August 29, 2001

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

SUBJECT: DRAFT SAFETY EVALUATION REPORTS FOR THE LICENSE RENEWAL DEMONSTRATION PROJECT

Dear Mr. Nelson:

By letter dated May 24, 2001, the Nuclear Energy Institute (NEI) submitted sample sections of a license renewal application to demonstrate the use of the Generic Aging Lessons Learned (GALL) report. The NRC staff reviewed the information contained in these sample sections and NEI's July 11, 2001, response to the staff's request for additional information (RAI). The staff has prepared sample draft Safety Evaluation Reports (SERs) to similarly demonstrate how the staff would use GALL in its renewal review. Enclosure 1 is the sample draft SER for Plant X (application format consistent with the SRP-LR). Enclosure 2 is the sample draft SER for Plant Y (application format consistent with previous submitted applications).

The staff would like the NEI Demonstration Project to stimulate a dialog that will build a consensus view of the attributes of the SER quality. We are soliciting feedback on constructive means to improve the efficiency, effectiveness, and clarity of the SER, as well as to maximize the benefits of the GALL report. Because the demonstration project is limited in scope and uses a sampling or "piecemeal" approach to test the review process, the sample SERs do not fully test the nature of a complete SER. However, the demonstration project provides valuable lessons in that the staff found it easier to prepare the SER for Plant X by following the guidance in the SRP-LR. This approach helps to ensure regulatory stability and predictability. On the other hand, the staff had to expend significant resources to constantly cross reference the GALL report to review the Plant Y format.

The staff's SER conclusions are limited to the aging management programs provided with your submittal. As agreed, the staff review does not include Section 2 of the submitted samples because it relates to scoping and the GALL report is not a scoping document. In addition, because the demonstration project is only a sampling and intended to be illustrative, the staff's conclusions may not be completely applicable to a plant-specific license renewal application. The demonstration project is based on the August 2000 version of the GALL report. Thus, the staff reviewed the sample sections in accordance with the NRC regulations and guidance provided in the License Renewal Standard Review Plan (SRP-LR) and the GALL report, dated August 2000. Future applicants are expected to reference the versions available at the time of application.

Although we found it efficient to prepare the SER for Plant X following the guidance in the SRP-LR, we would welcome suggestions from the NEI License Renewal Task Force on means to further enhance the quality of the SER and maximize the benefits of the GALL report. To this end, we specifically request that NEI comment on the best means to maintain future traceability of the SER conclusions to specific versions of GALL. Our goal is to achieve the optimum conciseness in articulating the basis for the staff's conclusions, in plain language and taking full advantage of the GALL report, while simultaneously achieving clarity in the basis for the staff's findings relative to the effectiveness of particular aging management programs.

We have planned a public meeting on September 5, 2001, to conduct a "table-top" inspection related to the Demonstration Project SERs. At that time, we would also welcome any preliminary feedback on the SERs and recommendations on the future plans and schedule for the Demonstration Project, consistent with the desired outcomes described above. If you have any question regarding this matter, please contact S. K. Mitra at (301) 415-2783.

Sincerely,

/***RA by STHoffman for***/

Christopher I Grimes, Chief
License Renewal and Standardization Branch
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Project No. 690

Enclosures: As stated

cc w/encl: See next page

Although we found it efficient to prepare the SER for Plant X following the guidance in the SRP-LR, we would welcome suggestions from the NEI License Renewal Task Force on means to further enhance the quality of the SER and maximize the benefits of the GALL report. To this end, we specifically request that NEI comment on the best means to maintain future traceability of the SER conclusions to specific versions of GALL. Our goal is to achieve the optimum conciseness in articulating the basis for the staff's conclusions, in plain language and taking full advantage of the GALL report, while simultaneously achieving clarity in the basis for the staff's findings relative to the effectiveness of particular aging management programs.

We have planned a public meeting on September 5, 2001, to conduct a "table-top" inspection related to the Demonstration Project SERs. At that time, we would also welcome any preliminary feedback on the SERs and recommendations on the future plans and schedule for the Demonstration Project, consistent with the desired outcomes described above. If you have any question regarding this matter, please contact S. K. Mitra at (301) 415-2783.

Sincerely,

/***RA by STHoffman for***/

Christopher I Grimes, Chief
License Renewal and Standardization Branch
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation

Project No. 690

Enclosures: As stated

cc w/encl: See next page

Distribution:
See next page
DOCUMENT NAME: C:\Program Files\Adobe\Acrobat 4.0\PDF Output\SERtoNE1.wpd

OFFICE	LA	RLSB	(A)SC:RLSB	OGC	BC:RLSB
NAME	EGHylton	SKMitra	DSolorio	NSt.Amour	CGrimes (STHoffman for)
DATE	8/ 27/01	8/27/01	8/27/01	8/ 28/01	8/29/01

OFFICIAL RECORD COPY

DISTRIBUTION:
HARD COPY
RLSB RF
E. Hylton

E-MAIL:
PUBLIC
J. Johnson
W. Borchardt
D. Matthews
C. Carpenter
C. Grimes
W. Beckner
B. Zalcman
J. Strosnider (RidsNrrDe)
F. Eltawila
G. Bagchi
P.T. Kuo
K. Manoly
W. Bateman
J. Calvo
C. Holden
P. Shemanski
S. Rosenberg
G. Holahan
S. Black
B. Boger
W. Dean
D. Thatcher
G. Galletti
B. Thomas
J. Moore
R. Weisman
M. Mayfield
J. Vora
W. McDowell
S. Droggitis
S. Duraiswami
J. Peralta
RLSB Staff

A. Thadani
R. Zimmerman
C. Julian
R. Gardner
D. Chyu
M. Modes

NUCLEAR ENERGY INSTITUTE

Project No. 690

cc:

Mr. Joe Bartell
U.S. Department of Energy
NE-42
Washington, D.C. 20585

Mr. Richard P. Sedano, Commissioner
State Liaison Officer
Department of Public Service
112 State Street
Drawer 20
Montipelier, Vermont 05620-2601

Mr. Stephen T. Hale
Florida Power & Light Company
9760 S.W. 344 Street
Florida City, Florida 33035

Mr. Robert Gill
Duke Energy Corporation
Mail Stop EC-12R
P.O. Box 1006
Charlotte, NC 28201-1006

Mr. Charles R. Pierce
Southern Nuclear Operating Co.
40 Inverness Center Parkway
BIN B064
Birmingham, AL 35242

Mr. David Lochbaum
Union of Concerned Scientists
1707 H Street, NW
Suite 600
Washington, DC 20006-3919

Mr. Garry Young
Entergy Operations, Inc.
Arkansas Nuclear One
1448 SR 333 GSB-2E
Russellville, Arkansas 72802

Mr. Frederick W. Polaski
Manager, License Renewal
Exelon Corporation
200 Exelon Way
Kennet Square, PA 19348

Mr. Paul Gunter
Director, Reactor Watchdog Project
Nuclear Information & Resource Service
1424 16th Street, NW, Suite 404
Washington, DC 20036

Ms. Jennifer Peterson
Public Citizen
Critical Mass Energy Project
211 Pennsylvania Avenue, SE
Washington, DC 20003

SAMPLE DRAFT SAFETY EVALUATION REPORT
PLANT X LICENSE RENEWAL APPLICATION

3.4 Aging Management of Steam and Power Conversion System

3.4.1 Introduction

By letter dated May 24, 2001, the Nuclear Energy Institute (NEI) submitted Section 3.4, "Aging Management of Steam and Power Conversion System." The staff's review of this sample license renewal application (LRA) section was conducted as part of the NEI demonstration project. The demonstration project is intended to provide examples of how an applicant would reference the Generic Aging Lessons Learned (GALL) report to prepare an LRA and how the staff would use the Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants (SRP-LR) to review it. This Plant X submittal was intended to demonstrate the use of the GALL report with an LRA that was prepared using the format delineated in the SRP-LR. As agreed with NEI, the staff did not review Section 2, "Scoping and Screening Methodology for Identifying Structures and Components Subject to Aging Management Review, and Implementation Results," of the LRA because it related to scoping, which was not the focus of this effort. Section 3, "Aging Management Review Results," of the LRA contained a sample of aging management programs that allowed the staff to exercise the review process. Therefore, the staff's conclusions are limited to the sample programs submitted. In addition, because the demonstration project is intended to be illustrative, the staff's conclusions may not be applicable to a plant-specific LRA. The demonstration project is based on the August 2000 version of the GALL report. Thus, the staff reviewed this section in accordance with Nuclear Regulatory Commission (NRC) regulations and the guidance provided in the SRP-LR and the GALL report, dated August 2000. Future applicants are expected to reference the versions available at the time of application.

3.4.2 Summary of Technical Information in the Application

The applicant for Plant X, a pressurized-water reactor (PWR), described its aging management review of the steam and power conversion system in Section 3.4 of the LRA. The Plant X steam and power conversion system includes the main steam and extraction steam systems, the main and auxiliary feedwater system, condensate system, steam generator blowdown system, and associated components.

Passive components of the steam and power conversion system, such as tanks, pumps, heat exchangers, and piping, are exposed to internal environments of treated water, lubricating oil, and air/gas; and external outdoor environment, building air (inside and outside containment), underground, and potential borated water leaks. Tables 3.4.1 and 3.4.2 of the LRA provide a summary of the components and commodity groups, their intended functions, the materials, environments, aging effects, and aging management programs for the steam and power conversion system.

3.4.3 Staff Evaluation

In Section 3.4 of the LRA, the applicant submitted an aging management review of the steam and power conversion system at Plant X. The LRA referenced the GALL report in its aging management review. The staff has previously evaluated the adequacy of aging management

of structures and components for license renewal as documented in the GALL report. Thus, the staff did not repeat its review of the matters described in the GALL report, except to ensure that the material presented in the LRA was applicable, and to verify that the applicant had identified the appropriate programs as described and evaluated in the GALL report. The staff also reviewed aging management information submitted by the applicant that was different from that in the GALL report or was not addressed in the GALL report.

The staff reviewed Section 3.4 of the LRA in accordance with the guidance provided in Section 3.4 of the SRP-LR for a PWR to determine whether the applicant had submitted adequate information to meet the requirements of 10 CFR Part 54 for managing the effects of aging on the steam and power conversion system for license renewal. Table 3.4-1 of the SRP-LR provides a summary of components, aging effects/mechanisms, and aging management programs for the steam and power conversion system listed in Chapter VIII of the GALL report. The staff compared the information provided in the LRA to Table 3.4-1 of the SRP-LR. Table 3.4-1 of this SER provides a summary of the staff's evaluation of components, aging effects/mechanisms, and aging management programs listed in Section 3.4 of the LRA that are addressed by SRP-LR Table 3.4-1. The staff evaluation for components or aging effects identified by the applicant that are not addressed in the GALL report are evaluated by the staff in Section 3.4.3.3.2 of this SER.

The first three columns of Table 3.4-1 of this SER are copied from the SRP-LR Table 3.4-1. These three columns list the component, aging effect/mechanism, and aging management programs that are evaluated in the GALL report. The aging management program provided by the applicant in the LRA is listed in the fourth column titled, "Aging Management Program in LRA." The staff's evaluation of the component, aging effect, and aging management program is summarized in the fifth column titled, "Staff Evaluation." If the applicant's components, aging effects, and aging management programs are consistent with the GALL report, the staff identified this in the staff evaluation column as "Consistent with GALL." As such, no further staff evaluation is necessary as discussed in Section 3.4.3.1 of this SER. In addition, the GALL report recommends further evaluation for those programs that should be augmented, are plant specific, or involve a time-limited aging analysis (TLAA) evaluation. For programs in the LRA that should be further evaluated, "GALL recommends further evaluation" is documented in the staff evaluation column and discussed further in Section 3.4.3.2 of this SER. The applicant's aging management programs or evaluations that are different from the GALL report are identified as "Program Different from GALL" in the staff evaluation column and discussed further in Section 3.4.3.3.1 of this SER.

