



US Nuclear Regulatory Commission

US License Renewal Workshop

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Division of License Renewal
March 28-30, 2007

Workshop Agenda

Day	Topic	Time
1	Introduction	10:00
	Historical Backgrounds	10:15
	License Renewal Process Safety Review Environmental Review	10:30
	Discussion	15:45
	Adjourn	18:00
	2	License Renewal Application Scoping and Screening Integrated Plant Assessment Time-Limited Aging Analyses Final Safety Analyses Report
License-Renewal Inspection Activities		
Interim-Staff Guidance		



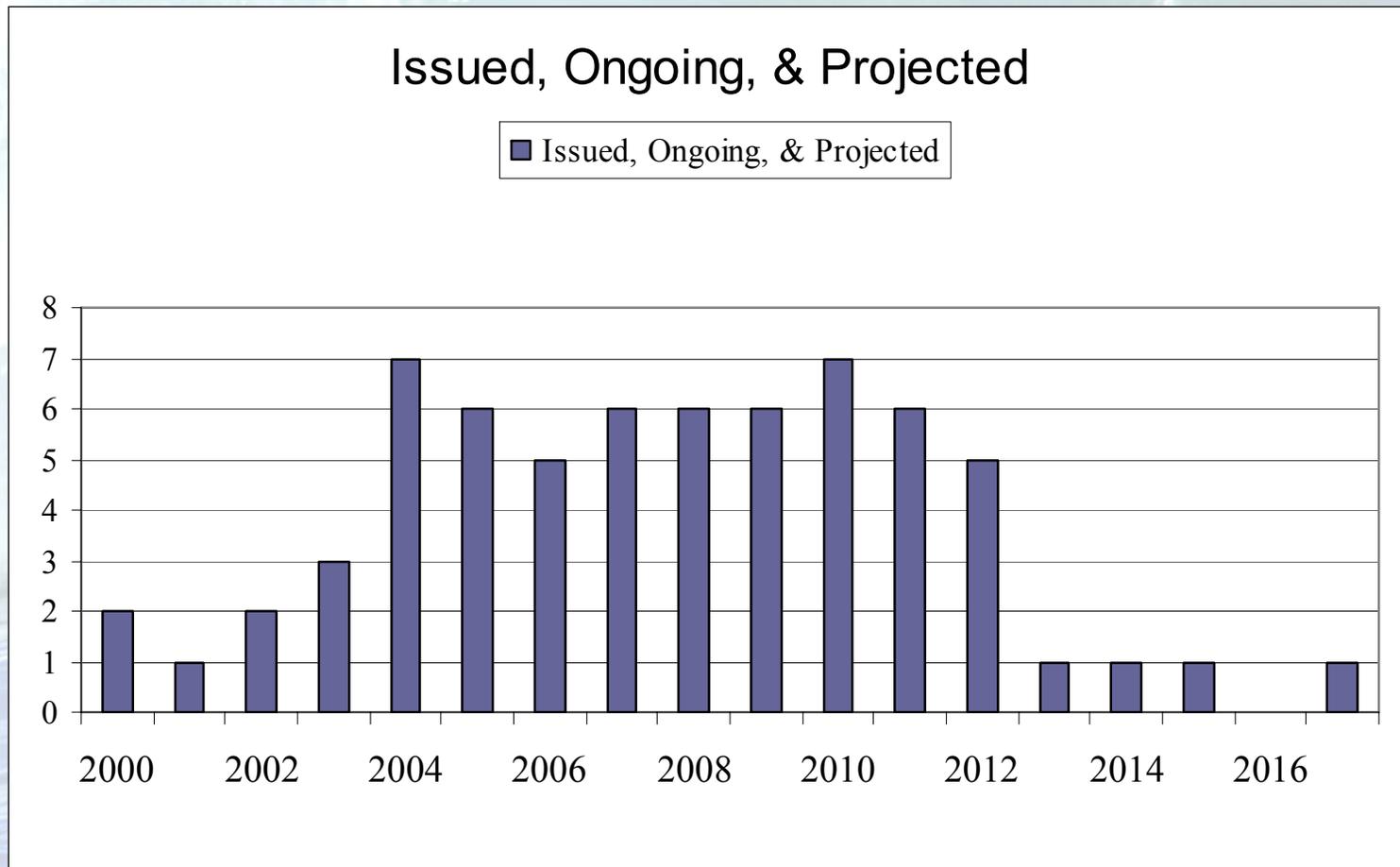
Workshop Agenda

Day	Topic	Time
2	Discussion	15:45
	Adjourn	18:00
3	License-Renewal Guidance Documents	10:00
	Audit	
	Issues of Interests	
	Discussion	15:45
	Adjourn	18:00

