

April 5, 2002

Mr. Alan Nelson  
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1776 I Street, NW., Suite 400  
Washington, DC 20006-3708

Mr. David Lochbaum  
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Washington, DC 20006-3919

SUBJECT: STAFF RESPONSE TO INDUSTRY'S PROPOSED REVISIONS OF  
CHAPTERS II AND III OF GENERIC AGING LESSONS LEARNED (GALL)  
REPORT ON AGING MANAGEMENT OF CONCRETE ELEMENTS

Dear Messrs. Nelson and Lochbaum:

On February 14, 2002, the Nuclear Regulatory Commission (NRC) staff met with the Nuclear Energy Institute (NEI) and other industry representatives to discuss the proposed revision of Chapters II and III of Generic Aging Lessons Learned (GALL) report on aging management of concrete elements, which was transmitted to NEI by a letter on November 23, 2001. During the meeting, some of the industry representatives indicated that industry operating experience and other available information do not support a need for aging management of concrete elements for license renewal.

Subsequent to the above meeting, NEI provided the staff with their comments on the staff's proposed revision that reflected the aforementioned view in a letter dated March 14, 2002. Enclosed is the staff's response to that letter. The staff will discuss its response during the upcoming April 10, 2002, meeting. Based on the results of the discussion, the staff will decide how to finalize and implement the proposed revision of Chapters II and III of Generic Aging Lessons Learned (GALL) report on aging management of concrete elements. If you have any questions regarding this matter, please contact Peter Kang at 301-415-2279.

Sincerely,

*/RA/*

Christopher I. Grimes, Program Director  
License Renewal and Environmental Impacts  
Division of Regulatory Improvement Programs  
Office of Nuclear Reactor Regulation

Project 690

Enclosure: As stated

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STAFF RESPONSE TO INDUSTRY'S PROPOSED REVISIONS OF  
CHAPTERS II AND III OF GENERIC AGING LESSONS LEARNED (GALL) REPORT  
ON AGING MANAGEMENT OF CONCRETE ELEMENTS

In a letter dated March 14, 2002, the Nuclear Energy Institute (NEI) presented its views concerning the staff's proposed revisions to Chapters II and III of the Generic Aging Lessons Learned (GALL) report on aging management of concrete elements for license renewal. In addition, the March 14, 2002, letter from NEI to the NRC staff contained industry's response to the staff's letter to Florida Power and Light Company, dated October 30, 2001, in which the staff emphasized a need for aging management of concrete structures. The March 14, 2002, NEI letter also contained three attachments. Attachment 1 described industry's understanding of the license renewal process, Attachment 2 is a short paper that described aging management of concrete, and Attachment 3 presented industry's proposed revisions to Chapters II and III of the GALL report.

In Attachment 1, NEI presented portions of Title 10 of the Code of Federal Regulation Part 54 (10 CFR Part 54) related to the determination of systems, structures, and components (SSCs) that are in the scope of license renewal. In addition, NEI quoted several statements from the Statement of Consideration (SOC) for Part 54 and also presented its views on the use of the Standard Review Plan for License Renewal (NUREG 1800) and the GALL Report (NUREG 1801).

In Attachment 2, NEI discussed industry's views concerning the aging of concrete and the appropriate aging management of concrete components. NEI cited American Concrete Institute (ACI) 201.2R, "Guide to Durable Concrete," NUREG/CR-6424, "Report on Aging of Nuclear Power Plant Reinforced Concrete Structures," and NUREG/CR-4652, "Concrete Component Aging and Its Significance Relative to Life Extension of Nuclear Power Plants," to emphasize the view that well-constructed concrete structures have performed and will continue to perform satisfactorily. NEI also asserted that deficiencies found during inspections of concrete nuclear structures can be attributed to design, construction, and human error.

In Attachment 3, NEI proposed changes to Chapters II and III of the GALL report that require license renewal applicants to monitor only those concrete components that are subjected to aggressive or harsh environments as defined by several different indicators listed in the GALL report tables.