Table 3.4.1
Staff Evaluation Table for Steam and Power Conversion System

Component	Aging Effect/ Mechanism	Aging Management Program in GALL Report	Aging Management Program in LRA	Staff Evaluation
Piping and fittings in main feedwater line and steam line	Cumulative fatigue damage	TLAA	Fatigue monitoring program	GALL recommends further evaluation. (See Section 3.4.3.2.1 below)
Carbon steel piping, valve bodies, pump casings and tanks. (Except main steam system)	Loss of material from general, crevice, and pitting corrosion	Water chemistry	Water chemistry and; one-time inspection or periodic surveillance and preventive maintenance inspection program	GALL recommends further evaluation. (See Section 3.4.3.2.2 below)
Oil coolers and AFW piping	Loss of material from general and microbiologically influenced corrosion, and buildup of deposit due from biofouling	Plant-specific	Periodic surveillance and preventive maintenance program	GALL recommends further evaluation. (See Section 3.4.3.2.3 below)
Carbon steel piping, valve bodies, and pump casings	Wall thinning from flow accelerated corrosion	Flow accelerated corrosion program	Flow accelerated corrosion program	Consistent with GALL. (See Section 3.4.3.1 below)
Carbon steel piping and valve bodies in main steam system	Loss of material from crevice and pitting corrosion	Water chemistry	Water chemistry	Consistent with GALL. (See Section 3.4.3.1 below)

Closure bolting in high-pressure or high-temperature systems	Loss of material from atmospheric corrosion, loss of preload from stress relaxation, and crack initiation and growth from cyclic loading, stress corrosion cracking	Bolting integrity	Bolting integrity	Consistent with GALL. (See Section 3.4.3.1 below)
Heat exchangers and coolers/ condensers serviced by open-cycle cooling water	Loss of material from general and microbiologically influenced corrosion, and buildup of deposit from biofouling	Open-cycle cooling water system	Not applicable	Plant X components do not interface with an open-water cooling water system. (See Section 3.4.3.2.3 below)
Heat exchangers and coolers/ condensers serviced by closed-cycle cooling water	Loss of material from general corrosion	Closed-cycle cooling water system	Water chemistry and one-time inspection	Consistent with GALL, but the applicant has different program names. (See Section 3.4.3.1 below)
External surface of above-ground condensate storage tank	Loss of material from general corrosion	Outer surface of above ground carbon steel tanks	General corrosion of external surfaces program	Program different from GALL. (See Section 3.4.3.3.1.1 below)
External surface of buried condensate storage tank and AFW piping	Loss of material from general, galvanic, & microbiologically influenced corrosion	Outer surface of buried piping and components	One-time inspection or periodic surveillance and preventive maintenance inspection program	Program different from GALL. (See Section 3.4.3.3.2.2.3 below)

External surface of carbon steel components	Loss of material from boric acid corrosion	Boric acid corrosion	Boric acid corrosion	Consistent with GALL. (See Section 3.4.3.1 below)
External surface of carbon steel components	Loss of material from atmospheric corrosion	Protective coating monitoring and maintenance	General corrosion of external surfaces program	Program different from GALL. (See Section 3.4.3.3.1.1 below)

3.4.3.1 Aging Management Programs Evaluated in the GALL Report that Are Relied on for License Renewal

In accordance with the guidance contained in SRP-LR Section 3.4, the staff has reviewed the LRA and determined that the applicant has submitted the information necessary to adopt the finding of program acceptability as described and evaluated in the GALL report. The applicant has identified those aging effects for the steam and power conversion system components that are contained in the GALL report as applicable to its plant. The applicant has identified the programs in the GALL report for the aging management of the components in the steam and power conversion system. The staff has verified that the applicant has identified the appropriate programs as described and evaluated in the GALL report. Thus, it is acceptable for the applicant to reference the information in the GALL report and no further staff evaluation is necessary. The applicant's components, aging effects, and aging management programs that are consistent with the GALL report are identified in the above table under the staff evaluation column as consistent with GALL.

3.4.3.2 Further Evaluation of Aging Management as Recommended by the GALL Report

3.4.3.2.1 Cumulative Fatigue Damage

Fatigue is a TLAA as defined in 10 CFR 54.3. The LRA indicates that fatigue was not identified as a TLAA for Plant X. However, the LRA indicates that fatigue would be managed by the fatigue monitoring program. This program was not included as part of this demonstration project; therefore, this program is outside of the scope of the staff review.

3.4.3.2.2 Loss of Material Due to General, Crevice and Pitting Corrosion

The GALL report indicates that a one-time inspection is an acceptable method of verifying the effectiveness of the chemistry program for managing loss of material due to general, crevice and pitting corrosion. The LRA indicates that these inspections are either being conducted in accordance with the periodic surveillance and preventive maintenance inspection program or will be conducted in accordance with the one-time inspection program prior to expiration of the current license. These programs were not included as part of this demonstration project; therefore, these programs are outside of the scope of the staff review.

3.4.3.2.3 Loss of Material Due to General Corrosion, Microbiologically Influenced Corrosion, and Biofouling

Loss of material due to biofouling and microbiologically-influenced corrosion (MIC) in carbon steel piping and fittings is not applicable for this LRA because the environment for auxiliary feedwater piping is treated water. Corrosion is an aging effect that requires aging management for components within the bearing oil coolers. The LRA indicates the periodic surveillance and preventive maintenance program ensures water is not present in lubricating oil and the oil is changed on a refueling frequency. This program was not included as part of this demonstration project; therefore, this program is outside of the scope of the staff review.

3.4.3.2.4 Quality Assurance for Aging Management of Non-Safety-Related Components

This information was not included as part of this demonstration project; therefore, this information is outside of the scope of the staff review.

3.4.3.3 Aging Management Programs or Evaluations that Are Different from or Not addressed in the GALL Report

3.4.3.3.1 Aging Management Programs or Evaluations that Are Different from those Described in the GALL Report

3.4.3.3.1.1 General Corrosion of External Surfaces for License Renewal Program

The applicant submitted the general corrosion of external surfaces for license renewal program to manage corrosion of external carbon steel surfaces. The program to manage buried piping in inaccessible areas is discussed in Section 3.4.3.3.2.2.3. The staff's evaluation of this program, which follows, is on the basis of the 10-element program as described in branch technical position RLSB-1 of the SRP-LR.

[Scope] The general corrosion of external surfaces for license renewal program consists of activities that manage the aging effects of loss of material for selected systems and non-structural components within the scope of license renewal. The program provides for visual inspection of accessible external surfaces of certain carbon and low-alloy steel components, including piping, valves, supports, tanks, and bolting. The staff finds this acceptable because it is consistent with the SRP-LR.

[Preventive Actions] External surfaces of most carbons steel and cast iron components are coated to minimize corrosion. Although coatings minimize corrosion by limiting exposure to the environment, they are not credited in the determination of the aging effects that require management. The staff finds this acceptable because it is consistent with the SRP-LR.

[Parameters Monitored or Inspected] Surface conditions of components are monitored through visual inspection to detect signs of external corrosion and to detect conditions that can result in external corrosion, such as fluid leakage. The staff finds this acceptable because it is consistent with the SRP-LR.

[Detection of Aging Effects] The aging effect of concern is loss of material which is detected by visual inspection of external surfaces for evidence of leaking fluids, significant coating damage, or significant corrosion. Operator rounds occur several times daily and provide discovery and correction of significant corrosion and of conditions that cause it for components in accessible areas. Periodic system engineer walkdowns augment the operator rounds and provide an independent assessment. Refueling interval inspections provide for discovery of corrosion and of conditions that can cause it for components inside containment. Inspection for evidence of leaking fluids also provides indirect monitoring of certain components that are not routinely accessible. The staff finds this acceptable because it is consistent with the SRP-LR.

[Monitoring and Trending] Various plant personnel including operators and system engineers perform periodic material condition inspections outside containment. These visual inspections are performed in accordance with approved Plant X procedures. Evidence of fluid leaks, significant coating damage, or significant corrosion is documented. Visual inspections are performed at intervals based on previous inspections and industry experience. Operator rounds occur several times daily and system engineer walkdowns occur at least quarterly. Visual inspections inside containment are conducted each refueling outage by a team that includes knowledgeable subject matter experts from design engineering and quality control. The in-containment visual inspections for corrosion are part of the containment coatings inspections established in response to Regulatory Guide 1.54, “Quality Assurance Requirements for Protective Coatings Applied to Water-Cooled Nuclear Power Plants,” dated July 1973, and reviewed by NRC under Generic Letter 98-04. The staff finds this acceptable because it is consistent with the SRP-LR.

[Acceptance Criteria] Plant X procedures provide criteria for determining the acceptability of as-found conditions and for initiating the appropriate corrective action. The acceptance criteria and guidance are related to avoiding unacceptable degradation of the component intended functions, and include existence of leakage, presence of corrosion products, coating defects, and the presence of boric acid crystals. Appropriate provisions of NRC and industry guidance are incorporated. The staff finds this acceptable because it is consistent with the SRP-LR.

[Confirmation Process] Unacceptable visual inspection results are evaluated and addressed in the site corrective action process. The quality assurance program was not included as part of this demonstration project; therefore, the quality assurance program is outside of the scope of the staff review.

[Corrective Action] The corrective action process provides measures to verify completion and effectiveness of corrective action. The quality assurance program was not included as part of this demonstration project; therefore, the quality assurance program is outside of the scope of the staff review.

[Administrative Controls] The procedures governing visual inspections for external corrosion are included in the population of site procedures that are subject to systematic control of changes. The quality assurance program was not included as part of this demonstration project; therefore, the quality assurance program is outside of the scope of the staff review.

[Operating Experience] Several visual inspections such as operator rounds and system engineering walkdowns, are relied upon to detect corrosion of accessible carbon and low-alloy

steel and cast iron external surfaces and the precursors thereof. The activities credited for license renewal were selected on the basis of their effectiveness as indicated by a review of site corrective action documents. The visual inspections are elements of established programs that have been ongoing for years. They have been enhanced over the years on the basis of site and industry experience and are relied on to support implementation of Regulatory Guide 1.54 for coatings inside containment and the Maintenance Rule (10 CFR 50.65). Review of Plant X records indicates they are effective in detecting loss of material due to corrosion and its precursors for accessible external surfaces. These findings are consistent with the findings of recent internal and external assessments of these activities, such as audits and NRC inspections. The staff finds this acceptable because it is consistent with the SRP-LR.

On the basis of this 10-element program evaluation set forth above, the staff finds the continued implementation of the existing visual inspections for signs of external corrosion and for conditions that can cause it provide reasonable assurance that loss of material due to corrosion of external surfaces will be managed such that systems and components within the scope of license renewal will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation and is acceptable.

3.4.3.3.2 Components or Aging Effects that Are Not Addressed in the GALL Report

The LRA has identified components that contain materials and environments that are different than those specified in GALL. The components and the associated aging effects and program to manage the aging effects are contained in Table 3.4.2 of the LRA.

3.4.3.3.2.1 Aging Effects

3.4.3.3.2.1.1 Aluminum and Copper Alloy Components

The applicant identified loss of material as an aging effect requiring management for aluminum and copper alloy components exposed to lubricating oil possibly contaminated with water. The staff finds the applicant has identified the appropriate aging effect based on operating experience.

The applicant indicated that heat exchanger components made of copper alloy exposed to treated water may experience loss of material because of wear and selective leaching if zinc content of the material is greater than 15%. The staff finds that the applicant has identified the appropriate aging effect based on operating experience.

3.4.3.3.2.1.2 Stainless Steel Components

The applicant indicated that stainless steel components exposed to treated water could be susceptible to loss of material due to pitting corrosion and to cracking if the water chemistry is not maintained. Stainless steel components exposed to lubricating oil possibly contaminated with water are also susceptible to loss of material due to pitting and crevice corrosion and to cracking. Stainless steel components may also be susceptible to loss of material due to galvanic corrosion if these components are in contact with a more cathodic material such as brass/bronze. The staff finds the applicant has identified the appropriate aging effects based on operating experience.

3.4.3.3.2.2 Aging Management Programs

3.4.3.3.2.2.1 Loss of Material of Aluminum and Copper Alloy Components

The applicant indicated that loss of material could occur in aluminum and copper alloy components exposed to lubricating oil possibly contaminated with water in the steam and power conversion system. This would be managed by the periodic surveillance and preventive maintenance program which ensures water is not present in lubricating oil and that the oil is changed on a refueling frequency. This program was not included as part of this demonstration project; therefore, this program is outside of the scope of the staff review.

The applicant indicated that heat exchanger components made of copper alloy exposed to treated water may experience loss of material because of wear and selective leaching if zinc content of the material is greater than 15%. Since the zinc content of the material is not known, the applicant has proposed to conduct a one-time inspection of these components to confirm the absence of this aging effect prior to expiration of the current license. The one-time inspection was not included as part of the demonstration project; therefore, the program is outside the scope of the staff review.

3.4.3.3.2.2.2 Loss of Material and Cracking of Stainless Steel Components

Stainless steel components exposed to treated water are not susceptible to pitting corrosion if halogens are less than 150 ppb and sulfates are less than 100 ppb. These components are not susceptible to crevice corrosion if the dissolved oxygen level is less than 100 ppb. In Section 3.4.2.5, “Stainless Steel in Treated Water and Saturated Steam,” of the LRA, the applicant stated that these chemistry limits for treated water will be adhered to so that pitting and crevice corrosion are not plausible. For saturated steam and treated water (temperature greater than 93°C) environments, the applicant proposed to employ water chemistry and closed-cycle cooling water programs to maintain these chemistry limits. The staff finds the programs to manage loss of material acceptable because they are consistent with those in the SRP-LR for other stainless steel components such as heat exchangers and coolers/condensers serviced by closed-cycle cooling water. For the environment of cooler treated water, temperature less than 90°C (194°F), the applicant proposed an additional one-time inspection to inspect the stagnant flow locations. The one-time inspection program was not included as part of this demonstration project; therefore, the one-time inspection program is outside of the scope of the staff review.

For stainless steel components exposed to lubricating oil, loss of material due to pitting and crevice corrosion and cracking could occur due to possible contamination with water. Also loss of material due to galvanic corrosion could occur if these components are in contact with a more cathodic material such as brass/bronze. The applicant proposed the periodic surveillance and preventive maintenance program for periodic lube oil sampling to ensure that water is not present in the oil and that the oil is changed on a refueling frequency. This program was not included as part of this demonstration project; therefore, this program is outside of the scope of the staff review.

