

November 1, 2012

Dr. J. Sam Armijo, Chairman
Advisory Committee on Reactor Safeguards
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: DRAFT REGULATORY GUIDE DG-1290 (PROPOSED REVISION OF
REGULATORY GUIDE 1.59), "DESIGN-BASIS FLOODS FOR NUCLEAR
POWER PLANTS"

Dear Dr. Armijo:

Thank you for your September 25, 2012, letter regarding your review of the U.S. Nuclear Regulatory Commission's (NRC's) Draft Regulatory Guide (DG)-1290, "Proposed Revision of Regulatory Guide 1.59, 'Design-Basis Floods for Nuclear Power Plants.'" The staff has considered the recommendations provided in your letter and developed the following responses.

ACRS Recommendation 1:

Draft Regulatory Guide DG-1290 should be issued for public comments after Recommendations 2, 3, and 4 are addressed.

NRC Response:

The staff plans to issue DG-1290 for public comment as soon as possible after addressing your recommendations and completing the ongoing interoffice concurrence review process. The key step remaining in the interoffice review process is to align DG-1290 with interim staff guidance (ISG) documents that address coastal flooding phenomena, such as storm surge, seiche, and tsunami. The Office of New Reactors (NRO) staff is developing the ISGs in coordination with the Japan Lessons Learned Directorate, in the course of Commission-directed interactions with stakeholders on the flooding reevaluations requested in the Commission's March 12, 2012, information request letter to all power reactor licensees and holders of construction permits under Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities." The staff is tentatively scheduled to release DG-1290 for public comment by December 31, 2012.

ACRS Recommendation 2:

The guidance in DG-1290 should provide clear and consistent definitions of a "design-basis flood" and of all phenomena that are characterized by the term "probable maximum." The guidance should clarify whether these analyzed conditions represent the maximum possible severity for each flood-causing mechanism.

The guidance should make it clear that licensees should provide justification that the deterministically derived flood levels correspond to conditions that have a total expected frequency of less than 1×10^{-6} event per year, as specified for combined events in DG-1290, or they should develop suitable alternative analyses that provide this assurance.

NRC Response:

The staff plans to revise the guidance to incorporate the recommended clarification of terms and definitions. The staff also will revise the guidance to address the perceived lack of consistency between deterministically derived flood levels and the qualitative target annual exceedance probability of 1×10^{-6} used for combined events. The feasibility and value of using approximate frequency estimates to assess the severity of deterministically derived flood levels will be addressed. In some instances, there may be very large uncertainties in the associated frequency estimate. The combined probabilistic-deterministic approaches, as outlined in the ISGs discussed above, will be the preferred approach to estimating the total expected frequency of deterministically derived flood levels, when it is feasible to do so.

ACRS Recommendation 3:

The staff should revise Appendix H, Section H-2, to remove the implied need to evaluate the list of prescribed conditions. The guidance should emphasize the need to perform analyses for the applicable site-specific flood-causing mechanisms and to examine the sensitivity of the analysis results to variations in the combined event frequencies and possible dependencies among the conditions. It should provide more general examples of the types of combined conditions that should be evaluated, without reference to specific numerical values, assumed recurrence intervals, or logical combination rules.

NRC Response:

The staff plans to revise the guidance to incorporate this recommendation. The revised Appendix H discussion will stress the need for site-specific examination of applicable flood-causing phenomena and combined event frequency estimates. Specific combination rules and numerical values for recurrence intervals will be avoided, except when warranted by generally acknowledged lack of site-specific information or when needed to enable consistent and efficient reviews.

ACRS Recommendation 4:

The guidance for evaluation of the effects from dam failures should include coincident or dependent failures of downstream dams that may either drain or significantly reduce the plant's safety-related cooling water supply.

NRC Response:

The staff plans to revise the guidance to incorporate this recommendation. Evaluation guidance for the effects from dam failures will be revised to emphasize coincident or dependent failures of downstream dams that may affect the plant's safety-related cooling water supply.

ACRS Recommendation 5:

After RG 1.59, Revision 3, is issued, the staff should expedite the development of probabilistic methods to consistently evaluate exceedance frequencies for each flood-causing mechanism that is addressed in DG-1290. To the extent possible, those efforts should build on existing methods and guidance for the evaluation of other severe external hazards. The proposed methods should be applied to pilot plant sites which are exposed to multiple flooding hazards.

NRC Response:

The staff agrees that expeditious development of probabilistic methods for evaluating exceedance frequencies for the flood-causing mechanisms addressed in DG-1290 is appropriate. The staff agrees that such efforts should build on existing methods and guidance for evaluating other severe external hazards, and that applying proposed methods to pilot plant sites exposed to multiple flooding hazards is appropriate.

Some steps already have been taken to provide the basis for incorporating probabilistic flood hazard assessment (PFHA) methodologies into NRC guidance. The staff is enlisting assistance of subject-matter experts in Federal agencies, such as the U.S. Army Corps of Engineers (USACE), U.S. Department of the Interior's Bureau of Reclamation, National Oceanic and Atmospheric Administration's National Weather Service, U.S. Geological Survey, as well as the National Laboratories. The Office of Research (RES) recently completed a project with USACE that addressed the estimation of very low probability hurricane storm surges for design and licensing of nuclear power plants in coastal areas (NUREG/CR-7134). RES also has initiated projects to assess the technical basis for probabilistic estimation of extreme precipitation and riverine flooding hazards. Finally, RES, NRR, and NRO will jointly host an interagency PFHA workshop on January 29-31, 2013. This workshop will consider most of the flood-causing mechanisms addressed in DG-1290, aiming to assess the state of practice in probabilistic methods and to identify areas that need further research. The staff will continue to explore with internal and external stakeholders how PFHA methodologies could be applied within the NRC's regulatory framework.

J.S. Armijo

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The NRC staff appreciates the Committee's prompt and very thorough review of DG-1290. The NRC staff recognizes the Committee's commitment to safety and appreciates the support of efforts to incorporate probabilistic methods for flood hazard assessments into NRC guidance.

Sincerely,

/RA by Michael F. Weber for/

R. W. Borchardt
Executive Director
for Operations

cc: Chairman Macfarlane
Commissioner Svinicki
Commissioner Apostolakis
Commissioner Magwood
Commissioner Ostendorff
SECY

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