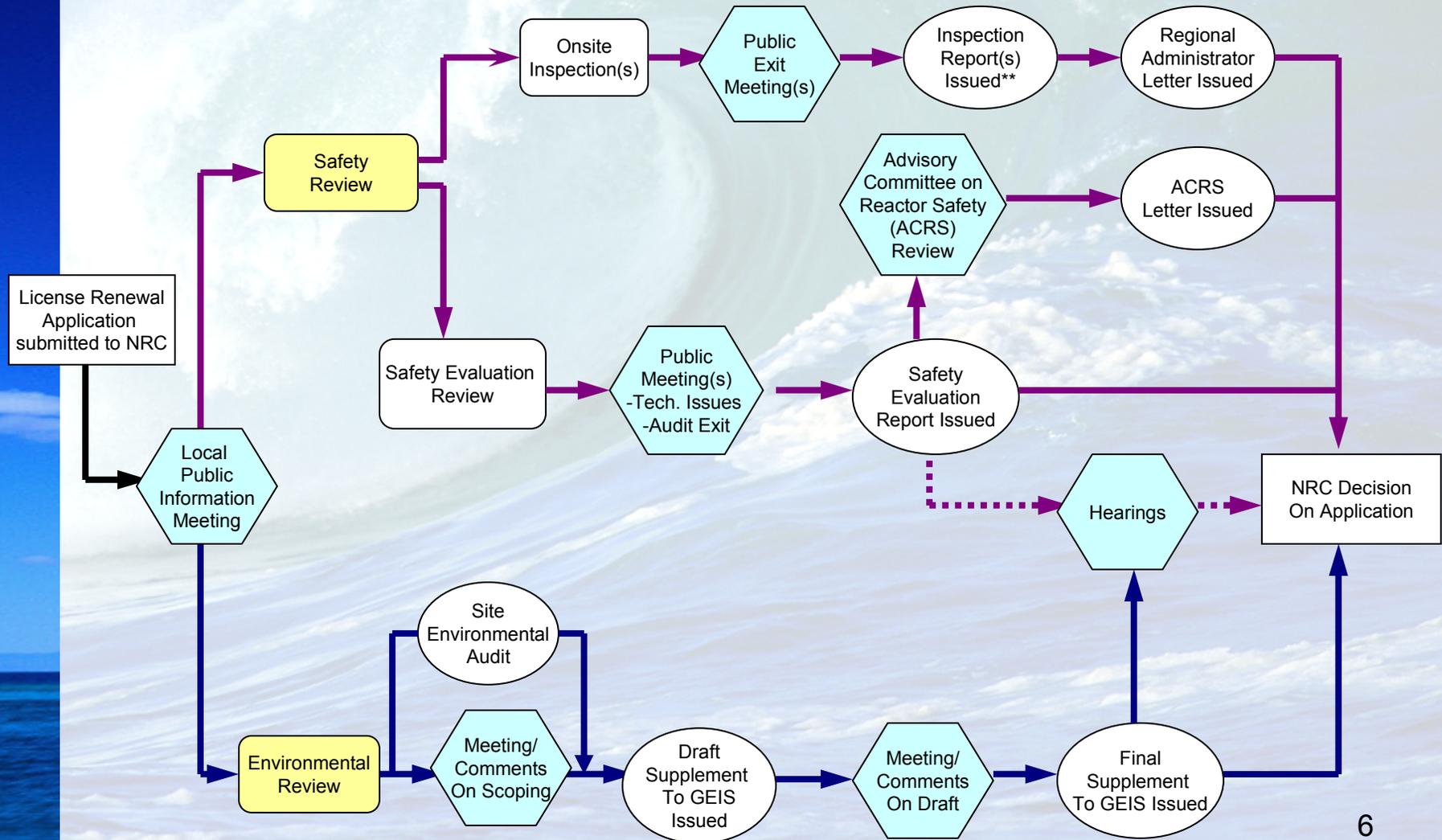
Introduction

- Atomic Energy Act, as amended 1954
 - 40-year license to operate
 - Allows for renewal
- 10 CFR 54, “License Renewal Rule” allows a new license to be issued to operate for up to 20 years beyond the current 40-year term