Stainless steel components exposed to treated water and saturated steam are not susceptible to crack initiation and growth if halogens are less than 150 ppb and sulfates are less than 100 ppb. In Section 3.4.2.5 of the LRA, the applicant proposed water chemistry program to ensure

that these chemistry limits for treated water will be adhered to mitigate cracking. The program to manage loss of material was not included as part of this demonstration project; therefore, the program is outside of the scope of the staff review.

3.4.3.3.2.2.3 Loss of Material From General, Galvanic, and Microbiologically Influenced Corrosion

The applicant indicated that the external surfaces of the buried condensate storage tank and AFW piping components are subject to loss of material from general, galvanic, and microbiologically influenced corrosion. The loss of material would be managed by the periodic surveillance and preventive maintenance program or a one-time inspection program. Neither of these programs were included as part of this demonstration project; therefore, these programs are outside of the scope of the staff review.

3.4.3.5 Final Safety Analysis Report (FSAR) Supplement

The staff reviewed the proposed FSAR supplement for the flow accelerated corrosion program and the general corrosion of the external surfaces for license renewal program to manage the aging effects associated with the steam and power conversion system and found the description of the programs to be consistent with the SRP-LR. The FSAR supplement for the other aging management programs relied on for the steam and power conversion system was not included as part of this demonstration project; therefore, the FSAR supplement for the other aging management programs is outside of the scope of the staff review.

3.4.4 Conclusions

The staff has reviewed the information in Section 3.4 of the LRA. The staff concludes that the applicant has demonstrated that the aging effects associated with the identified steam and power conversion system components will be adequately managed so that there is reasonable assurance that these components will perform their intended functions in accordance with the current licensing basis during the period of extended operation. The staff also concludes that the FSAR supplement for Plant X provides an acceptable description of the programs and activities for managing the effects of aging of the steam and power conversion system components for the period of extended operation. These conclusions are based on the fact that certain items identified in the above evaluation were outside the scope of the staff's review and therefore were not required to be provided for the purposes of the review.

3.5 Aging Management of Containment, Structures, and Components Supports

3.5.1 Introduction

By letter dated May 24, 2001, the Nuclear Energy Institute (NEI) submitted Section 3.5, "Aging Management of Containment, Structures and Component Supports." The staff's review of this sample license renewal application (LRA) section was conducted as part of the NEI demonstration project. The demonstration project is intended to provide examples of how an applicant would reference the Generic Aging Lessons Learned (GALL) report to prepare an LRA and how the staff would use the Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants (SRP-LR) to review it. This Plant X submittal was intended to demonstrate the use of the GALL report with the LRA that was prepared using the format delineated in the SRP-LR. As agreed with NEI, the staff did not review Section 2, "Scoping and Screening Methodology for Identifying Structures and Components Subject to Aging Management Review, and Implementation Results," of the LRA because it related to scoping, which was not the focus of this effort. Section 3, "Aging Management Review Results," of the LRA contained a sample of aging management programs that allowed the staff to exercise the review process. Therefore, the staff's conclusions are limited to the sample programs submitted. In addition, because the demonstration project is intended to be illustrative, the staff's conclusions may not be applicable to a plant-specific LRA. The demonstration project is based on the August 2000 version of the GALL report. Thus, the staff reviewed this section in accordance with Nuclear Regulatory Commission (NRC) regulations and the guidance provided in the SRP-LR and the GALL report, dated August 2000. Future applicants are expected to reference the versions available at the time of application.

3.5.2 Summary of Technical Information in the LRA

The applicant for Plant X, a pressurized-water reactor (PWR), described its aging management review of the containment, structures, and component supports in Section 3.5 of the LRA. The structural elements included for its aging management review are the containment structures, containment internal structures, Class 1 structures, and component supports. The Class 1 structures at Plant X consist of the auxiliary building, turbine building, and intake structure. The applicant identified the aging effects requiring management for concrete and steel structural components, such as loss of material and cracking, and the associated aging management programs, such as containment inservice inspection and structure monitoring programs.

3.5.3 Staff Evaluation

In Section 3.5 of the LRA, the applicant submitted an aging management review of the containment, structures, and component supports at Plant X. The applicant referenced the GALL report in its aging management review. The staff has previously evaluated the adequacy of aging management of structures and components for license renewal as documented in the GALL report. Thus, the staff did not repeat its review of the matters described in the GALL report, except to ensure that the material presented in the LRA was applicable, and to verify that the applicant has identified the appropriate programs as described and evaluated in the GALL report. The staff evaluated those aging management programs recommended for further evaluation in the GALL report. The staff also reviewed aging management information

submitted by the applicant that was different from that in the GALL report or was not addressed in the GALL report.

The staff reviewed Section 3.5 of the LRA in accordance with the guidance provided in Section 3.5 of the SRP-LR for a PWR to determine whether the applicant had submitted adequate information to meet the requirements of 10 CFR Part 54 for managing the effects of aging on the containment, structures, and component supports for license renewal. Table 3.5-1 of the SRP-LR provides a summary of components, aging effects/mechanisms, and aging management programs for containment, structures, and component supports listed in Chapters II and III of the GALL report. The staff compared the information provided in the LRA to Table 3.5-1 of the SRP-LR. Table 3.5-1 of this SER provides a summary of the staff's evaluation of components, aging effects/mechanisms, and aging management programs listed in Section 3.5 of the LRA that are addressed by the SRP-LR Table 3.5-1. The staff evaluation for components or aging effects identified by the applicant that are not addressed in the GALL report are evaluated by the staff in Section 3.5.3.3.2 of this SER.

The first three columns of Table 3.5-1 of this SER are copied from the SRP-LR Table 3.5-1. These three columns list the component, aging effect/mechanism, and aging management programs that are evaluated in the GALL report. The aging management program provided by the applicant in the LRA is listed in the fourth column titled, "Aging Management Program in LRA." The staff's evaluation of the component, aging effect and aging management program is summarized in the fifth column titled, "Staff Evaluation." If the applicant's components, aging effects, and aging management programs are consistent with the GALL report, the staff identified this in the staff evaluation column as "Consistent with GALL." As such, no further staff evaluation is necessary as discussed in Section 3.5.3.1 of this SER. In addition, the GALL report recommends further evaluation for those programs that should be augmented, are plant specific, or involve a time-limited aging analysis (TLAA) evaluation. For programs in the LRA that should be further evaluated, "GALL recommends further evaluation" is documented in the staff evaluation column and discussed further in Section 3.5.3.2 of this SER. The applicant's aging management programs or evaluations that are different from the GALL report are identified as "Program Different from GALL" in the staff evaluation column and discussed further in Section 3.5.3.3.1 of this SER.

Table 3.5.1
Staff Evaluation Table for Containment, Structures, and Components Structures

Component	Aging Effect/ Mechanism	Aging Management Program in GALL Report	Aging Management Program in LRA	Staff Evaluation
Common Components				
Penetration sleeves, penetration bellows, and dissimilar metal welds	Cumulative fatigue damage	TLAA	Not included as part of this demonstration project	Outside of the scope of the staff review. (See Section 3.5.3.2.1.6 below)
Penetration sleeves, bellows, and dissimilar metal welds	Cracking from cyclic loading & crack initiation and growth from stress corrosion cracking	Containment inservice inspection and containment leak rate test	Not applicable	GALL recommends further evaluation. (See Section 3.5.3.2.1.7 below)
Penetration sleeves, penetration bellows, and dissimilar metal welds	Loss of material from corrosion	Containment inservice inspection and containment leak rate test	Containment inservice inspection and containment leak rate test	Consistent with GALL. (See Section 3.5.3.1 below)
Personnel airlock and equipment hatch	Loss of material from corrosion	Containment inservice inspection	Containment inservice inspection	Consistent with GALL. (See Section 3.5.3.1 below)
Personnel airlock and equipment hatch	Fretting/lockup due to wear of locks, hinges, and closure mechanisms	Containment inservice inspection and containment leak rate test	Containment inservice inspection and containment leak rate test	Consistent with GALL. (See Section 3.5.3.1 below)

Seals, gaskets, and moisture barriers	Loss of sealant and leakage through containment from deterioration of joint seals, gaskets, and moisture barriers	Containment inservice inspection and containment leak rate test	Containment inservice inspection and containment leak rate test	Consistent with GALL. (See Section 3.5.3.1 below)
PWR Concrete Containment				
Concrete elements: Basemat, exterior walls below grade	Aging of inaccessible concrete areas due to leaching of calcium hydroxide, aggressive chemical attack, and corrosion of embedded steel	Containment inservice inspection	No program needed	GALL recommends further evaluation. (See Section 3.5.3.2.1.1 below)
Concrete elements: Basemat	Cracks, distortion, and increases in components stress level from settlement	Containment structure settlement monitoring	No program needed	Applicant indicates that settlement is not plausible aging mechanism. (See Section 3.5.3.2.1.2 below)
Concrete elements: Foundation	Reduction in foundation strength from erosion of porous concrete subfoundation	Containment structure settlement monitoring	No program needed	Plant X does not have porous concrete subfoundation. (See Section 3.5.3.2.1.2 below)
Concrete elements: Basemat, dome, and wall	Loss of strength and modulus from elevated temperature	Plant-specific	No program needed	GALL recommends further evaluation. (See Section 3.5.3.2.1.3 below)

Prestressed containment: Tendons and anchorage components	Loss of prestress from relaxation, shrinkage, creep, and elevated temperature	TLAA	Not included as part of this demonstration project	Outside of the scope of the staff review. (See Section 3.5.3.2.1.5 below)
Steel elements: Liner plates and steel structures	Aging of inaccessible steel areas: loss of material from corrosion	Containment inservice inspection and containment leak rate test	No program needed	GALL recommends further evaluation. (See Section 3.5.3.2.1.4 below)
Steel elements: Protected by coating	Loss of material from corrosion	Protective coating monitoring and maintenance	Not Applicable	Applicant evaluates steel elements as if they are not coated in Plant X and the staff agrees that this is conservative.
Prestressed containment: Tendons and anchorage components	Loss of material from corrosion of prestressing tendons anchorage components	Containment inservice inspection	Containment inservice inspection	Consistent with GALL. (See Section 3.5.3.1 below)
Concrete elements: Basemat, dome, and wall	Scaling, cracking, and spalling from freeze-thaw; expansion and cracking from reaction with aggregate	Containment inservice inspection	No program needed	Different from GALL. (See Section 3.5.3.3.1.1 below)

Class I Structures				
All Groups except Group 6: Accessible interior/exterior concrete & steel components	All types of aging effects	Structures monitoring	Structures monitoring (steel components) No program needed (concrete components)	Consistent with GALL. (See Section 3.5.3.1 below) Different from GALL. (See Section 3.5.3.3.1.2 below)
All Groups except group 6: Inaccessible concrete & steel components such as exterior walls below grade and foundation	Aging of inaccessible concrete and steel areas due to corrosion, leaching of calcium hydroxides, aggressive chemical attack, and corrosion of embedded steel	Plant-specific	No program needed	GALL recommends further evaluation. (See Section 3.5.3.2.2.2 below)
Group 5: Liners	Crack initiation and growth from stress corrosion cracking and loss of material from crevice corrosion	Monitoring of leak in fuel storage facility	Monitoring of leak in fuel storage facility	Consistent with GALL. (See Section 3.5.3.1 below)
Group 6: All accessible/ inaccessible concrete & steel components	All types of aging effects including loss of material from abrasion, cavitation, and corrosion	Inspection of water-controlled structures	Inspection of water-controlled structures (steel components) No program needed (concrete components)	Consistent with GALL. (See Section 3.5.3.1 below) Different from GALL. (See Section 3.5.3.3.1.2 below)

Groups 1-3, 5-6: All masonry block walls	Cracking from restraint, shrinkage, creep, and aggressive environment	Masonry wall	Masonry wall	Consistent with GALL. (See Section 3.5.3.1 below)
Component Supports				
All Groups: Support members, anchor bolts, and welds, concrete surrounding anchor bolts, grout pad, bolted friction connections etc.	Aging of component supports	Structures monitoring	Structures monitoring	Consistent with GALL. (See Section 3.5.3.1 below)
Groups B1.1, B1.2, and B1.3: Support members, anchor bolts, and welds	Cumulative fatigue damage	TLAA	Not included as part of this demonstration project	Outside of the scope of the staff review. (See Section 3.5.3.2.3.2 below)
All Groups: Support members, anchor bolts, and welds	Loss of material from boric acid corrosion	Boric acid corrosion	Boric acid corrosion	Consistent with GALL. (See Section 3.5.3.1 below)
Groups B1.1, B1.2, and B1.3: Support members, anchor bolts, welds, spring hangers, guides, stops, guides, stops, and vibration isolators	Loss of material from environmental corrosion; loss of mechanical function from corrosion, distortion, dirt, overload; cracking initiation and growth from stress corrosion cracking	Inservice inspection	Inservice inspection	Consistent with GALL. (See Section 3.5.3.1 below)

Group B1.1: High strength low-alloy bolts	Crack initiation and growth from stress corrosion cracking	Bolting integrity	Bolting integrity	Consistent with GALL. (See Section 3.5.3.1 below)

3.5.3.1 Aging Management Programs Evaluated in the GALL Report that Are Relied on for License Renewal

In accordance with the guidance contained in SRP-LR Section 3.5, the staff has reviewed the LRA and determined that the applicant has submitted the information necessary to adopt the finding of program acceptability as described and evaluated in the GALL report. The applicant has identified those aging effects for the containment, structures, and component supports that are contained in the GALL report as applicable to its plant. The applicant has identified the programs in the GALL report for the aging management of the components in the containment, structures, and component supports. The staff has verified that the applicant has identified the appropriate programs as described and evaluated in the GALL report. Thus, it is acceptable for the applicant to reference the information in the GALL report and no further staff evaluation is necessary. The applicant's components, aging effects, and aging management programs that are consistent with the GALL report are identified in the above table under the staff evaluation column as consistent with GALL.

