otherwise reallocate a limited number of qualified risk analysts from other priority assignments, the staff recommends the Commission approve Option 2. Selecting this option will enable the staff to use additional resources already requested to support future Level 3 PRA activities to continue important progress toward performing a new full-scope comprehensive site Level 3 PRA. Moreover, this will enable the staff and the Commission to better understand the potential needs and implications of pending recommendations from multiple task forces (e.g., the Chairman's task force to develop options for a more holistic risk-informed, performance-based regulatory approach<sup>17</sup> and the near-term task force to conduct methodical and systematic reviews of our current processes and regulations in response to the recent event in Japan<sup>18</sup>) before committing substantial resources to support a new full-scope comprehensive site Level 3 PRA.

ACRS recommends the staff proceed with a modified version of Option 3 by developing a phased approach and longer schedule for a selected site that will simultaneously minimize the resource impact while still achieving the objectives associated with completing a new full-scope comprehensive site Level 3 PRA. The staff believes Option 2 will provide necessary flexibility to address both current issues and identified technical gaps by not constraining the staff to a particular site. In addition, the staff believes that by first addressing the technical gaps, Option 2 will ultimately result in a more efficient use of resources by better enabling the staff to complete a new full-scope comprehensive site Level 3 PRA within a shorter time period, thereby facilitating continuity in project staff and reducing costly turnover.

Over the next 2 years, the staff will continue to work collaboratively with the program offices and task forces to coordinate and optimize efforts related to (1) ongoing and planned mission-critical work, (2) research to address identified gaps in existing PRA technology, (3) the SOARCA project, and (4) any pending task force recommendations and related subsequent actions. In

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<sup>17</sup> Memorandum from G.B. Jaczko to R.W. Borchardt, "Assessment of Options for a More Holistic Risk-Informed, Performance-Based Regulatory Approach" (February 11, 2011).

<sup>18</sup> Tasking Memorandum – COMGBJ-11-0002, "NRC Actions Following the Events in Japan" (March 23, 2011).

addition, the staff will continue to take necessary steps toward performing a new full-scope comprehensive site Level 3 PRA by engaging with the nuclear industry to identify and discuss issues related to the extent of industry participation and site selection. At the end of FY 2013, the staff will reassess the agency's progress and readiness for performing a new full-scope comprehensive site Level 3 PRA and will provide the Commission with options and a recommendation for proceeding.

In preparation for the Commission meeting scheduled for July 28, 2011 to discuss options for proceeding with future Level 3 PRA activities, the staff also recommends releasing this SECY paper to the public as soon as possible. Early release will enhance external stakeholder interactions with the Commission during this meeting by providing external stakeholders who plan to participate with more time to review the staff's final proposal and to prepare a response. Likewise, early release will enhance staff interactions with the Commission by providing the staff with more time to engage with external stakeholders to better understand their position prior to the meeting.

#### RESOURCES:

The President's Budget for FY 2012 requests 2.0 full-time equivalents (FTE) and \$500k in contract support for future Level 3 PRA activities.

For Option 1, which involves maintaining the status quo and not proceeding with near-term Level 3 PRA activities, the 2.0 FTE and \$500k already requested for future Level 3 PRA activities in FY 2012 would not be needed and therefore could be reallocated to support other higher priority work.

For Option 2, which involves conducting focused research over the next 2 years to address gaps in existing PRA technology before performing a new full-scope comprehensive site Level 3 PRA, the estimated resources needed are 2.0 FTE and \$500k per year for FY 2012 and FY 2013—assuming work commences at the start of FY 2012. For FY 2012, these resources have already been requested to support future Level 3 PRA activities; therefore, Option 2 does not require any additional resource commitments. For FY 2013, the projected resources will be requested through the routine Planning, Budgeting, and Performance Management (PBPM) process.

For Option 3, which involves proceeding with a new full-scope comprehensive site Level 3 PRA for an operating NPP, the estimated resources needed are 8.0 FTE and \$2,000k per year for FY 2012, FY 2013, and FY2014. This represents an additional resource commitment of 6.0 FTE and \$1,500k per year beyond what has already been requested for FY 2012. These estimates are based on an assumed 3-year project plan and on conservative assumptions with regard to the amount and quality of baseline PRA information available to the staff at the start of the project—which depend on the site selected. The estimated resources needed per year could be reduced by (1) extending the project schedule beyond 3 years, and/or (2) selecting a site willing to participate that has more favorable attributes (e.g., an integrated SPAR model that includes internal and external hazards, low-power/shutdown POSs, and/or Level 2 PRA analyses; developed MELCOR input decks; and/or a developed detailed fire PRA to support transition to NFPA 805).