Renewal Licenses Issued by Site



License Renewal Program

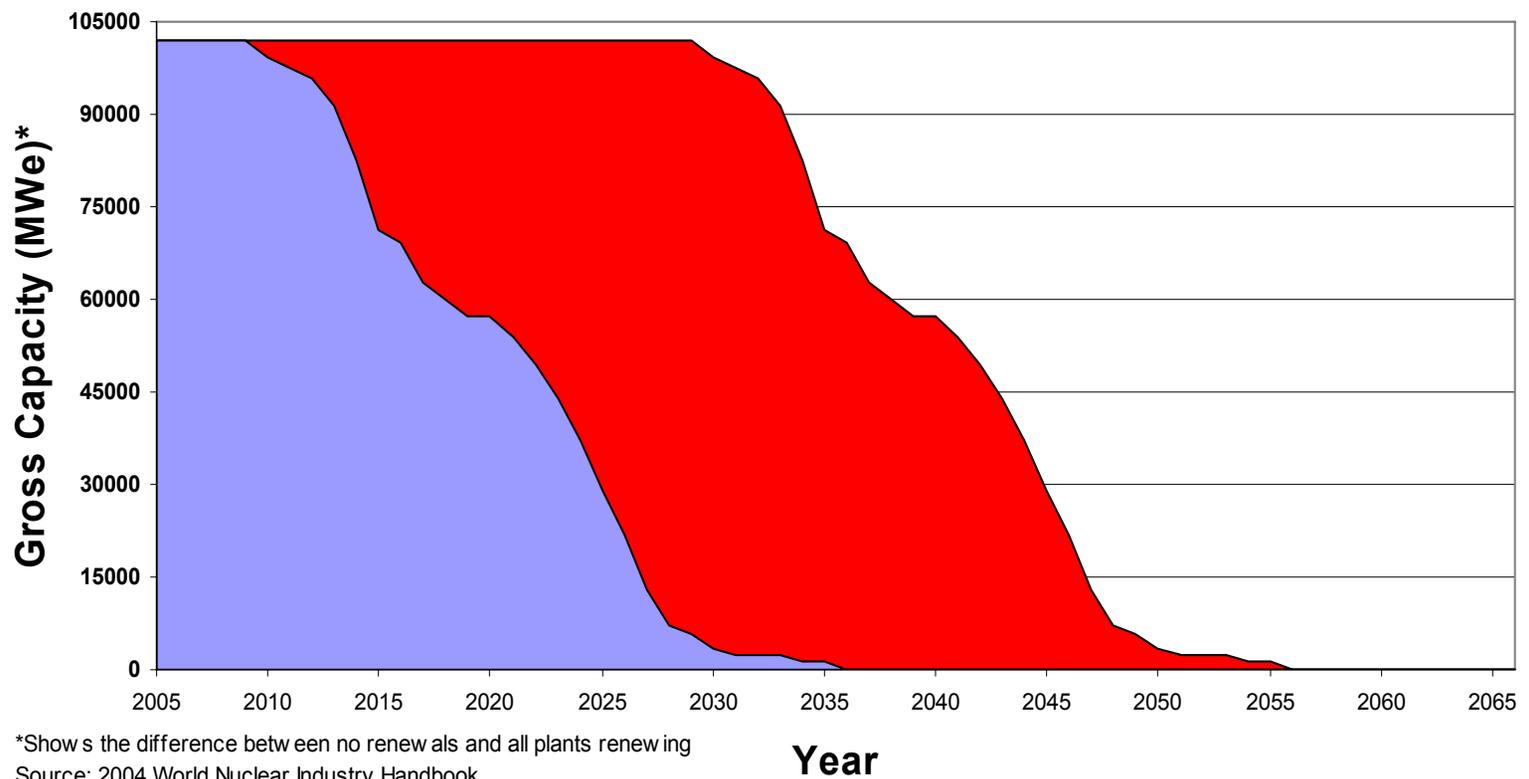


License Renewal Review Process

- Nuclear power plants
 - License renewal is voluntary
 - Decision rest with owners
 - Plant's economic situation
 - Whether it can meet NRC's requirement