3.5.3.2 Further Evaluation of Aging Management as Recommended by the GALL Report

3.5.3.2.1 PWR Containments

3.5.3.2.1.1 Aging of Inaccessible Concrete Areas

The applicant stated that the reinforced concrete at Plant X is not exposed to flowing water and corrosion of embedded steel and aggressive chemical attack on reinforced concrete are not significant as the concrete is not exposed to an aggressive environment (i.e., within the pH, chlorides, and sulfate limits specified in the GALL report). Since the staff has determined that the reinforced concrete is not exposed to flowing water or an aggressive environment, the staff concurs with the applicant that aging management of inaccessible concrete areas is not required.

3.5.3.2.1.2 Cracking, Distortion, and Increase in Component Stress Level Due to Settlement and Reduction of Foundation Strength Due to Erosion of Porous Concrete Subfoundations

The applicant indicated that Plant X is supported on end-bearing piles driven to bedrock and do not have a porous foundation, thus, this potential aging effect as stated in the SRP-LR is not applicable. The staff agrees with this conclusion and finds it acceptable.

3.5.3.2.1.3 Loss of Strength and Modulus of Concrete Structures Due to Elevated Temperature

The applicant indicated that any portions of the concrete containment components will not exceed specified temperature limits specified in SRP-LR. Therefore, aging management is not required. The staff finds this conclusion acceptable because it is consistent with the SRP-LR.

3.5.3.2.1.4 Loss of Material Due to Corrosion in Inaccessible Areas of Liner Plate and Steel Structures

The applicant indicated that the seal between the containment floor and the containment steel liner is inspected as part of the containment inservice inspection program. If this seal were determined to be damaged then an appropriate portion of the liner would be accessed and inspected. In a letter dated June 27, 2001, the staff asked the applicant to describe its approach to manage loss of material of the liner plate if there are cracks in the concrete floor and to explain the technical basis for concluding that if damage or degradation of this seal is not visible, then degradation of the containment liner has not occurred (RAI 3.5-3). By letter dated July 11, 2001, the applicant responded that there are no aging effects requiring management, including cracking, for concrete structures. The staff disagrees with this response because operating experience indicates that concrete may degrade. This is an open item (3.5.3-1).

3.5.3.2.1.5 Loss of Prestress Due to Relaxation, Shrinkage, Creep, and Elevated Temperature

This information was not included as part of this demonstration project; therefore, this information is outside of the scope of the staff review.

3.5.3.2.1.6 Cumulative Fatigue Damage

This information was not included as part of this demonstration project; therefore, this information is outside of the scope of the staff review.

3.5.3.2.1.7 Cracking due to Cyclic Loading and Stress Corrosion Cracking

The applicant indicated that Plant X does not use stainless steel and dissimilar metal welds bellows at Plant X and potential cracking as stated in the SRP-LR is not applicable. The staff agrees that this is not applicable because Plant X does not have these materials.

3.5.3.2.2 Class I Structures

3.5.3.2.2.1 Aging of Structures Not Covered by Structures Monitoring Program

The applicant indicated that Class 1 structures are covered by their structures monitoring program at Plant X and thus, requires no further evaluation as stated in the SRP-LR. The staff finds this acceptable because it is consistent with the SRP-LR.

3.5.3.2.2.2 Aging Management of Inaccessible Areas

In a letter dated June 27, 2001, the staff asked the applicant to describe aging management of inaccessible areas of Class 1 structures (RAI 3.5-4). By letter dated July 11, 2001, the applicant responded that they determined there are no aging effects requiring management for the Class 1 concrete structures at Plant X and therefore, no reference is made to inaccessible areas for aging management of concrete. The applicant also determined that Class 1 steel components and structures are accessible, thus requiring no program for inaccessible areas. The staff disagrees with this response because operating experience indicates that concrete

may degrade. In addition, the staff does not have sufficient information to determine if all Class 1 structures at Plant X are accessible. This is an open item (3.5.3-2).

3.5.3.2.3 Component Supports

3.5.3.2.3.1 Aging of Supports Not Covered by Structures Monitoring Program

The applicant indicated that component supports are covered by their structures monitoring program at Plant X and thus, require no further evaluation as stated in the SRP-LR.

3.5.3.2.3.2 Cumulative Fatigue Damage

This information was not included as part of this demonstration project; therefore, this information is outside of the scope of the staff review.

3.5.3.2.4 Quality Assurance for Aging Management of Non-Safety-Related Components

This information was not included as part of this demonstration project; therefore, this information is outside of the scope of the staff review.

3.5.3.3 Aging Management Programs or Evaluations that Are Different from or Not Addressed in the GALL Report

3.5.3.3.1 Aging Management Programs or Evaluations that Are Different from those Described in the GALL Report

3.5.3.3.1.1 Scaling, Cracking, and Spalling from Freeze-thaw; Expansion and Cracking from Reaction with Aggregate

The applicant indicated that freeze-thaw does not cause loss of material from reinforced concrete in foundations and those aggregates at Plant X have been tested in accordance with American Society of Testing and Materials (ASTM) C295 or C227 and found not to react within reinforced concrete. Therefore, the applicant concluded that no aging management is required. The staff disagrees with this response because operating experience indicates that concrete may degrade. This is an open item (3.5.3-3).

3.5.3.3.1.2 No Aging Effects Requiring Management for the Class 1 Concrete Structures

In a letter dated June 27, 2001, the staff asked the applicant to describe aging management of Class 1 structures (RAI 3.5-4). By letter dated July 11, 2001, the applicant responded that they determined there are no aging effects requiring management for the Class 1 concrete structures at Plant X. The staff disagrees with this response because operating experience indicates that concrete may degrade. This is an open item (3.5.3-4).

3.5.3.3.1.3 Liners in the Containment

The applicant identified crack initiation and growth due to stress corrosion cracking and loss of material from crevice corrosion for liners in the containment. The applicant proposed

monitoring of the leak in fuel storage facility as the aging management program. The staff finds this consistent with the SRP-LR regarding liners in Class 1 structures and is acceptable.

3.5.3.3.2 Components or Aging Effects that are Not Addressed in the GALL Report

Table 3.5.2 of the LRA contained structures and component supports aging management review results for internal and external environments that are not included in the GALL report.

3.5.3.3.2.1 Aging Effects

3.5.3.3.2.1.1 Structural Stainless Steel in Plant Indoor Air/Borated Water

The applicant identified loss of material due to: (1) crevice corrosion resulted from the exposure of stainless steel to dissolved oxygen and (2) pitting corrosion resulted from the exposure of stainless steel to halogens and sulfates as requiring management of aging effects.

The applicant also identified cracking due to: (1) fatigue resulted from the exposure of stainless steel to halogen, sulfates, and stress, and (2) fatigue resulted from the progressive, localized structural change in materials subjected to fluctuating stresses and strains as requiring management of aging effects.

Although the applicant has identified stainless steel structural components in a plant indoor air/borated water environment which are not addressed in the GALL report, the GALL report does address the spent fuel pool liner that is of a similar material and in a similar environment. The staff has determined that the GALL report can be used to address a structure (or component) of a similar material, environment, and system. The staff finds the applicant's identification of aging effects consistent with the SRP-LR for the spent fuel pool liner and is acceptable.

3.5.3.3.2.1.2 Structural Stainless Steel in Plant Indoor Air

The applicant identified no aging effects requiring management for stainless steel in ambient air. In a letter dated June 27, 2001, the staff asked the applicant to provide additional information on their determination (RAI 3.5-12). By letter dated July 11, 2001, the applicant responded with insufficient information specific to the trisodium phosphate baskets, which are stainless steel in plant indoor air, for staff to evaluate. This is an open item (3.5.3-5).

3.5.3.3.2.1.3 Neoprene in Plant Indoor Air

The applicant identified cracking and a change in material properties of neoprene due to thermal exposure resulted from the prolong exposure to temperatures above 35°C (95°F) as aging effects requiring management. The staff concurs with this assessment on the basis of operating experience. The staff finds the applicant has identified appropriate aging effects.

3.5.3.3.2.2 Aging Management Programs

3.5.3.3.2.2.1 Structural Stainless Steel in Plant Indoor Air/Borated Water

The applicant indicated that loss of material and cracking could occur in the fuel transfer tube that is fabricated of structural stainless steel by exposing it to dissolved oxygen or halogens and sulfates. The aging could be managed by containment leak rate program, monitoring of pool level and leakage, and chemistry program.

Although the fuel transfer tube is not addressed in the GALL report, the GALL report does address the spent fuel pool liner that is of a similar material and in a similar environment. The staff finds the applicant's proposed programs consistent with the SRP-LR for the spent fuel pool liner and are acceptable. However, the program to monitor pool level and leakage was not included as part of this demonstration project: therefore, the program to monitor pool level and leakage is outside of the scope of the staff review.

3.5.3.3.2.2.2 Neoprene in Plant Indoor Air

The applicant indicated that cracking and change in material properties by prolonged exposure of neoprene to temperature above 35°C (95°F). This would be managed by periodic surveillance and preventive maintenance program. This program was not included as part of this demonstration project; therefore, this program is outside of the scope of the staff review.

3.5.3.4 Final Safety Analysis Report (FSAR) Supplement

The staff reviewed the applicant proposed FSAR supplement for structures monitoring program and found that it only addresses managing the aging effects of loss of material. In a letter dated June 27, 2001, the staff asked the applicant to address other aging effects in the FSAR supplement (RAI 3.5-16). By letter dated July 11, 2001, the applicant responded but did not provide sufficient information for staff evaluation; therefore, this FSAR supplement for structures monitoring program is an open item (3.5.3-6). In addition, the FSAR supplement did not provide any description of the other programs identified in Section 3.5 of the LRA; therefore, the FSAR supplement for the other programs is outside of the scope of the staff review.

3.5.4 Conclusions

The staff has reviewed the information in Section 3.5 of the LRA. The staff has identified open items in Section 3.5.3 above. If the applicant resolves these open items, the staff will be able to conclude that the applicant has demonstrated that the aging effects associated with the identified containment, structures, and component supports will be adequately managed so that there is reasonable assurance that these components will perform their intended functions in accordance with the current licensing basis during the period of extended operation. The staff will also be able to conclude that the FSAR supplement for Plant X provides an acceptable description of the programs and activities for managing the effects of aging of the containment, structures, and component supports for the period of extended operation. These conclusions are based on the fact that certain items identified in the above evaluation were outside of the scope of the staff review for the purposes of this demonstration project and therefore were not required to be provided for the purposes of this review.

3.6 Aging Management of Electrical and Instrumentation and Controls

3.6.1 Introduction

By letter dated May 24, 2001, the Nuclear Energy Institute (NEI) submitted Section 3.6, "Aging Management of Electrical and Instrumentation and Controls." The staff's review of this sample license renewal (LRA) section was conducted as part of the NEI demonstration project. The demonstration project is intended to provide examples of how an applicant would reference the Generic Aging Lessons Learned (GALL) report to prepare an LRA and how the staff would use the Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants (SRP-LR) to review it. This Plant X submittal was intended to demonstrate the use of the GALL report with an LRA that was prepared using the format delineated in the SRP-LR. As agreed with NEI, the staff did not review Section 2, "Scoping and Screening Methodology for Identifying Structures and Components Subject to Aging Management Review, and Implementation Results," of the LRA because it related to scoping, which was not the focus of this effort. Section 3, "Aging Management Review Results," of the LRA contained a sample of aging management programs that allowed the staff to exercise the review process. Therefore, the staff's conclusions are limited to the sample programs provided. In addition, because the demonstration project is intended to be illustrative, the staff's conclusions may not be applicable to a plant-specific LRA. The demonstration project is based on the August 2000 version of the GALL report. Thus, the staff reviewed this section in accordance with NRC regulations and the guidance provided in the SRP-LR and the GALL report, dated August 2000. Future applicants are expected to reference the versions available at the time of application.

3.6.2 Summary of Technical Information in the Application

The electrical and instrumentation & control components for Plant X, a pressurized-water reactor (PWR), evaluated in this section of the LRA encompass the passive, long-lived electrical cables and connections which support an intended function, as defined by 10 CFR Part 54.4. Cables and their associated connectors provide electrical energy to power various equipment and components throughout the plant to enable them to perform their intended functions. Cables and connectors associated with the 10 CFR 50.49 environmental qualification (EQ) program are addressed either as short lived (replaced periodically) or as long-lived TLAA components and are not included in the set of cables and connectors requiring an aging management review.

