

**License Renewal Meeting
Aging Management of Concrete Elements
Agenda**

February 14, 2002

Welcome and Introductions	ALL 10 min.
Process - Fred Polaski	NEI 40 min.
<ul style="list-style-type: none">- Generic and plant-specific experience bearing on the applicability of the postulated aging effects.- Issuance of topical reports or other documents- The process by which resolutions of issues are incorporated into the GALL	
Industry Experience - Debbie Keiser	NEI 40 min.
<ul style="list-style-type: none">- Aging management of concrete- Industry operating experience,- Quality control programs	
Concrete Technical Review - Bob Nickoll	NEI 10 min.
NRC- NEI open discussion	ALL 50 min.
Summary - Actions - NRC - NEI	ALL 10 min.

Aging Management of Concrete The License Renewal Process

Fred Polaski
Exelon Nuclear
February 14, 2002

IDENTIFICATION OF SSCs IN THE SCOPE OF LICENSE RENEWAL

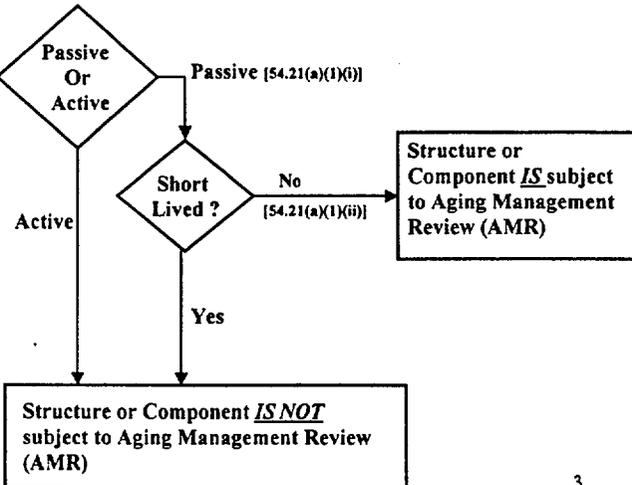
- Review CLB documents & Identify SSCs within the scope of license renewal pursuant to 10CFR54.4, section:
 - (a)(1) - Safety-related SSCs
 - (a)(2) - Nonsafety-related SSCs whose failure can prevent accomplishment of a Safety function.
 - (a)(3) - SSCs relied upon to demonstrate compliance with the five regulated events (Fire protection, Environmental qualification, Pressurized thermal shock, ATWS, SBO).

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STRUCTURES AND COMPONENTS SUBJECT TO AMR [10CFR54.21(a)(1)]

SSCs within the scope of §54.4

- Identify the *intended* function(s) of structures and components
- Classify Structures and components as Passive or Active based on how they perform their *intended function(s)*



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AGING MANAGEMENT REVIEW

- “.. only aging degradation that leads to degraded condition (i.e. , detrimental effects) during the period of extended operation is of principal concern for license renewal.” [SOC III.d(i)]
- “.. aging management review should focus on ensuring that structures and components perform their intended function(s) ..” [SOC III. f(i)]
- “To determine the aging effects requiring management, the applicant should consider and address materials, environment, and stressors that are associated with each structure, component or commodity grouping under review. In many instances, the proper selection of materials for the operating environment results in few, if any, aging effects of concern.” [NEI 95-10]

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AGING MANAGEMENT REVIEW (Cont'd)
(NEI 95-10 § 4.2.1.1)

- For each passive and long-lived structure, component or component group within the scope of license renewal:
 - Identify material of construction
 - Identify normal operating environment
 - Based on material/environment combination, identify the aging effects potentially effecting the structures' and components' ability to perform their intended function(s).
 - Review Industry Reports
 - Review available NRC guidance documents, GALL
 - Review Industry operating experience
 - Review plant unique experience

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AGING MANAGEMENT REVIEW (Cont'd)
(NEI 95-10 § 4.2.1.1)

- For each aging effect:
 - Review the design and/or material properties to determine if certain aging effects can be shown by analysis not to affect the capability of the structure or component to perform its intended function during the period of extended operation.
 - Review and assess plant specific operating experience to ensure that it substantiates the results of the analysis.
 - Review and Assess industry operating experience and its applicability to determine whether it changes plant specific determinations.

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AGING MANAGEMENT REVIEW (Cont'd)

(NEI 95-10 § 4.2.1.1)

- Aging effects requiring aging management:
 - Aging effects which cannot be shown by analysis not to affect the capability of the structure or component to perform its intended function(s) during the period of extended operation.
 - Aging effects for which plant specific operating experience does not substantiate the results of the analysis.