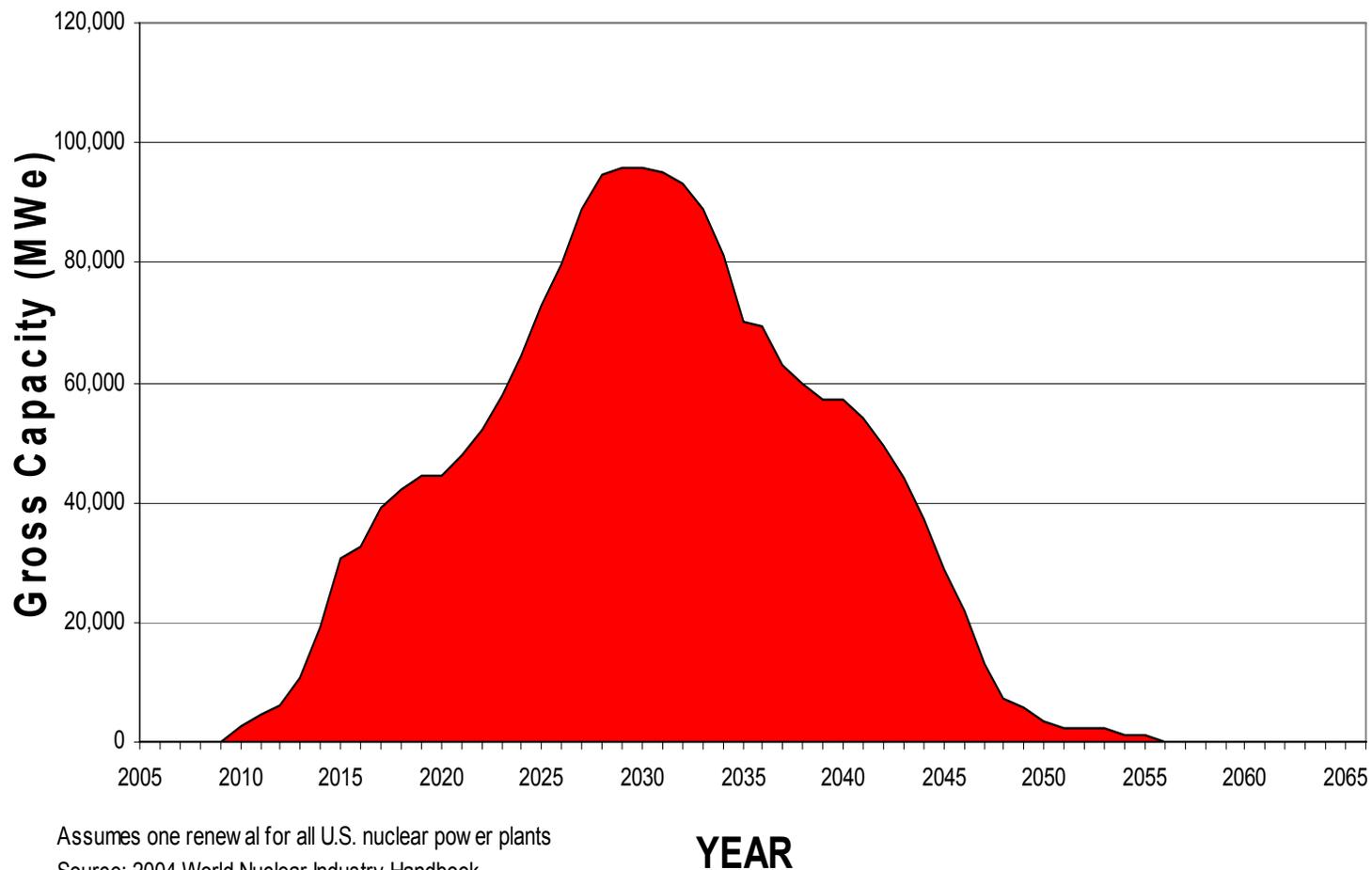
US License Extension Capacity

License Renewal Impact on Nuclear Power



US License Extension Capacity

Additional Nuclear Power Capacity Due to License Renewal



Assumes one renewal for all U.S. nuclear power plants

Source: 2004 World Nuclear Industry Handbook

YEAR

License Renewal Status

Completed Applications	Type	Date
Calvert Cliff, Unit 1 and 2	PWR	03/23/00
Oconee Nuclear Station, Unit 1, 2 and 3	PWR	05/23/00
Arkansas Nuclear One, Unit 1	PWR	06/20/01
Edwin I. Hatch Nuclear Plant, Units 1 & 2	BWR	01/15/02
Turkey Point Nuclear Plant, Units 3 & 4	PWR	06/06/02
North Anna and Surry, Power Stations	PWR	03/20/03
Peach Bottom, Units 2 & 3	BWR	05/07/03
St. Lucie, Units 1 & 2	PWR	10/02/03
Fort Calhoun Station	PWR	11/04/03
McGuire and Catawba, Nuclear Stations	PWR	12/05/03
Robinson Nuclear Plant	PWR	04/19/04
R.E. Ginna Nuclear Power Plant	PWR	05/19/04
V.C. Summer Nuclear Station	PWR	04/23/04
Dresden and Quad Cities, Nuclear Power Stations	BWR	10/28/04
Joseph M. Farley Nuclear Plant	PWR	05/12/05