Table 3.6.1 of the LRA shows the electrical component groups (combinations of materials and environments), and aging management programs evaluated in the GALL report that are relied on for license renewal of the non-EQ electrical cables and connections. In addition to the industry review of operating experience, Plant X operating experience searches were conducted of pertinent site records, including the condition report system, and discussions were held with appropriate site personnel. The industry and site reviews revealed no evidence of additional aging effects requiring management than those identified in the GALL report.

3.6.3 Staff Evaluation

In Section 3.6 of the LRA, the applicant described its aging management review of the electrical and instrumentation and controls components at Plant X. The applicant referenced the GALL

report in its aging management review. The staff has previously evaluated the adequacy of aging management of structures and components for license renewal as documented in the GALL report. Thus, the staff did not repeat its review of the matters described in the GALL report, except to ensure that the material presented in the LRA was applicable, and to verify that the applicant had identified the appropriate programs as described and evaluated in the GALL report. The staff evaluated those aging management programs recommended for further evaluation in the GALL report. The staff also reviewed aging management program information submitted by the applicant that was different from that in the GALL report or was not addressed in the GALL report.

The staff reviewed Section 3.6 of the LRA in accordance with the guidance provided in Section 3.6 of the SRP-LR for a PWR to determine whether the applicant had submitted adequate information to meet the requirements of 10 CFR Part 54 for managing the effects of aging on the electrical and instrumentation and controls components for license renewal. Table 3.6-1 of the SRP-LR provides a summary of components, aging effects/mechanisms, and aging management programs for electrical and instrumentation and controls components listed in Chapter VI of the GALL report. The staff compared the information provided in the LRA to Table 3.6-1 of the SRP-LR. Table 3.6-1 of this SER provides a summary of the staff's evaluation of components, aging effects/mechanisms, and aging management programs listed in Section 3.6 of the LRA that are addressed by the SRP-LR Table 3.6-1. The staff evaluation for components or aging effects identified by the applicant that are not addressed in the GALL report are evaluated by the staff in Section 3.6.3.3.2 of this SER.

The first three columns of Table 3.6-1 of this SER are copied from the SRP-LR Table 3.6-1. These three columns list the component, aging effect/mechanism, and aging management programs that are evaluated in the GALL report. The aging management program provided by the applicant in the LRA is listed in the fourth column titled, "Aging Management Program in LRA." The staff's evaluation of the component, aging effect and aging management program is summarized in the fifth column titled, "Staff Evaluation." If the applicant's components, aging effects, and aging management programs are consistent with the GALL report, the staff identified this in the staff evaluation column as "Consistent with GALL." As such, no further staff evaluation is necessary as discussed in Section 3.6.3.1 of this SER. In addition, the GALL report recommends further evaluation for those programs that should be augmented, are plant specific, or involve a time-limited aging analysis (TLAA) evaluation. For programs in the LRA that should be further evaluated, "GALL recommends further evaluation" is documented in the staff evaluation column and discussed further in Section 3.6.3.2 of this SER. The applicant's aging management programs or evaluations that are different from the GALL report are identified as "Program Different from GALL" in the staff evaluation column and discussed further in Section 3.6.3.3.1 of this SER.

Table 3.6.1
Staff Evaluation Table for Electrical and Instrumentation and Controls

Component	Aging Effect/ Mechanism	Aging Management Program in GALL Report	Aging Management Program in LRA	Staff Evaluation
Electrical equipment subject to 10 CFR 50.49 EQ requirements	Degradation due to various aging mechanisms	EQ Program	Not included as part of this demonstration project	Outside of the scope of the staff review (See Section 3.6.3.2.1 below)
Non-EQ electrical cables and connections	Embrittlement, cracking, melting, discoloration, leading to reduced insulation resistance, electrical failure caused by thermal/ thermoxidative degradation of organics, radiolysis and photolysis (UV sensitive material only) of organics; radiation-induced oxidation	Aging management program for non-EQ electrical cables and connections exposed to an adverse localized environment caused by heat and radiation	Aging management program for non-EQ electrical cables and connections exposed to an adverse localized environment caused by heat and radiation	Consistent with GALL. (See Section 3.6.3.1 below)

Non-EQ electrical cables used in instrumentation circuits that are sensitive to reduction in conductor insulation resistance (IR)	Embrittlement, cracking, melting, discoloration, leading to reduced insulation resistance, electrical failure, caused by thermal/ thermoxidative degradation of organics, radiation-induced oxidation	Aging management program for non-EQ electrical cables used in instrumentation circuits that are sensitive to reduction in conductor insulation resistance (IR) exposed to an adverse localized environment caused by heat or radiation	Not included as part of this demonstration project	Outside of the scope of the staff review (See Section 3.6.3.2.2 below)
Non-EQ inaccessible medium-voltage (2 kV to 15 kV) cables (e.g., installed in conduit or direct buried)	Formation of water trees, localized damage, leading to electrical failure (breakdown of insulation), caused by moisture intrusion, water tree	Aging management program for non-EQ inaccessible medium-voltage cables exposed to an adverse localized environment caused by moisture and voltage exposure	Electrical component inspection program	Different from GALL. (See Section 3.6.3.3.1.1 below)
Non-EQ electrical connectors exposed to borated water leakage	Corrosion of connector contact surfaces caused by intrusion of borated water	Borated water leakage surveillance program for non-EQ electrical connectors	Boric acid corrosion program	Different from GALL. (See Section 3.6.3.3.1.2 below)

3.6.3.1 Aging Management Programs Evaluated in the GALL Report that Are Relied on for License Renewal

In accordance with the guidance contained in SRP-LR Section 3.6, the staff has reviewed the LRA and determined that the applicant has submitted the information necessary to adopt the

finding of program acceptability as described and evaluated in the GALL report. The applicant has identified those aging effects for the electrical and instrumentation and controls components that are contained in the GALL report as applicable to its plant. The applicant has identified the programs in the GALL report for the aging management of these components. The staff has verified that the applicant has identified the appropriate programs as described and evaluated in the GALL report. Thus, it is acceptable for the applicant to reference the information in the GALL report and no further staff evaluation is necessary. The applicant's components, aging effects, and aging management programs that are consistent with GALL report are identified in the above table under the staff evaluation column as consistent with GALL.

3.6.3.2 Further Evaluation of Aging Management as Recommended by the GALL Report

3.6.3.2.1 Electrical Equipment Subject to Environmental Qualification (EQ)

This information was not included as part of this demonstration project; therefore, this information is outside of the scope of the staff review.

3.6.3.2.2 Quality Assurance for Aging Management of Non-Safety-Related Components

This information was not included as part of this demonstration project; therefore, this information is outside the scope of the staff review.

3.6.3.3 Aging Management Programs or Evaluations that Are Different from or Not Addressed in the GALL Report

3.6.3.3.1 Aging Management Programs or Evaluations that are Different from those Described in the GALL Report

3.6.3.3.1.1 Non-EQ Inaccessible Medium-Voltage Cables Program

The electrical component inspection program described in Appendix B of the LRA is credited for managing aging effects that apply to non-EQ inaccessible medium-voltage cables. This program will use visual inspections of selected samples of the accessible portion of medium-voltage cables to detect aging effects for non-EQ inaccessible medium-voltage cables. The applicant stated that this program is consistent with the ten attributes of Chapter XI.E3, "Non-EQ Inaccessible Medium-Voltage Cables," in the GALL report. However, Plant X takes exception to the ten year testing frequency requirement identified in Chapter XI.E3 of the GALL report. The Plant X program does not include scheduled testing since Plant X has determined that these non-EQ medium-voltage cables were designed for the applications where they are installed. The moisture and voltage exposures described as significant in Chapter XI.E3 of the GALL report are not significant at Plant X since the design criteria for cables used in these applications assures that cables will continue to perform their intended function. Engineering review determined the expected life of these cables extends beyond the extended period of operation. The staff finds this acceptable for managing aging for the non-EQ electrical connectors during the period of extended operation.

Section 3.6.2.2.1, “Non-EQ Inaccessible Medium-Voltage (2kv to 15kv) Cables Potentially Exposed to Wetting,” of the LRA stated that the duct banks in which non-EQ inaccessible medium-voltage cables are enclosed at Plant X have been sealed to prevent water intrusion and a one-time inspection will be performed prior to the end of the current license period to ensure these duct banks remain effectively sealed. However, the description of the electrical component inspection program in Appendix B of the LRA does not discuss the inspection of the duct banks. In a letter dated June 27, 2001, the staff asked the applicant to clarify the proposed aging management of inaccessible medium-voltage cables (RAI 3.6-1). By letter dated July 11, 2001, the applicant responded that the LRA sections will be revised to be consistent with the terminology and descriptions in Appendix B of the LRA. The staff finds this acceptable.

3.6.3.3.1.2 Boric Acid Corrosion Program

Visual inspections are performed each refueling outage of electrical connector and enclosure external surfaces for evidence of borated water leakage such as discoloration or accumulated boric acid residue. Boric acid residue is removed and determination is made as to the possible intrusion of the borated water into the electrical connector or enclosure.

For the non-EQ electrical connectors exposed to borated water leakage, the inspection of electrical components at Plant X is included in the boric acid corrosion program. A separate boric acid inspection program for electrical connectors as described in the SRP-LR is not warranted. The staff finds this acceptable because the applicant is simply combining two boric acid corrosion inspection programs described in the SRP-LR into one plant program.

3.6.3.3.2 Components or Aging Effects that are Not Addressed in the GALL Report

The applicant did not identify any components or aging effects for the electrical and instrumentation and controls components at Plant X which are not addressed in the GALL report.

3.6.3.4 Final Safety Analysis Report (FSAR) Supplement

The staff reviewed the proposed FSAR supplement for the electrical component inspection program to manage the aging effects associated with the electrical and instrumentation and controls components and found description of the program is consistent with the SRP-LR. The FSAR supplement for the other aging management programs relied on for the electrical and instrumentation and controls components was not included as part of this demonstration project; therefore, the FSAR supplement for the other aging management programs is outside of the scope of the staff review.

3.6.4 Conclusions

The staff has reviewed the information in Section 3.6 of the LRA. The staff concludes that the applicant has demonstrated that the aging effects associated with the identified electrical and instrumentation and controls components will be adequately managed so that there is reasonable assurance that these components will perform their intended functions in accordance with the current licensing basis during the period of extended operation. The staff

also concludes that the FSAR supplement for Plant X provides an acceptable description of the programs and activities for managing the effects of aging of the electrical and instrumentation and controls components for the period of extended operation. These conclusions are based on the fact that certain items identified in the above evaluation were outside the scope of the staff's review and therefore were not required to be provided for the purpose of the review.

SAMPLE DRAFT SAFETY EVALUATION REPORT
PLANT Y LICENSE RENEWAL APPLICATION

3.4 Aging Management of Steam and Power Conversion System

3.4.1 Introduction

In a letter dated May 24, 2001, the Nuclear Energy Institute (NEI) submitted Section 3.4, "Aging Management of Steam and Power Conversion System." The staff's review of this sample license renewal application (LRA) section was conducted as part of the NEI demonstration project. The demonstration project is intended to provide examples of how an applicant would reference the Generic Aging Lessons Learned (GALL) report to prepare an LRA and how the staff would use the Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants (SRP-LR) to review it. This Plant Y submittal was intended to demonstrate the use of the GALL report with an LRA that was prepared in the six-column format that is consistent with the majority of previously submitted LRAs. As agreed with NEI, the staff did not review Section 2, "Scoping and Screening Methodology for Identifying Structures and Components Subject to Aging Management Review, and Implementation Results," of the LRA because it related to scoping, which was not the focus of this effort. Section 3, "Aging Management Review Results," of the LRA contains a sample of aging management programs that allowed the staff to exercise the review process. Therefore, the staff's conclusions are limited to the sample programs submitted. In addition, because the demonstration project is intended to be illustrative, the staff's conclusions may not be applicable to a plant-specific LRA. The demonstration project is based on the August 2000 version of the GALL report. Thus, the staff reviewed this section in accordance with Nuclear Regulatory Commission (NRC) regulations and the guidance provided in the SRP-LR and the GALL report, dated August 2000. Future applicants are expected to reference the versions available at the time of application.

3.4.2 Summary of Technical Information in the Application

The applicant for Plant Y, a pressurized-water reactor (PWR), described its aging management review of the steam and power conversion system in Section 3.4 of the LRA. The Plant Y steam and power conversion system includes the main steam and turbine generator system, the feedwater, blowdown and chemical addition system, and the auxiliary feedwater and condensate storage system.

Passive components of the steam and power conversion system, such as tanks, pump casings, heat exchangers, piping, and valves are constructed of carbon steel, stainless steel, low alloy steel, cast iron, and brass. These components are exposed to internal environments of treated water, lubricating oil, and air/gas; and external outdoor environment, building air (inside and outside containment), underground, and potential borated water leaks. Tables 3.4.1 through 3.4.3 in the LRA provide a summary of the components and commodity groups, their intended functions, the materials, environments, aging effects, and aging management programs for the steam and power conversion system components.

3.4.3 Staff Evaluation

The staff evaluated Section 3.4 of the LRA which describes the aging management of the steam and power conversion system.