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ASSURING THAT THE EFFECT OF AGING WILL BE MANAGED [10CFR54.21(a)(3), NEI 95-10 §4.2.1.1]

- Identify existing programs or activities which will be credited for managing aging effects that require aging management.
- Review to determine whether they include actions to detect and mitigate the effects of aging.
- Evaluate credited programs or activities to show that the intended functions will be maintained for the period of extended operation; or,
- Enhance the existing program or activity / implement new programs or activities.

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USE OF GALL

- GALL is a compilation of Aging Management Programs that the NRC has found to be generically acceptable to manage aging for the period of extended operation for the combination of materials, environments, and aging effects listed.
- The programs credited in GALL were reviewed and found acceptable by the NRC.
 - These programs have been found acceptable in previous License Renewal Applications.
 - These programs are based on good engineering information and actual industry experience.

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USE OF GALL (cont'd)

- An applicant does not have to credit all the programs in GALL.
- An applicant may take exceptions to GALL or credit a program that is not listed in GALL.
- There may be combinations of materials, environments and aging effects listed in GALL which may not apply to all plants, based on plant specific operating experience.
- The NRC will be updating GALL based on experience gained with each successive application.
- There may be more than one acceptable AMP listed in GALL for a combination of material, environment and aging effect.

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CONCLUSION

- Slides 2 through 8 show the process used by a licensee in preparing a license renewal application. The result is a conclusion that the effects of aging are being adequately managed to provide reasonable assurance that the Intended Functions of SSCs are being maintained in accordance with the Current Licensing Basis for the period of extended operation.
- This process:
 - Complies with 10CFR54
 - Is explained in detail in NEI 95-10 (endorsed by the NRC in Reg. Guide 1104)
 - Has been used to prepare all License Renewal Applications
- It is important that all applicants and the NRC follow this process in order to have a stable, predictable and efficient process.

Aging Management of Concrete Structures

**February 14, 2002
Debbie Keiser, P. E.**

NRC Position Basis

- Contrary to operating experience to date, the NRC staff has developed a position that concrete aging effects must always be managed.
- NRC staff cite some evidence claiming to support the assertion that concrete ages unacceptably with time, if aging effects are not properly managed.
- ACI standards are based on industry-wide evidence of concrete degradation.

[Technical Observations

- Most of the industry-wide experience in the standards is the result of exposure to severe environments such as marine environments.
- Most, if not all, of the pictures in ACI 201.1R depict degradation of bridges due to chloride attack.

[ACI 201.2R, Guide to Durable Concrete

- “Durable concrete will retain its original form, quality, and serviceability when exposed to its designed environment.”
- “Concrete will perform satisfactorily when exposed to various atmospheric conditions, to most waters and soils containing aggressive chemicals, and to many other kinds of chemical exposure.”

[NUREG/CR-6424

- Most instances of concrete degradation occurred early in the life of the structures, were not attributed to aging, and have been corrected.
- Examples of problems include concrete cracking, concrete voids or honeycombing, and low concrete compressive strength.
- Cracks were considered to be structurally insignificant and easily repaired.
- Voids, honeycombs, and low-strength concrete were repaired or replaced.

[NUREG/CR-4652

- Contains summary of degradation associated with nuclear power plants.
- Vast majority of problems detected did not jeopardize the structural integrity.
- Five incidences could potentially have had serious consequences.
- These incidences involved dome delaminations, voids under tendon bearing plates, anchor head failures, and breakdown in quality control.
- These incidences were attributed to design, construction, or human errors, but not to aging.

[NUREG/CR-4652

“When concrete is fabricated with close attention to the factors shown in Fig. 21 (Ref. 29) related to the production of good concrete, the concrete will have infinite durability unless subjected to extreme external influences* (overload, elevated temperatures, industrial liquids and gases, etc.). Under normal environmental conditions aging of concrete does not have a detrimental effect on its strength for concrete ages to at least 50 years.”

[NUREG-1522 and NUREG/CR-6679

- NUREGs identify concrete cracking in various structures at several nuclear plants.
- NUREGs do not discuss the severity or impact on functional capabilities of the cracking.
- The pictures do not depict significant cracking that would result in loss of intended functions.

[NUREG-1522 and NUREG/CR-6679

- The NUREG findings may support the need for concrete inspections in structures exposed to severe environments.
- The findings do not support the need for inspections of all concrete structures in all environments.

[Conclusions

- Industry and NRC have worked over the years to develop guidelines and agreements that are based on technically sound information (NUREG-1557).
- Objective evaluation of concrete using current guidance concludes that aging management is not required for some concrete structures.
- The proposed revisions to GALL appear to be based on other information not yet in evidence.