July 30, 2012

The Honorable Dianne Feinstein
United States Senate
Washington, D.C. 20510

Dear Senator Feinstein:

On behalf of the U.S. Nuclear Regulatory Commission (NRC), I am responding to your letter of June 4, 2012, regarding the agency's response to a recent Government Accountability Office (GAO) study entitled "Natural Hazard Assessments Could Be More Risk-Informed." Responses to your specific inquiries are enclosed with this letter.

If you have any additional questions, please contact me or Ms. Rebecca Schmidt, Director of the Office of Congressional Affairs, at (301) 415-1776.

Sincerely,

/RA/

Allison M. Macfarlane

Enclosure:
As stated

Responses to Questions from Senator Dianne Feinstein
Letter Dated June 4, 2012

1. What is NRC doing to determine whether all nuclear plants should be required to use probabilistic risk assessment (PRA) to evaluate natural hazards like earthquakes and floods? Will the NRC initiate a rulemaking or take other concrete steps to make this determination?

On March 12, 2012, the NRC issued a request for information to all power reactor licensees and holders of construction permits, in response to a recommendation made by the NRC Fukushima Near-Term Task Force and recent Congressional direction. This request for information includes a request that licensees reevaluate both the seismic and flooding hazards at nuclear power plant sites using updated seismic and flooding hazard information and the most current regulatory guidance and methodologies, including risk assessment approaches, as appropriate. The NRC staff will evaluate the licensees' responses to this request for information and determine whether regulatory actions are necessary to provide additional protection against natural hazards.

In addition, the NRC continues to evaluate the further application of PRA to its regulatory programs and requirements, recognizing that PRA can provide a better understanding of risk, and a systematic evaluation of risk drivers. Last year, Commissioner George Apostolakis led a Risk Management Task Force, at the request of then Chairman Gregory Jaczko, to develop a strategic vision and options for adopting a more comprehensive, holistic, risk-informed, performance-based regulatory approach for nuclear reactors, as well as for nuclear materials, waste, fuel cycle, and transportation. The report, "A Proposed Risk Management Regulatory Framework" (NUREG-2150), was issued in April 2012. The staff is currently evaluating this report and will provide recommendations to the Commission next year on whether modifications to the regulatory framework should be made. Separately, the NRC's Fukushima Near-Term Task Force recommended that the agency establish a logical, systematic, and coherent regulatory framework for adequate protection that appropriately balances defense-in-depth and risk considerations. The staff is currently developing its proposed approach for implementing this recommendation. The NRC is also considering whether to further evaluate the insights on natural hazard assessments gained from the agency's Individual Plant Examination for External Events program to identify potential generic regulations or plant-specific regulatory requirements.

The NRC will continue to evaluate its processes and policies regarding the enhanced use of PRA and risk insights as part of its overall regulatory framework.

2. Given that NRC requires new reactor applicants to use PRA techniques, why should operating reactors continue to rely on traditional safety assessments?

The NRC requires designers and license applicants for new reactors to develop a PRA in support of design certification and licensing reviews. PRA supplements traditional engineering methods; it does not replace them. Designers, licensees, and regulators involved with the construction of new reactors use PRA to inform their decisions for safe design and operation of the facilities, but the PRA is never the sole basis for these decisions. Consequently, both operating reactor licensees and new reactor licensees will continue to rely on traditional safety assessments until their plants are decommissioned.

At the same time, the regulatory oversight of the existing fleet of U.S. operating reactors does not rely solely on traditional safety assessments. In 1988, all power reactor licensees were requested to examine their plants for any vulnerability to severe accidents. For every U.S. nuclear power plant, PRA techniques were used to perform this evaluation. The results are used by NRC staff when reviewing risk information submitted in support of license amendments. Most of these PRA studies have been significantly enhanced over time. In addition, the NRC has developed and maintains its own PRA models for each plant.

The use of PRAs to support regulatory decision-making is consistent with the Commission's 1995 PRA policy statement, which states that PRAs should be used in a manner that complements the NRC's deterministic approach and supports the traditional philosophy of defense-in-depth. In reactor oversight activities, the NRC uses PRA techniques to assess the significance of inspection findings and reactor incidents. This supports an objective, transparent and predictable regulatory response.

In the U.S., licensees of operating reactors have the option to use PRA to focus their resources on activities of greatest safety benefit, and all of them do so. Maintenance, testing, inspection, and even technical specification requirements are refined on the basis of information derived from PRAs. All operating reactor licensees use plant-specific PRAs to assess and manage risk during maintenance activities to meet the requirements of the NRC's maintenance rule. Plant-specific PRAs are periodically updated to meet quality expectations so that licensees can use them to support risk-informed license amendment applications.

The NRC staff also may use PRA information when imposing new requirements on licensees. NRC regulations state that, unless the new requirement is necessary for adequate protection of the public, the cost of the new requirement must be less than the benefit in terms of averted risk. PRA may be used to estimate the averted risk.

3. Will NRC use PRA techniques to analyze information that is gathered in response to Fukushima? If so, how will PRA be used? If not, why not?

As noted above, on March 12, 2012, NRC issued a request for information to all power reactor licensees and holders of construction permits in response to recommendations generated by the Near-Term Task Force and recent Congressional direction. Among other requests, the letter asks all addressees to reevaluate seismic and flood hazards at their sites using current regulatory guidance and methodologies, including risk assessment approaches, as appropriate.