3.4.3.1 Effects of Aging

The applicant supplied references pertaining to Plant Y plant-specific as well as industry-wide experience to support its identification of applicable aging effects for steam and power conversion system. In a letter dated June 27, 2001, the staff indicated that there was a reference that contained relevant industry-wide experiences that had not been stated to be reviewed by the applicant (RAI 3.4-14). In Section 3.4.3, "Operating Experience," of the LRA, the applicant listed the generic NRC communications that were reviewed for operating experience related to steam and power conversion system. The list does not include the following information notice;

- NRC Information Notice 97-84, Rupture in Extraction Steam Piping as a Result of Flow-Accelerated Corrosion, December 11, 1997.

In a letter dated July 11, 2001, the applicant indicated that this document was inadvertently excluded from the list. Further review by the applicant in response to RAI 3.4-14 revealed that exclusion of this document had no impact on the identification of aging effects.

A review of industry operating experience and a review of NRC generic communications was performed by the applicant to validate the set of aging effects that require management. Plant Y plant specific operating experience was also reviewed to validate the identified aging effects requiring management . This review included a survey of Plant Y non-conformance reports, licensee event reports, and condition reports for any documented instances of steam and power conversion system component aging, in addition to interviews with responsible engineering personnel. No aging effect requiring management was identified from this review beyond those identified in LRA Section 3.4.2, "Aging Effects Requiring Management."

The aging effect requiring management and the programs and activities that manage the aging effects for each applicable environment and material combination are presented in Tables 3.4-1 through 3.4-3 of the LRA. The aging effects requiring management for each system are summarized in the following paragraphs:

- Main steam and turbine generator system - The aging effects requiring management are loss of material for carbon steel and stainless steel components, and cracking for certain stainless steel components and heat exchanger tubing. The aging effect requiring management for carbon steel mechanical closure bolting is loss of mechanical closure integrity. Fatigue is addressed as a time-limited aging analysis (TLAA) in Section 4.3 (not included as part of demonstration project) of the LRA.
- Feedwater, blowdown and chemical addition system - The aging effects requiring management are loss of material for carbon steel and stainless steel components, and cracking for certain stainless steel components. The aging effect requiring management for carbon steel mechanical closure bolting is loss of mechanical closure

integrity. Fatigue is addressed as a TLAA in Section 4.3 (not included as part of demonstration project) of the LRA.

- Auxiliary feedwater and condensate storage systems - The aging effect requiring management is loss of material for cast iron, admiralty brass, carbon steel, low alloy steel, and stainless steel components.

Tables 3.4-1 and 3.4-2 of the LRA indicate that cracking is identified as an aging effect for stainless steel components in treated water-secondary environment; but is not an aging effect for stainless steel components in treated water. Table 3.4-2 indicates stainless steel components (standby steam generator feedwater pump suction) in an outdoor environment is susceptible to cracking; but is not an aging effect for buried piping. The table footnote indicates that plant experience has identified the potential for cracking in non-stress relieved heat affected zones of weld joints for the piping in an outdoor environment. In a letter dated June 27, 2001, the staff asked the applicant to identify the plant-specific and industry experience, including maintenance and inspection, that indicates cracking is an aging effect for stainless steel components in treated water-secondary outdoor environments and not an aging effect in treated water and buried environments (RAI 3.4-1). The applicant was also asked to explain why cracking is not an applicable aging effect for stainless steel in treated water and buried environments (RAI 3.4-1). In a letter dated July 11, 2001, the applicant indicated that information providing the answers to these types of questions would have been submitted in Appendix C of an actual LRA but was not included as part of this demonstration project. The applicant responded to RAI 3.4-1 that stainless steel is considered susceptible to stress corrosion cracking at temperatures greater than 60°C (140°F) in a treated water environment. The standby feedwater components are normally at ambient conditions and do not exceed this temperature threshold. Plant specific experience has identified stress corrosion cracking of stainless steel in an outdoor environment that involves occasional wetting due to rain. The staff concurs that internal surface of piping is not susceptible to stress corrosion cracking in a chemically controlled environment and temperatures of less than 60°C (140°F). The external environment and aging effects of the buried piping and condensate storage tank is an open item because more information is needed to determine if there is an aging effect open item (3.4-1)

Tables 3.4-1 and 3.4-2 of the LRA indicate that cracking could occur in stainless steel components in the steam and power conversion system. The staff concurs with this assessment on the basis of operating experience.

Tables 3.4-1 and 3.4-2 of the LRA indicate bolting is subject to loss of mechanical closure integrity due to borated water leakage. Table 3.4-3 of the LRA indicates bolting in an outdoor environment does not have a plausible aging effect. In a letter dated June 27, 2001, the staff asked the applicant to provide the basis for the conclusion that the aging effects associated with cracking and loss of preload need not be managed (RAI 3.4-10). In a letter dated July 11, 2001, the applicant responded that loss of preload of mechanical closures can occur due to settling of mating surfaces, relaxation after cyclic loading, gasket creep, and loss of gasket compression due to differential thermal expansion. The loss of preload due to these mechanisms can result in leakage at the joint, e.g., gasket or seal leakage, not failure of the mechanical joint. The American Society of Mechanical Engineers (ASME) code does not consider gaskets, seals, and o-rings to perform a pressure retaining function. It follows that the loss of preload from the above mechanisms does not result in loss of mechanical closure or

loss of pressure boundary integrity. It is noted that Plant Y utilizes proper bolt torquing procedures to prevent loss of preload, and leakage of mechanical joints due to loss of preload has not been a significant issue at Plant Y. Therefore, no aging effects associated with loss of pre-load resulting from settling, relaxation after cyclic loading, gasket creep, and temperature effects are considered to require management during the period of extended operation. At Plant Y, the potential for stress corrosion cracking of fasteners is minimized by utilizing American Society of Standards and Testing (ASTM) A193, Grade B7 bolting material and limiting contaminants such as chlorides and sulfur in lubricants and sealant compounds. Additionally, sound maintenance bolt torquing practices are used to control bolting material stresses. These actions have been effective in eliminating the potential for stress corrosion cracking of bolting materials. The results of a review of Plant Y operating experience support this conclusion that no instances of bolting degradation due to stress corrosion cracking were identified. Therefore, cracking of bolting material due to stress corrosion cracking is not considered an aging effect requiring management at Plant Y. The applicant also indicated that the above information would have been submitted in Appendix C of the LRA for Plant Y which was not included as part of this demonstration project. The resolution of crack initiation/growth due to stress corrosion cracking for carbon steel closure bolting is one of the five continuing dialog items with NEI and is outside the scope of the demonstration project.

In a letter dated June 27, 2001, the staff asked the applicant to consider (1) the potential for loss of material due to general corrosion and microbiologically influenced corrosion (MIC) in stainless steel and carbon steel shells, tubes, and tubesheets within the bearing oil coolers; and (2) the buildup of deposits due to biofouling and loss of material due to general corrosion and MIC in carbon steel piping and fittings in untreated water from backup water supplies in auxiliary feedwater systems (RAI 3.4-4). In a letter dated July 11, 2001, the applicant indicated that loss of material due to biofouling and MIC in carbon steel piping and fittings is not applicable to Plant Y because the environment for auxiliary feedwater piping is only treated water. Corrosion is an aging effect that requires aging management for components within the bearing oil coolers, if water is present. The LRA indicates that carbon steel components within the auxiliary feedwater pump containing lube oil are not subject to an aging effect requiring management. The applicant indicated that plant history has not identified any cases of water contamination of the auxiliary feedwater lube oil. Therefore, the applicant concluded that water contamination was not considered to be applicable to this system. The staff concurs that loss of material in carbon steel is not an aging effect for the carbon steel components within the auxiliary feedwater pump containing lube oil if water is not present.

In a letter dated June 27, 2001, the applicant was asked if the carbon steel steam and power conversion system components (including stagnant lines, main actuation/isolation valves, etc.) are exposed to a raw water environment due to standby conditions, actuation of the back-up systems, or testing (RAI 3.4-7). In a letter dated July 11, 2001, the applicant responded that the internal environment for the steam and power conversion system components is treated water, whether the components are in service, being tested or in standby. Therefore, the staff concurs that there are no additional aging effects of concern due to exposure of carbon steel components to raw water.

The staff finds the applicant has identified the applicable aging effects for the steam and power conversion system on the basis of operating experience.

3.4.3.2 Aging Management Programs

Tables 3.4-1 through 3.4-3 of the LRA contain the results of the aging management review for the steam and power conversion system and summarizes the aging effects requiring management. The applicant identifies a number of aging management programs for managing the effects of aging in the steam and power conversion system. The programs were developed from industry-wide data, industry developed methodologies, NRC documents, and the applicant's own experience. The applicant concluded that these programs will adequately manage the effects of aging of the steam and power conversion system so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation. The LRA referenced the GALL report in its review of the aging management programs. The aging effects requiring management are adequately managed by the following programs, which are consistent with the GALL report except as identified below, according to the applicant:

- Primary chemistry monitoring program (program consistent with the GALL report with exceptions)
- Auxiliary feedwater pump oil coolers inspection (the GALL report specifies a plant-specific aging management program)
- Auxiliary feedwater steam piping inspection program (the GALL report specifies a plant-specific aging management program)
- Boric acid wastage surveillance program
- Secondary chemistry monitoring program (program consistent with the GALL report except the chemical addition system which is not included in the GALL report)
- Field erected tanks internal inspection (aging management program not included in the GALL report)
- Flow accelerated corrosion program
- Galvanic corrosion susceptibility inspection program (aging management program not included in the GALL report)
- Structures monitoring program

The staff's evaluation of the submitted aging management programs is on the basis of the 10-element program as described in branch technical position RLSB-1 of the SRP-LR.

3.4.3.2.1 Aging Management Programs for the Main Steam and Turbine Generator Systems

The aging management programs for the main steam and turbine generator systems are the flow accelerated corrosion program, boric acid wastage surveillance program, structures monitoring program, and the secondary chemistry monitoring program.

3.4.3.2.1.1 Flow Accelerated Corrosion

The flow accelerated corrosion program is credited in the LRA for aging management of flow accelerated corrosion in selected piping and components in the steam and power conversion system. The staff has reviewed the LRA and determined that the applicant has submitted the information necessary to adopt the finding of program acceptability as described and evaluated in the GALL report. The applicant has identified that the flow accelerated corrosion program is consistent with the ten attributes of Chapter XI.M6, "Flow Accelerated Corrosion" of the GALL

report. The staff has reviewed the LRA and finds the flow accelerated corrosion program appropriate to manage the applicable aging effects for the main steam and steam generator systems passive components. Thus, it is acceptable for the LRA to reference the information in the GALL report and no further staff evaluation is necessary.

3.4.3.2.1.2 Boric Acid Wastage Surveillance Program

The boric acid wastage surveillance program is credited in the LRA for aging management of selected components in the steam and power conversion system. This program was not included as part of this demonstration project; therefore, this program is outside of the scope of the staff review.

3.4.3.2.1.3 Structures Monitoring Program

Tables 3.4-1 through 3.4-3 of the LRA indicate that the structures monitoring program is used to monitor the loss of material on the external surface of carbon steel and stainless steel components in an outdoor environment. The LRA indicates that the structures monitoring program is consistent with the ten attributes of Chapter XI.S6, "Structures Monitoring Program," of the GALL report. However, the structures monitoring program, as described and evaluated in the GALL report, applies to buildings and structures. The components identified in Tables 3.4-1 through 3.4-3 that identify the structures monitoring program to manage aging effects are not structures. The components identified are tanks, pumps, valves, pipes, fittings, tubing, strainers (standby steam generator feedwater pump suction), orifices, steam traps, auxiliary feedwater pump lube oil cooler, and cooler shells and channels. In a letter dated June 27, 2001, the staff asked the applicant to provide the basis for claiming that the structures monitoring program is consistent with the GALL report (RAI 3.4-6). In a letter dated July 11, 2001, the applicant responded that with respect to structures/structural components, that its structures monitoring program is consistent with the aging management program in Chapter XI.S6 of the GALL report. With respect to non-structural components, the plant-specific systems monitoring program should have been referenced and included in Appendix B of the LRA. The staff finds it unacceptable to apply the structures monitoring program to those components that are not structures. Since the systems monitoring program was not included as part of this demonstration project, this is outside of the scope of the staff review.

3.4.3.2.1.4 Secondary Chemistry Monitoring Program

The secondary chemistry monitoring program is credited in the LRA for managing the aging effects applicable to the passive component/item groupings exposed to contact with the secondary plant fluids. The LRA indicates that the secondary chemistry monitoring program is consistent with the ten attributes of Chapter XI.M11, "Water Chemistry," of the GALL report, with the exception that the program does not include a one-time inspection to verify the adequacy of the program. The one-time inspection is not included because the LRA indicates that operating experience has not identified any problems that would warrant a one-time inspection. In a letter dated June 27, 2001, the staff asked for this operating experience (RAI 3.4-3). In a letter dated July 11, 2001, the applicant responded that during routine and corrective maintenance requiring equipment disassembly, internal surfaces of components are visually inspected for loss of material and other aging effects. If the results of the inspections indicate loss of material (other than light surface corrosion, cracking or fouling), the condition is

evaluated pursuant to the Plant Y corrective action program. The corrective action process includes cause determination and if the aging mechanism is not readily apparent, metallurgical analysis may be performed. The metallurgical analyses include the use of standard metallurgical laboratory techniques for the identification of aging mechanisms such as crevice and pitting corrosion. A review of approximately 100 metallurgical laboratory reports associated with license renewal passive components, was performed to identify any material failures attributed to corrosion. This review by the applicant concluded that there have been no occurrences of general, pitting, or crevice corrosion in treated water systems. The staff concurs with this conclusion because the effectiveness of the chemistry control program has been verified with satisfactory results.