The staff is fully aware of the content and purpose of the standard ACI 201.2R and the NUREG reports cited in Attachment 2. However, none of these documents suggest that nuclear safety-related concrete structures do not need to be periodically examined or inspected. In fact, one of the NUREG reports cited by NEI (NUREG/CR-6424) states,

*However, as these structures age, incidences of degradation due to environment stressor effects are likely to increase to potentially threaten their durability. Items of note would be corrosion of steel reinforcement due to carbonation of the concrete or presence of chloride ions, excessive loss of prestressing force, leaching of concrete, and leakage of post-tensioning system corrosion inhibitor through cracks in the concrete.*

Enclosure

After reviewing the findings at six nuclear power plants and accumulating industry wide experience, NUREG 1522, "Assessment of In-service Conditions of Safety-Related Nuclear Power Plant Structures," concludes,

*Although quality of construction is the primary factor in ensuring the durability of nuclear structures, it is not a substitute for periodic inspections and maintenance of the structures and civil engineering features. The observations and information related to these structures support the fact that such construction should be followed by periodic inspections and a systematic maintenance program to ensure the expected useful life of the structures.*

ACI 349.3R, "Evaluation of Existing Nuclear Safety-Related Concrete Structures," is a report that represents a consensus of knowledgeable individuals from nuclear industry, consultants, and regulators. As stated in ACI 349.3R, sound engineering practices during material (concrete mix) design and construction together with sound inspection programs, in which the performance and condition of plant structures are periodically evaluated and monitored, are both necessary to maintain the serviceability of concrete nuclear structures. Periodic visual inspections (1) can provide significant quantitative and qualitative data regarding structural performance and extent of degradation, (2) are vital to monitor the effects of operating and environmental conditions, and (3) enable the timely identification and correction of degraded conditions. Regarding the frequency for periodic inspections, ACI 349.3R states:

1. The frequency at which periodic evaluations are conducted within the evaluation procedure should be defined by the plant owner.
2. Frequencies should be based on the aggressiveness of environmental conditions and physical conditions of plant structures.
3. The established frequencies should also provide assurance that any age-related degradation is detected at an early stage of degradation and that appropriate mitigative actions can be implemented.
4. In general, it is recommended that all safety-related structures be visually inspected at intervals not to exceed 10 years.
5. The frequency of inspection for nuclear safety-related concrete structures should follow those in the table below:

Structure Category	Frequency of Visual Inspection
Below-grade structures	Every 10 years
Structures exposed to natural environment	Every 5 years
Structures inside primary containment	Every 5 years
Continuous fluid-exposed structures	Every 5 years
Structures retaining fluid and pressure	Every 5 years
Controlled interior environment	Every 10 years

Note that the GALL report does not recommend further evaluation of concrete components in inaccessible areas for which the applicant can demonstrate a non-aggressive environment. In addition, the Structures Monitoring Program (XI.S6) in the GALL report recommends the use of ACI 349.3R but does not mandate the use of ACI 349.3R for developing acceptance criteria for the inspection of concrete components. For concrete containments, the staff requires that license renewal applicants implement the examination requirements and inspection intervals of ASME Section XI, Subsection IWL as an aging management program (AMP) for the period of extended operation. If the requirements of Subsection IWL for concrete containment are changed in the future, the staff will review these changes and endorse them in future rulemaking of 10 CFR 50.55a.

The staff's position that accessible concrete components require aging management for license renewal for the period of extended operation has been consistently applied. The recent changes proposed by the staff for Chapters II and III of the GALL report are intended only to clarify the staff's position concerning the different requirements for accessible and inaccessible concrete components.

The staff recognizes that license renewal applicants are required to perform an Aging Management Review (AMR) by 10 CFR 54.21(a)(3) for each structure and component that is determined to be in the scope of license renewal. In the performance of AMRs for in-scope concrete components, recent license renewal applicants have concluded that many of these components do not require aging management for the period of extended operation. This conclusion is based on the material of construction, environment, as well as industry and plant-specific operating experience for these components. However, staff experience with the aging of concrete nuclear structures demonstrates that effective management of these structures and components requires periodic inspections. Aging management reviews of concrete components performed by license renewal applicants should be used to differentiate between those components requiring only the periodic inspections of a license renewal AMP and those requiring further evaluation, as recommended by the GALL report. AMR results of concrete structures and components may also be used to establish different scheduled inspection frequencies, similar to those recommended by ACI 349.3R, for aging management programs.

In conclusion, in order for the NRC staff to make a reasonable assurance finding that in-scope concrete structures and components will maintain their structural integrity and intended function(s), the staff requires inspections of concrete components during the period of extended operation. Periodic visual inspections of concrete nuclear structures are a vital part of the license renewal program.

On this basis, the staff cannot accept the changes proposed by industry to Chapter II and III of the GALL report.

## NUCLEAR ENERGY INSTITUTE

Project No. 690

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