Current NRC requirements and guidance for characterizing seismic hazards use probabilistic methods to develop a risk-informed, performance-based ground motion response spectrum (GMRS) for a site. In response to the NRC request for information, addressees were asked to (1) use this current guidance to define a GMRS for each site, and (2) compare the reevaluated hazard to the current design basis at the site. If the hazard reevaluation results in a seismic hazard that is not bounded by the current design basis, licensees were requested to perform a seismic risk assessment. Acceptable risk assessment approaches include seismic probabilistic risk assessment or a seismic margin assessment that considers probabilistic insights.

Similarly, the March 12, 2012, letter requested the revaluation of flood hazards at each site and comparison of the reevaluated hazard to the current design basis at the site for each potential flood mechanism. Consistent with the state-of-practice in hydrology, NRC's current regulatory guidance related to flooding utilizes deterministic methods for defining flood hazards. If the reevaluated flood hazard at a site is not bounded by the current design basis, licensees were

requested to perform an integrated assessment. An integrated assessment evaluates the total plant response to the hazard, considering multiple and diverse capabilities such as physical barriers, temporary protective measures, and operational procedures. NRC staff is currently developing guidance for the performance of the integrated assessment.

4. Will NRC use PRA techniques to inform its license renewal process? If so, how will PRA be used? If not, why not?

The NRC's current license renewal process does not require the use of PRA techniques. A deterministic approach is used to identify all plant systems, structures, and components (SSCs) that are within the scope of license renewal, not just those SSCs that have the highest risk ranking. Similarly, a deterministic approach is used to determine all of the aging effects for the SSCs (not just those aging effects with the highest risk ranking) and appropriate approaches for managing these aging effects.

The Commission specifically considered the role of plant-specific probabilistic analyses when it promulgated the current license renewal rule. The Commission determined that plant-specific PRAs were of very limited use for establishing the scope of license renewal, and instead it based the scope on deterministic criteria, recognizing that a plant's licensing basis is also largely based on deterministic criteria. As such, the scope of the current license renewal rule includes all SSCs that are safety-related or important to safety, whereas a scope based on PRA would focus aging management on only those SSCs that are the most risk significant.

Despite the deterministic scope of the license renewal rule, PRA techniques may be used by licensees to develop elements of the programs used to manage aging of SSCs. For example, the identification of a specific set of SSCs to be inspected may be based on the relative risk significance of the individual SSCs within the total population of SSCs subject to aging management. Thus, risk significance may be considered in developing the details of an aging management program for a specific SSC, but it may not be used to conclude that no aging management program is necessary for that SCC.

In addition, an analysis of Severe Accident Mitigation Alternatives (SAMAs) is included as part of the environmental review of the application for license renewal if it had not been considered earlier for the facility. The SAMAs review is an evaluation of alternatives to mitigate severe accidents and typically involves the extensive use of a plant-specific probabilistic safety assessment, similar to a PRA. The outcome of the SAMAs analysis is a list of plant improvements that meet the criteria of being cost-beneficial.

5. In H.R. 2055, Congress directed that "The Nuclear Regulatory Commission shall require reactor licenses to re-evaluate the seismic, tsunami, flooding, and other external hazards at their sites against current applicable Commission requirements and guidance for such licenses as expeditiously as possible…. Based upon the evaluations conducted pursuant to this section and other information it deems relevant, the Commission shall require licensees to update the design basis for each reactor, if necessary." Will NRC require licensees to use PRA when conducting these design basis reviews? If not, why not?

The seismic and flood hazard reevaluations described in the response to Question 3 will be implemented in two phases. Phase 1 was implemented by the March 12, 2012, NRC request for information, which asks that power reactor licensees and construction permit holders reevaluate the seismic and flooding hazards at their sites using updated information and current

regulatory guidance and methodologies. The letter also requests that for plants where the reevaluated hazard exceeds the current design basis, licensees perform a subsequent risk evaluation, including a seismic PRA, if appropriate, or an integrated assessment. Under phase 2, NRC staff will use the information gathered in phase 1 (including the hazard reevaluations and available risk insights) to determine whether regulatory actions are necessary to provide additional protection against the reevaluated hazards. Updating of the design basis at a site is a potential action that will be considered under phase 2. The NRC expects that seismic and flood hazards dominate the risks to the operating fleet of plants from external hazards. In accordance with H.R. 2055, the NRC staff has committed to address other external hazards, such as wind and missile loads from tornadoes and hurricanes and snow and ice loads for roof design, as soon as sufficient resources become available.

6. What challenges would NRC need to overcome in order to effectively implement a new PRA requirement for operating reactors?

As indicated in the response to Question 2 above, PRA is used in NRC regulatory activities for the current fleet of U.S. operating reactors. If the NRC moves forward to promulgate a rule or position requiring a PRA for operating reactors, the NRC staff would be required to perform regulatory analyses to support the new regulation or change to a previously established position. The regulatory analysis would assess whether the benefits justify the cost. In addition, a backfit analysis would be performed in accordance with Section 50.109 of Title 10 of the Code of *Federal Regulations* unless the proposed action falls within one of the exceptions to the requirements to prepare a backfit analysis.

Other challenges anticipated for effective implementation of a new PRA requirement for operating reactors, at least in the near-term, include the availability of resources for development of independent risk assessment models and recruitment and retention of skilled risk analysts for both the industry and the NRC.