3.4.3.2.2 Aging Management Programs for the Feedwater, Blowdown, and Chemical Addition Systems

The aging management programs for the feedwater, blowdown, and chemical addition systems are the primary chemistry monitoring program, boric acid wastage surveillance program, secondary chemistry monitoring program, field erected tanks internal inspection, flow accelerated corrosion program, galvanic corrosion susceptibility inspection program, and the structures monitoring program.

3.4.3.2.2.1 Primary Chemistry Monitoring Program

The primary chemistry program is credited in the LRA for managing the aging effects applicable to the passive component/item groupings exposed to contact with the reactor coolant. The LRA indicates that the primary chemistry program is consistent with the ten attributes of Chapter XI.M11 of the GALL report, with the exception that the program does not include a one-time inspection to verify the adequacy of the program. The one-time inspection is not included because the LRA indicated that operating experience has not identified any problems that would warrant a one-time inspection. In a letter dated June 27, 2001, the staff asked for this operating experience (RAI 3.4-3). In a letter dated July 11, 2001, the applicant responded that during routine and corrective maintenance requiring equipment disassembly, internal surfaces of components are visually inspected for loss of material and other aging effects. If the results of the inspections indicate loss of material (other than light surface corrosion, cracking or fouling), the condition is evaluated pursuant to the Plant Y corrective action program. The corrective action process includes cause determination and if the aging mechanism is not readily apparent, metallurgical analysis may be performed. The metallurgical analyses include the use of standard metallurgical laboratory techniques for the identification of aging mechanisms such as crevice and pitting corrosion. A review of approximately 100 metallurgical laboratory reports associated with license renewal passive components, was performed to identify any material failures attributed to corrosion. This review by the applicant concluded that there have been no occurrences of general, pitting, or crevice corrosion in treated water systems. The staff concurs with this conclusion because the effectiveness of the chemistry control program has been verified with satisfactory results.

3.4.3.2.2.2 Boric Acid Surveillance Wastage Program

See Section 3.4.3.2.1.2

3.4.3.2.2.3 Secondary Chemistry Monitoring Program

See Section 3.4.3.2.1.4

3.4.3.2.2.4 Field Erected Tanks Internal Inspection

This program is plant specific and the ten element evaluation is as follows:

[Scope] This is a one-time inspection of the two condensate storage tanks, two refueling water storage tanks, and the shared demineralized water storage tank. The field erected tanks internal inspection is credited with managing the aging effect of loss of material due to corrosion of the tanks within the scope. The one-time inspection of selected internal areas, including surface welds, will determine the extent of internal corrosion in the listed tanks. The staff finds this acceptable because it is consistent with the SRP-LR.

[Preventive Actions] Internal tank surfaces are coated to reduce corrosion. Coatings minimize corrosion by limiting exposure to the environment. However, coatings are not credited in the determination of the aging effects requiring management. The staff finds this acceptable because it is consistent with the SRP-LR.

[Parameters Monitored or Inspected] The material condition of the internal surfaces of accessible areas of the tanks will be visually inspected. The staff finds this acceptable because it is consistent with the SRP-LR.

[Detection of Aging Effects] The presence of corrosion that could lead to loss of material will be determined by visual inspection of the accessible areas of the field erected tanks. Internal surfaces will be examined for evidence of flaking, blistering, peeling, discoloration, pitting, or excessive corrosion. The visual inspection will consist of direct (e.g., divers) or remote (e.g., television cameras, fiber optic scopes, periscopes) means. The staff finds this acceptable because it is consistent with the SRP-LR.

[Monitoring and Trending] As identified above, this is a one-time inspection, therefore, monitoring or trending is not anticipated. Results of the inspection will be evaluated to determine if additional actions are required. The staff finds this acceptable because it is consistent with the SRP-LR.

[Acceptance Criteria] The results of the one-time inspection will be evaluated. Specific acceptance criteria will be included in the implementing procedure. The acceptance criteria is an open item because more information is needed to determine if it is acceptable open item (3.4-2)

[Confirmation Process] Any follow-up inspection required will be on the basis of the evaluation of the inspection results and will be documented in accordance with the corrective action program. The quality assurance program was not included as part of this demonstration project; therefore, the quality assurance program is outside of the scope of the staff review.

[Corrective Action] The applicant did not discuss the corrective action. This is an open item (3.4-3).

[Administrative Controls] The applicant did not discuss administrative controls. This is an open item (3.4-4).

[Operating Experience and Demonstration] Visual inspections have been performed at Plant Y for several years. This technique has proven successful for identifying material defects on the surface of field erected tanks. The staff finds this acceptable because it is consistent with the SRP-LR.

The field erected tanks internal inspection is a new program that will use techniques with demonstrated capability and a proven industry record to detect corrosion. This inspection will be performed utilizing approved procedures and qualified personnel.

The field erected tanks internal inspection and the chemistry (primary for demineralized storage tank and secondary for condensate storage tank) monitoring programs are credited for managing the loss of material. Since the field erected tanks internal inspection will include a one-time inspection of susceptible tank locations and the chemistry monitoring programs will monitor water chemistry in accordance with the ten attributes of Chapter XI.M11 of the GALL report, these programs will provide reasonable assurance that loss of material due to corrosion will be managed such that the condensate and demineralizer storage tanks within the scope of license renewal will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation. On the basis of the above evaluation, the staff concurs that this is an acceptable program.

3.4.3.2.2.5 Flow Accelerated Corrosion Program

See Section 3.4.3.2.1.1.

3.4.3.2.2.6 Galvanic Corrosion Susceptibility Inspection Program

This program was not included as part of this demonstration project; therefore, this program is outside of the scope of the staff review.

3.4.3.2.2.7 Structures Monitoring Program

See Section 3.4.3.2.1.3

3.4.3.2.3 Aging Management Programs for the Auxiliary Feedwater and Condensate Storage Systems

The aging management programs for the auxiliary feedwater and condensate storage system are the auxiliary feedwater pump oil coolers inspection, auxiliary feedwater steam piping inspection program, secondary chemistry monitoring program, field erected tanks internal inspection, galvanic corrosion susceptibility inspection program, and the structures monitoring program.

3.4.3.2.3.1 Auxiliary Feedwater Pump Oil Coolers Inspection

This program was not included as part of this demonstration project; therefore, this program is outside of the scope of the staff review.

3.4.3.2.3.2 Auxiliary Feedwater Steam Piping Inspection Program

This program was not included as part of this demonstration project; therefore, this program is outside of the scope of the staff review.

3.4.3.2.3.3 Secondary Chemistry Monitoring Program

See Section 3.4.3.2.1.4

3.4.3.2.3.4 Field Erected Tanks Internal Inspection

See Section 3.4.3.2.2.4

3.4.3.2.3.5 Galvanic Corrosion Susceptibility Inspection program

See Section 3.4.3.2.2.6

3.4.3.2.3.6 Structures Monitoring Program

See Section 3.4.3.2.1.3

3.4.3.3 Final Safety Analysis Report (FSAR) Supplement

The staff reviewed the proposed FSAR supplement for the flow accelerated corrosion program, secondary chemistry monitoring program, structures monitoring program and field erected tanks internal inspection to manage the aging effects associated with the steam and power conversion system and found them consistent with the SRP-LR and are acceptable. The FSAR supplement for the other aging management programs relied on for the steam and power conversion system was not included as part of this demonstration project; therefore, this FSAR supplement for the other aging management programs is outside of the scope of the staff review.

3.4.4 Conclusions

The staff has reviewed the information in Section 3.4 of the LRA. The staff has identified open items in Section 3.4.3 above. If the applicant resolves these items, the staff will be able to conclude that the applicant has demonstrated that the aging effects associated with the identified steam and power conversion system components will be adequately managed so that there is reasonable assurance that these components will perform their intended functions in accordance with the current licensing basis during the period of extended operation. The staff will also be able to conclude that the FSAR supplement for Plant X provides an acceptable description of the programs and activities for managing the effects of aging of the steam and power conversion system components for the period of extended operation. These conclusions are based on the fact that certain items identified in the above evaluation were outside the scope of the staff's review and therefore were not required to be provided for the purposes of this review.

3.5 Structures, and Structural Components

3.5.1 Introduction

By letter dated May 24, 2001, the Nuclear Energy Institute (NEI) submitted Section 3.5, "Structures, and Structural Components." The staff's review of this sample license renewal application (LRA) section was conducted as part of the NEI demonstration project. The demonstration project is intended to provide examples of how an applicant would reference the Generic Aging Lessons Learned (GALL) report to prepare an LRA and how the staff would use the Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants (SRP-LR) to review it. This Plant Y submittal was intended to demonstrate the use of the GALL report with an LRA that was prepared in the six-column format that is consistent with the majority of previously submitted LRAs. As agreed with NEI, the staff did not review Section 2, "Scoping and Screening Methodology for Identifying Structures and Components Subject to Aging Management Review, and Implementation Results," of the LRA because it related to scoping which was not the focus of this effort. Section 3, "Aging Management Review Results," of the LRA contained a sample of aging management programs that allowed the staff to exercise the review process. Therefore, the staff's conclusions are limited to the sample programs submitted. In addition, because the demonstration project is intended to be illustrative, the staff's conclusions may not be applicable to a plant-specific LRA. The demonstration project is based on the August 2000 version of the GALL report. Thus, the staff reviewed this section in accordance with Nuclear Regulatory Commission (NRC) regulations and the guidance provided in the SRP-LR and the GALL report, dated August 2000. Future applicants are expected to reference the versions available at the time of application.

3.5.2 Summary of Technical Information in the Application

The applicant for Plant Y, a pressurized-water reactor (PWR), described its aging management review of the structures and structural components in Section 3.5 of the LRA. For this demonstration project, Section 3.5.1, "Containment Structure Concrete Components," of the LRA was limited to review of containment concrete components. The containment concrete components were the dome, cylinder wall, floor, and foundation mat. The applicant identified aging effects requiring management such as cracking and change in material properties for the cylinder walls and foundation mat in Table 3.5-2 of the LRA. Table 3.5.2 also provided aging management review summary applicable to containment concrete components in a six-column format which consists of component/commodity group, intended function, material, environment, aging effects requiring management, and program/activity according to each component/commodity group.

3.5.3 Staff Evaluation

The staff evaluated Section 3.5 of the LRA which describes the aging management review of the concrete components of containment.

3.5.3.1 Aging Effects

Section 3.5.1.1.2, "Aging Effects Requiring Management," of the LRA listed three aging effects. These three aging effects and associated aging mechanisms cited in the LRA for Plant Y are:

- Loss of material due to aggressive chemical attack and corrosion of embedded steel
- Cracking due to aggressive chemical attack and corrosion of embedded steel
- Change in material properties (increase in porosity and permeability) due to aggressive chemical attack

The applicant explained that these aging effects requiring management are applicable to the concrete cylinder walls and foundation mat of the containment located below groundwater elevation (i.e., inaccessible area). The applicant further explained that these aging effects requiring management are consistent with the GALL report. The staff has reviewed Table 3.5-2 of the LRA to determine whether the applicant has adequately addressed the aging effects applicable to Plant Y for license renewal. From the information submitted in the LRA, the staff could not determine why the three aging effects (loss of material, cracking, and change in material properties) listed by the applicant should be limited to concrete components located below groundwater elevation. In a letter dated June 27, 2001, the staff asked the applicant to provide the basis why these aging effects requiring management should be limited to below groundwater elevation (RAI 3.5-5). By letter dated July 11, 2001, the applicant explained that they are limited to the cylinder walls and foundation mat since they are the only containment concrete structures potentially exposed to the groundwater. Since the concrete below groundwater is potentially exposed to aggressive chemicals, the aging effects requiring management are limited to below ground concrete. On the basis of operating experience, the staff believes that the containment concrete components can degrade above groundwater. The staff disagrees with the applicant's assessment that the containment concrete components can degrade only below the groundwater. Therefore, aging management of containment concrete components above groundwater is an open item (3.5.3-1).