License Renewal Status

Completed Applications	Type	Date
Arkansas Nuclear One, Unit 2	PWR	06/30/2005
D.C. Cook Nuclear Plant	PWR	08/30/2005
Millstone Nuclear Power Station, Units 2 and 3	PWR	11/28/2005
Point Beach Nuclear Plant, Units 1 & 2	PWR	12/22/2005
Browns Ferry Nuclear Plant	BWR	05/04/06
Brunswick Steam Electric Plant	BWR	06/26/06
Nine Mile Point Units 1 & 2	BWR	10/31/06
Monticello Nuclear Generating Plant	BWR	11/08/06
Palisades Nuclear Plant	PWR	01/17/2007

License Renewal Status

Applications Under Review	Type	Date
Oyster Creek Nuclear Generating Station	BWR	07/22/2005
Pilgrim Nuclear Power Station	BWR	01/27/2006
Vermont Yankee Nuclear Power Station	BWR	01/27/2006
James A. FitzPatrick Nuclear Power Plant	BWR	08/01/2006
Susquehanna Steam Electric Station	BWR	09/15/2006
Wolf Creek Generating Station	PWR	10/04/2006
Shearon Harris Nuclear Power Plant	PWR	11/16/2006

Historical Background

- 1982 – Established nuclear plant aging research
- 1991 – First published 10 CFR Part 54
 - Defined age-related degradation (license renewal)
 - Industry-sponsored demonstration program
- 1995 – Published Amended 10 CFR 54
 - More stable
 - More predictable
 - More efficient

Historical Background

- Industry-sponsored demonstration program results
 - Many aging effects are dealt with adequately during the initial license period
 - Did not allow credit for existing programs
 - e.g., Maintenance Rule

Historical Background

- Maintenance Rule
 - 10 CFR 50.65, “Requirement for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants”
 - Risk-informed, performed-based regulation
 - Approximately 10% of routine baseline inspection activities
 - Important part of the NRC’s regulatory framework

Historical Background

- Maintenance Rule objectives
 - To monitor the effectiveness of maintenance activities for safety-significant plant equipment in order to minimize the likelihood of failures and events caused by the lack of effective maintenance
 - To broaden the NRC's capability to take enforcement action where maintenance activities fail to provide reasonable assurance that safety significant systems, structures, and components (SCCs) are capable of performing their intended functions

Historical Background

- Maintenance Rule
 - History
 - 1980s
 - Transients and scrams – BOP problems
 - Equipments problems not under regulation
 - NRC evaluation:
 - » Maintenance Rule Necessary ?

Historical Background

- Maintenance Rule

- History

- NRC evaluation result:

- “Clear link between effective maintenance and safety as it relates to factors such as number of transients and challenges to safety systems”

Historical Background

- Maintenance Rule
 - Actions following evaluation:
 1. 10 CFR 50.65 – July 10, 1991
 - *“Requirements for Monitoring the Effectiveness of Maintenance at Nuclear power plants”*
 - Paragraph (a)(4) – risk assessment – added in 1994
 2. Implementation guidance – NUMARC 93-10
 - *“Industry Guideline for Monitoring the Effectiveness at Nuclear Power Plants”*



Historical Background

- Maintenance Rule
 - Actions following evaluation:
 3. Reg. Guide 1.160 – NUMARC 93-01
 - *“Monitoring the Effectiveness of Maintenance at Nuclear Power Plants”*
 4. Reg. Guide 1.182 – NUMARC 93-10, Feb 00
 - *“Assessing and Managing Risk Before Maintenance Activities at Nuclear Power Plants”*
 5. NUREG 1864
 - *“Lessons Learned from the Maintenance Rule baseline inspections”*

The License Renewal Rule (10 CFR 54)

• Definition	54.3
• Scoping criteria	54.4
• Safety review	54.21
• Environmental review	54.23
• ACRS review	54.25
• Hearing	54.27
• Matters not subject to a renewal review	54.30
• Additional records and recordkeeping requirement	54.37