The additional resources needed to support Option 3 in FY 2012 would require reallocation of resources assigned to ongoing and planned mission-critical work. Should the Commission direct the staff to proceed with Option 3, the staff would first engage with industry to select a site and then develop a detailed project plan that would include more detailed and refined resource estimates; this approach is consistent with ACRS's recommendations. The staff would then coordinate with internal stakeholders to identify the impact of reallocating resources to support the project plan. The detailed project plan, refined resource estimates, and resource impact statements would be provided to the Commission in a separate SECY paper for information prior to proceeding. Projected resources needed to support Option 3 for FY 2013 and FY 2014 would be sought through the routine PBPM process.

To help identify the potential impacts of Option 3 or any other option requiring resources greater than those already requested, the staff examined ongoing and planned work that might be delayed or deferred to support such an option. As noted above, actual decisions regarding impacts would require more refined resource estimates based on site selection and a detailed project and resourcing plan. Examples include:

- **Commission-directed work:** evaluation of different HRA models in an effort to propose either a single model for the agency to use or guidance on which model[s] to use in specific circumstances<sup>19</sup>; development of guidance that will ensure the formal utilization of expert judgment is applied consistently in regulatory decisionmaking<sup>20</sup>; and development of guidance to support risk-informing SMR reviews<sup>21</sup>.
- **Program office-requested work:** SPAR model development and improvement to support evaluation of external events and low-power shutdown risk, new reactor designs, and licensee transition to NFPA 805 implementation; simulator research and data collection efforts to improve HRA; development of guidance to support oversight of fitness-for-duty regulations; development of risk-informed methods applicable to security regulation; and support for the extended storage and transportation of spent nuclear fuel initiative.
- **Program office licensing work:** reallocation of 1 FTE and \$400k from operating reactor licensing would result in both a per-year reduction of approximately 25 licensing actions or other licensing tasks not related to power uprates or license renewals as well as a delay in the completion of certain licensing actions, including the review of NFPA 805 submittals.

The table below summarizes both the resources already requested to support future Level 3 PRA activities for FY 2012 and the total additional resources needed beyond those already requested for each option for FY 2012, FY 2013, and FY 2014.

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<sup>19</sup> SRM-M061020, "Staff Requirements – Meeting with Advisory Committee on Reactor Safeguards, 2:30 p.m., Friday, October 20, 2006, Commissioners' Conference Room, One White Flint North, Rockville, Maryland (Open to Public Attendance)" (November 8, 2006).

<sup>20</sup> SRM-COMGEA-11-0001, "Utilization of Expert Judgment in Regulatory Decision Making" (March 15, 2011).

<sup>21</sup> SRM-SECY-11-0024, "Use of Risk Insights to Enhance the Safety Focus of Small Modular Reactor Reviews" (May 11, 2011).

Resources	FY 2012	FY 2013 (Projected)	FY 2014 (Projected)
<b>Resources Currently Requested for Future Level 3 PRA Activities</b>			
FTE	2.0	2.0	N/A
Contract Support	\$500k	\$500k	N/A
<b>Option 1: Maintain Status Quo – Continue Evolutionary Development of PRA Technology</b>			
FTE	-2.0	-2.0	N/A
Contract Support	-\$500k	-\$500k	N/A
<b>Option 2: Research to Address Identified Gaps Before Performing Future Level 3 PRAs</b>			
FTE	0.0	0.0	N/A
Contract Support	\$0k	\$0k	N/A
<b>Option 3: Full-Scope Comprehensive Site Level 3 PRA</b>			
FTE	6.0	6.0	6.0
Contract Support	\$1,500k	\$1,500k	\$1,500k

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 reviewed this paper and has no legal objection.

*/RA by Michael F. Weber for/*

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## Enclosures:

- Options for Proceeding with Future Level 3 Probabilistic Risk Assessment Activities.
- The Structure and Evolution of Probabilistic Risk Assessment and Risk-Informed Regulation.

Resources	FY 2012	FY 2013 (Projected)	FY 2014 (Projected)
<b>Resources Currently Requested for Future Level 3 PRA Activities</b>			
FTE	2.0	2.0	N/A
Contract Support	\$500k	\$500k	N/A
<b>Option 1: Maintain Status Quo – Continue Evolutionary Development of PRA Technology</b>			
FTE	-2.0	-2.0	N/A
Contract Support	-\$500k	-\$500k	N/A
<b>Option 2: Research to Address Identified Gaps Before Performing Future Level 3 PRAs</b>			
FTE	0.0	0.0	N/A
Contract Support	\$0k	\$0k	N/A
<b>Option 3: Full-Scope Comprehensive Site Level 3 PRA</b>			
FTE	6.0	6.0	6.0
Contract Support	\$1,500k	\$1,500k	\$1,500k

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 reviewed this paper and has no legal objection.

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Executive Director  
for Operations

## Enclosures:

- Options for Proceeding with Future Level 3 Probabilistic Risk Assessment Activities.
- The Structure and Evolution of Probabilistic Risk Assessment and Risk-Informed Regulation.

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