In Section 3.5.1.1.2 of the LRA, the applicant also discussed its determination that the following aging effects do not require aging management at Plant Y:

- Loss of material and cracking due to freeze-thaw
- Change in material properties (increase in porosity and permeability) due to leaching of calcium hydroxide
- Expansion and cracking due to reaction with aggregates
- Cracks, distortion, and increase in component stress level due to settlement
- Reduction in foundation strength due to erosion of porous concrete subfoundation
- Loss of strength and modulus due to elevated temperatures

The staff has reviewed the above aging effects to determine whether they are not applicable to Plant Y. Staff evaluation is stated below:

On the basis of the climate at the plant, which is stated in the LRA to be subtropical with long, warm summers accompanied by abundant rainfall and mild, dry winters with negligible freeze-thaw cycles, the applicant eliminated the aging effect of loss of material and cracking due to freeze-thaw. Since the term negligible freeze-thaw cycles as used in the LRA is subjective, the

staff could not make a reasonable assurance finding without further clarification. In a letter dated June 27, 2001, the staff asked the applicant to provide quantitative information such as the weathering index for the site which would demonstrate that this aging effect is not applicable (RAI 3.5-7). By letter dated July 11, 2001, the applicant explained that the description of weather conditions is from the Plant Y updated final safety analysis report (UFSAR). The Plant Y UFSAR does not include a weathering index. Based on subtropical climate at Plant Y, the applicant concluded that loss of material due to freeze is not an aging effect requiring management. Considering Plant Y is located in a subtropical climate where freeze-thaw cycles are negligible, the staff concurs with the applicant's assessment that loss of material due to freeze-thaw is not an aging effect requiring management. Therefore, the applicant can eliminate the aging effect of loss of material and cracking due to freeze-thaw.

For the aging effect of change in material properties (increase in porosity and permeability) due to leaching of calcium hydroxide, the applicant stated that "Plant Y concrete structures and concrete components are constructed of dense, well-cured concrete, with an amount of cement suitable for strength development, and achievement of a water-to-cement ratio that is characteristic of concrete having low permeability. This is consistent with the guidance provided by the American Concrete Institute (ACI)..." Therefore, the applicant stated that change in material properties (increase in porosity and permeability) due to leaching of calcium hydroxide is not an applicable aging effect for Plant Y. In a letter dated June 27, 2001, the staff asked the applicant to (1) define the meaning of "dense", (2) identify/clarify which ACI codes and standards are used, or (3) submit other quantitative information that would demonstrate the concrete has the characteristic described above (RAIs 3.5-4 and 8). By letter dated July 11, 2001, the applicant explained that the term "dense" as it relates to concrete has the same meaning intended by the staff in the GALL report. Specifically, the applicant referred to codes and standards listed in the GALL report (ACI 201.2R-77 and American Society for Testing and Materials (ASTM) C295-54 or ACI 318-63). On this basis, the staff concurs with the applicant that the aging effect of change in material properties (increase in porosity and permeability) due to leaching of calcium hydroxide is not an applicable aging effect to Plant Y.

The applicant stated that the aging effect of expansion and cracking due to reaction with aggregates are not applicable on the basis of the use of non-reactive aggregates whose acceptability was established using industry standards and ASTM tests. In a letter dated June 27, 2001, the staff asked the applicant to indicate whether the investigations, tests, and petrographic examinations of aggregates were performed in accordance with ASTM C295-54 or ASTM C227-50. If not, then provide the justification for conclusion that this aging effect is not applicable (RAI 3.5-9). By letter dated July 11, 2001, the applicant explained that detailed justification, for concluding that cracking due to reaction with aggregates is not an aging effect requiring management, is contained in the Plant Y aging management review documents and these documents are available for inspection at Plant Y. Because the applicant did not provide sufficient information for the staff review, as requested in this RAI, the staff could not conclude that the aging effect of expansion and cracking due to reaction with aggregates are not applicable based on the use of non-reactive aggregates. This is an open item (3.5.3-2).

Because Plant Y concrete structures are founded on fossiliferous limestone bedrock with crushed fill, the applicant eliminated the aging effects for; (1) cracks, distortion, and increase in component stress level due to settlement and (2) reduction in foundation strength due to erosion of porous concrete subfoundation. The applicant indicated that their foundation

material is suitable for foundation system with no significant structural settlement expected. In a letter dated June 27, 2001, the staff asked the applicant to clarify whether the concrete structures are founded on bedrock (RAI 3.5-10). By letter dated July 11, 2001, the applicant explained that the plant is built on crushed limestone (engineered fill) which was placed on limestone bedrock. The applicant indicated that the absence of plant specific history of any settlement problems is very strong evidence that settlement is not an aging effect requiring management. The staff concurs with the applicant's assessment; thus no aging management program is necessary for aging effects resulted from settlement and subfoundation.

The applicant stated that the aging effect of loss of strength and modulus due to elevated temperatures is not applicable because the hot piping penetrations were designed and constructed to maintain concrete components below the degradation threshold and localized temperature limits of the ACI standards without forced ventilation. The applicant also stated that no other containment structure concrete components are exposed to elevated temperatures. Because the aging effects due to elevated temperatures probably would not be identified by visual inspection, the staff, in a letter dated June 27, 2001, asked the applicant to provide (1) the general temperature limit corresponding to the degradation threshold and localized temperature limit referred to in the LRA and (2) available data that demonstrate the general and local temperatures during operation of the plant have not exceeded the specified temperature limits (RAI 3.5-11). By letter dated July 11, 2001, the applicant responded that the temperature limits are greater than 66°C (150°F) general and greater than 93°C (200°F) local. The applicant further explained that containment temperatures are limited by Technical Specifications to 49°C (120°F) and local temperatures are limited by design. Since the applicant did not provide the supporting data that could demonstrate the general and local temperatures during operation of the plant, the staff could not verify whether the plant exceeded the specified temperature limits. Since the applicant did not submit the supporting data (available plant records), the staff could not concur with the applicant's conclusion that the aging effect for loss of strength and modulus due to elevated temperatures is not applicable to Plant Y. This is an open item (3.5.3-3).

The staff noted that Section 3.5.1.1.2 of the LRA did not evaluate as an aging effect the loss of bond between the concrete and steel due to steel corrosion. In a letter dated June 27, 2001, the staff asked the applicant to provide a description of an aging management program if this aging effect is applicable. If it is not applicable, provide the justification for concluding that this is not applicable (RAI 3.5-6). By letter dated July 11, 2001, the applicant explained that loss of bond between the concrete and steel is caused by the loss of material due to corrosion of the embedded steel. At Plant Y, loss of material due to corrosion of embedded steel is an aging effect requiring management. The staff concurs with the applicant's assessment. Therefore, loss of bond does not need to be identified as a separate aging effect requiring management.

The applicant stated that they had reviewed industry and plant-specific operating experience in the Section 3.5.1.1.3, "Operating Experience," of the LRA. The review included a survey of Plant Y non-conformance reports, licensee event reports, and condition reports for any documented instances of containment structure concrete component aging and interviews with responsible engineering personnel. Based on these reviews, the applicant concluded that "no aging effects requiring management (of concrete components) were identified from this review beyond those identified in Section 3.5.1.1.2" of the LRA. The staff found that this conclusion may not be consistent with some of the reference documents cited in Section 3.5.1.1.3 of the

LRA. As an example, NUREG-1522, “Assessment of Inservice Conditions of Safety-Related Nuclear Plant Structures,” has identified aging effects beyond those identified in Section 3.5.1.1.2 of the LRA where degradation of concrete has occurred and some of these areas would warrant aging management. In a letter dated June 27, 2001, the staff asked the applicant to describe instances of accessible and inaccessible concrete aging degradation observed at Plant Y even if they have been identified as “not requiring aging management.” The staff further asked the applicant to provide a description of degradation occurrences from the reviews of the non-conformance reports, license event reports, and condition reports as well as interview with responsible engineering personnel (RAI 3.5-12). By letter dated July 11, 2001, the applicant responded that detailed plant history is contained in the Plant Y aging management review documents and these documents are available for inspection at Plant Y. Because the applicant did not provide sufficient information for the staff review, as requested in this RAI, and operating experience (e.g. NUREG-1522) indicates that concrete may degrade. This is an open item (3.5.3-4).

3.5.3.2 Aging Management Programs

In Section 3.5.1.1.4, “Conclusions,” of the LRA, the applicant stated that the containment structure concrete components are adequately managed by its structures monitoring program. The structures monitoring program provides for visual inspection and monitoring of the condition of specific structures and components to ensure that aging degradation leading to loss of intended function will be detected. The applicant further stated that its “structures monitoring program is in agreement with the GALL report in that it is being modified to include a plant specific approach to inspections of inaccessible areas” for containment structure concrete components. The staff noted that there is a statement in Chapter XI-S6, “Structures Monitoring Program", of the GALL report indicating that the structures monitoring program applies to “only to structures and structural components and applicable aging effects that are not addresses by the aging management programs described in Sections XI.S1 thru XI.S4 and XI.S7; i.e., this aging management program can not be substituted for any of the five (5) specified aging management programs.” This, in turn, means that the structures monitoring program can not be substituted for the containment inservice inspection program. Since it appeared that the applicant has credited the structures monitoring program for containment, this is inconsistent with the GALL report as claimed by the applicant. In a letter dated June 27, 2001, the staff asked the applicant to explain why the structures monitoring program as described in the GALL report is being credited for containment (RAI-13). By letter dated July 11, 2001, the applicant responded that Item IIA1.1-e of the GALL report (April 2001) states that American Society of Mechanical Engineers (ASME) Section XI, Subsection IWL is an acceptable program for accessible areas (exterior above grade) and a plant specific aging management program is required for inaccessible areas (exterior below grade). The structures monitoring program is the plant-specific program for Plant Y. The applicant also noted that the quoted restriction on the applicability of the structures monitoring program has been deleted in the current GALL report (April 2001). However, the applicant has not submitted the plant-specific information on how the structures monitoring program would adequately manage aging for inaccessible areas of containment. Therefore, aging management of inaccessible areas of containment is an open item (3.5.3-5).

Section 3.5.1.1.2 and Table 3.5-2 of the LRA also indicated that only concrete components of the containment concrete structure below groundwater require aging management (i.e.,

inaccessible area). The applicant has not credited ASME Section XI, Subsection IWL which is an existing mandated program that requires inservice examination of all accessible concrete surfaces of containment (i.e., above groundwater). For the containment concrete (dome, walls, and basemat), the staff found sufficient operating experience that demonstrates the need for aging management. As reported in NRC SECY-96-080, "Issuance of Final Amendment to 10 CFR 50.55a to Incorporate by Reference the ASME Boiler & Pressure Vessel Code (ASME Code), Section XI, Division I, Subsection IWE and Subsection IWL," April 16, 1996, "...nearly one-half of the concrete containments have reported degradation related to the concrete or the post-tensioning system." Consequently, 10 CFR 50.55a requires inservice inspection of containment concrete in accordance with ASME Section XI, Subsection IWL (Examination Category L-A) and also specifies additional provisions beyond those required in Subsection IWL. The applicant's determination is inconsistent with the requirements of IWL Examination Category L-A, which must be implemented during the current licensing term and will be carried forward to the period of extended operation per 10 CFR 50.55a. This is a result of the applicant not identifying concrete degradation as requiring management for license renewal. The staff has already identified concrete degradation as an open item under Section 3.5.3.1 above.

Under the operating experience, the structures monitoring program in Appendix B of the LRA described inspections that have been performed for the containment and other structures in 1996 and 1997, and in 1999, and 2000. The LRA stated that no significant deterioration has been identified in the inspections performed. In a letter dated June 27, 2001, the staff asked the applicant to describe instances of degradation observed during these two inception periods for containment structural components (RAI 3.5-16). By letter dated July 11, 2001, the applicant responded that detailed plant history is contained in the Plant Y aging management review documents and they are available for inspection at Plant Y. Because the applicant did not provide sufficient information for the staff review, as requested in this RAI, this is an open item (3.5.3-6).

The structures monitoring program in Appendix B of the LRA indicated that the aging management program is credited for managing only the effects of loss of material for selected structures within the scope of license renewal. In a letter dated June 27, 2001, the staff asked the applicant to explain the inconsistency between the structures monitoring program described in Appendix B and the aging effects described in Section 3.5.1.1.2 of the LRA (RAI 3.5-15). By letter dated July 11, 2001, the applicant responded that the other aging effects (cracking and change in material properties) were inadvertently omitted from the structures monitoring program in Appendix B of the LRA. The staff finds this response acceptable because the applicant will make the necessary changes to maintain consistency.

3.5.3.5 Final Safety Analysis Report (FSAR) Supplement

The staff reviewed the proposed FSAR supplement in Appendix B of the LRA for the structures monitoring program to manage containment concrete components. However, because of the open items identified above, such as the applicant's proposed plant-specific use of the structures monitoring program to manage inaccessible areas, the staff could not complete its review until these open items are resolved. In addition, the FSAR supplement for the other aging management programs relied on for the structures and structural components was not included as part of this demonstration project; therefore, the FSAR supplement for the other aging management programs is outside the scope of the staff review.

3.5.4 Conclusions

The staff has reviewed the information in Section 3.5 of the LRA. The staff has identified open items in Section 3.5.3 above. If the applicant resolves these items, the staff will be able to conclude that the applicant has demonstrated that the aging effects associated with the identified structures and structural components will be adequately managed so that there is reasonable assurance that these components will perform their intended functions in accordance with the current licensing basis during the period of extended operation. The staff will also be able to conclude that the FSAR supplement for Plant Y provides an acceptable description of the programs and activities for managing the effects of aging of the structures and structural components for the period of extended operation. These conclusions are based on the fact that certain items identified in the above evaluation were outside of the scope of the staff review for the purposes of this demonstration project and therefore were not required to be provided for the purposes of this review.