License Renewal Process

Safety review

Environmental review

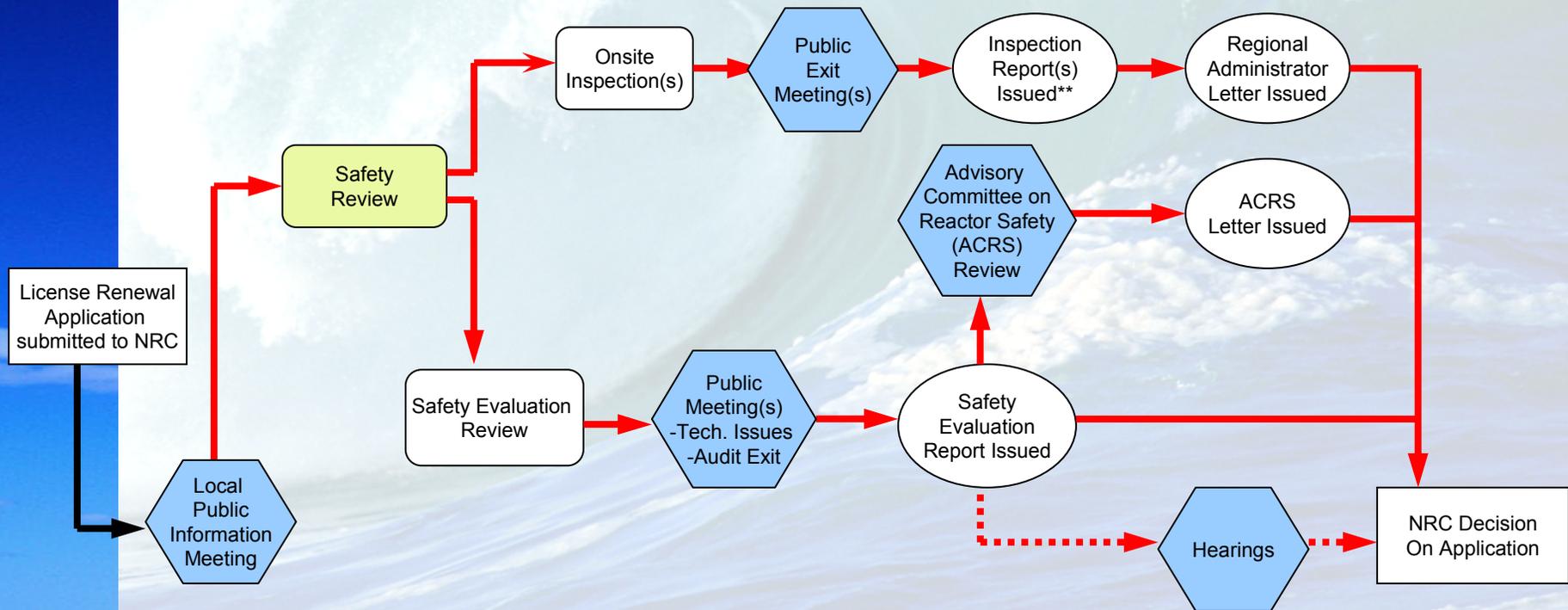
License Renewal Process

- Regulatory process ensures the safety of plants



- License renewal does not challenge current licensing basis

Safety Review Process



Safety Review Process

- Received submittal of license renewal application by operating plants
- Established technical and administrative requirement for renewal
- Reviewed to ensure adequate aging management programs are in place to maintain the current licensing basis for the period of extended operation

Safety Review Process

- Initial review of the license renewal applicant
 - Safety Acceptance Review
 - Items to consider for review for sufficiency of License Renewal Application
 - Conclusion:
 - Acceptable for docketing, technical review
 - Unacceptable for docketing as a sufficient renewal application

Safety Review Process

- Safety Acceptance Review Procedure
 - Standard review plan (SRP-LR or NUREG 1800)
 - Table 1.1-1 checklist
 - Yes = applicant provided reasonably complete information in the LRA
 - No = insufficient information
 - Application is not acceptable if there is a “No” checked in any category other than VI (timeliness provision)

Safety Review Process

NUREG 1800 – Table 1.1-1 checklist - General

Table 1.1-1. Acceptance Review Checklist for Docketing of Timely and Sufficient Renewal Application

		<u>Yes</u>	<u>No</u>
I.	General Information		
1.	Application identifies specific unit(s) applying for license renewal	<input type="checkbox"/>	<input type="checkbox"/>
2.	Filing of renewal application 10 CFR 54.17(a) is in accordance with:		
A.	10 CFR Part 2, Subpart A; 10 CFR 2.101	<input type="checkbox"/>	<input type="checkbox"/>
B.	10 CFR 50.4		
a.	Application is addressed to the Document Control Desk as specified in 10 CFR 50.4(a)	<input type="checkbox"/>	<input type="checkbox"/>
b.	Signed original application and 13 copies are provided to the Document Control Desk. One copy is provided to the appropriate Regional office [10 CFR 50.4(b)(3)]	<input type="checkbox"/>	<input type="checkbox"/>
c.	Form of the application meets the requirements of 10 CFR 50.4(c)	<input type="checkbox"/>	<input type="checkbox"/>
C.	10 CFR 50.30		
a.	Application is filed in accordance with 10 CFR 50.4 [10 CFR 50.30(a)(1)]	<input type="checkbox"/>	<input type="checkbox"/>
b.	Application is submitted under oath or affirmation [10 CFR 50.30(b)]	<input type="checkbox"/>	<input type="checkbox"/>

Safety Review Process

- NUREG 1800 – Table 1.1-1 checklist –
Technical
 - Additional checklists from lessons learned and repetitive RAIs
 - More technical in nature
 - Return to applicant
 - Any major item missing
 - A large number of minor items

Safety Review Process

NUREG 1800 – Table 1.1-1 checklist - Technical

II. Technical Information

1. An integrated plant assessment [10 CFR 54.21(a)] is provided, and consists of:
 - A. For those SSCs within the scope of license renewal [10 CFR 54.4], identification and listing of those structures and components that are subject to an aging management review (AMR) in accordance with 10 CFR 54.21(a)(1)(i) and (ii)
 - a. Description of the boundary of the system or structure considered (if applicant initially scoped at the system or structure level). Within this boundary, identification of structures and components subject to an AMR. For commodity groups, description of basis for the grouping
 - b. Lists of structures and components subject to an AMR
 - B. Description and justification of methods used to identify structures and components subject to an AMR [10 CFR 54.21(a)(2)]

Safety Review Process

- Safety Acceptance Review
 - Minor items missing may be requested through RAIs
 - Applicant may submit a supplement to the LRA before acceptable determination/docketing
 - If unacceptable:
 - Project manager –writes letter to applicant
 - Letter 1) Deficiencies
 - 2) Opportunity for applicant to modify LRA
 - Goal: 30-day for letter to applicant

Safety Review Process

- Items for sufficiency review of license renewal application
 - Technical part of license review application
 - Occur same time as acceptance review
 - Increase efficiency of the reviewer by identifying areas that need additional information
- ≠ acceptance review
 - NRC does not reject application based on items not included in checklist

Safety Review Process

Guidance Documents

NRC

- Standard Review Plan (SRP-LR)
- Generic Aging Lessons Learned (GALL) Report
- Reg. Guide 1.188 for L.R.

Nuclear Energy Institute (NEI)

- NEI 95-10 “Industry Guidelines for Implementing the Requirements of 10 CFR Part 54 -The License Renewal Rule

Safety Review Process

- Regulatory process ensures the safety of plants
 - Bulletins
 - Generic Letters
 - Information Notices
 - Orders
 - New/revised regulations
 - Special and routine inspection activities
 - Performance assessments and continuous oversight
 - Enforcement
 - Regulatory Information Summary (RIS)

Safety Review Process

- Applicant must prepare and submit a license renewal application
 - Scoping and Screening (10 CFR 54.4)
 - Integrated plant assessment (10 CFR 54.21)
 - Time-limited aging analyses
 - Update final safety analysis report
 - Programs and activities for aging effects
 - Evaluation of time-limited aging analyses
 - Revisions to operating technical specification
 - Environmental report

Safety Review Process

- Scope of LR Rule --- 10 CFR 54.4
 - Safety-related SSCs that
 - Maintain integrity of the reactor coolant pressure boundary
 - Ensure capability to shut down and maintain a safe shutdown condition
 - Prevent or mitigate offsite exposures comparable to those in §50.34(a)(1), §50.67(b)(2), or §100.11
 - Non-safety related SSCs whose failure could prevent safety-related function



Safety Review Process

- Scope of LR Rule (cont.)
 - Systems, structures, and components relied upon for compliance with regulations
 - Fire protection
 - Environmental qualification
 - Pressurized thermal shock
 - Anticipated transients without scrams
 - Station blackout

Safety Review Process

- Scoping and screening
 - 10 CFR 54.21, “Contents of Application Technical Information,” requires each LRA contain an IPA
 - 10 CFR 54.21 (a)(1) requires the LR applicant, in its IPA to identify and list the structures and components (SCs) subject to an AMR
 - 10 CFR 54.21 (a)(2) further requires that the methods used to identify and list the SCs be described and justified
 - Contained in Section 2 of the applicant’s LRA

Safety Review Process

- Scoping and screening
 - Scoping
 - Identification of the SSCs within the scope of license renewal
 - Screening
 - For those SSCs within the scope of license renewal, the identification of “passive”, “long-lived” structures and components that are subject to an AMR

Safety Review Process

- Integrated Plant Assessments
 - Identify intended functions that a systems, structure, or component must perform
 - Describe/justify methods used to identify structures and components subject to an AMR from those structures and components within scope
 - Demonstrate effects of aging will be adequately managed so that the intended function will be maintained consistent with the CLB for the period of extended operation

Safety Review Process

- Integrated Plant Assessment
 - Active
 - Generally excluded from review
 - Functional degradation readily detected and corrected
 - » Routine surveillance
 - » Performance indicators
 - » Maintenance
 - Surveillance and maintenance program for period of extended operation

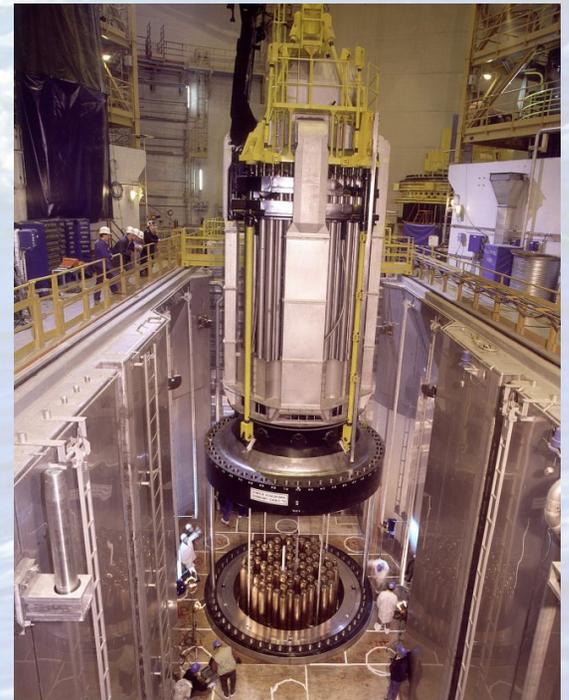
Safety Review Process

- Integrated Plant Assessment
 - Active
 - Motors
 - Diesel generators
 - Control rod drives
 - Cooling fans
 - Switchgear
 - Breakers
 - Batteries
 - Relays
 - Switches



Safety Review Process

- Integrated Plant Assessment
 - Passive and long-lived
 - Reactor vessel
 - Reactor coolant system piping
 - Steam generators
 - Pressurizer
 - Pump casings
 - Valve bodies
 - Containment building
 - Electrical cables
 - Electrical cabinets



Safety Review Process

- Integrated Plant Assessments

Ten Attributes for Acceptable Aging Management Program

- Scope
- Preventive action
- Parameter monitored or inspected
- Aging effect
- Monitoring and trending
- Acceptance criteria
- Corrective actions
- Confirmation process
- Administrative controls
- Operating experience

Safety Review Process

- Time-Limited Aging Analyses (TLAA)
 - What is a TLAA?
 - TLAA are plant-specific safety analyses that are based on assumed 40-year life
 - 10 CFR Part 54 gives the requirements for renewal of operating licenses for nuclear power plants

Safety Review Process

- TLAA
 - Acceptance criteria
 - License renewal applicant required to provide a list of TLAAAs
 - The applicant must show
 - The analyses will remain valid for the period of extended operation (PEO);
 - The analyses have been project to the end of PEO; or
 - Effects of aging will be adequately managed for the PEO

Safety Review Process

- TLAA
 - Pursuant to 10 CFR 54.21(c)
 - Involve SSC within the scope of LR
 - Consider the effects of aging
 - Involve time-limited assumptions
 - Determined to be relevant for a safety determination
 - Conclusions about the capability of a SSC to perform its intended function
 - Contained in or incorporated by reference in CLB

Environmental Review Process



Environmental Review Process

- Reviewed submittal of supplemental to the environmental report
- Reviewed in accordance with National Environmental Protection Act (NEPA) and the requirements of 10 CFR Part 51, “Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions.”

Environmental Review Process

– Environmental Reviews

- National Environmental Policy Act of 1969, as amended
 - An act to establish a national policy for the environment, to provide for the establishment of a Council on Environmental Quality, and for other purposes
- “Environmental protection regulations for domestic licensing and related regulatory functions” (10 CFR Part 51)

Environmental Review Process

– Guidance Related to Environmental Reviews

- NUREG – 1555, Standard Review Plans for Environmental Reviews for Nuclear Power Plants
 - Supplement 1: Operating License Renewal
- Reg. Guide 4.2, Rev. 2, Preparation of Environmental Reports for Nuclear Power Stations
 - Supplement 1: Preparation of Supplemental Environ. Report for Application of Renewal Nuclear Power Plant Operating License
- Reg. Guide 4.7, Rev. 2, General Site Suitability Criteria for Nuclear Power Stations
- NUREG – 1437, Generic Environmental Impact Statement (GEIS)

Environmental Review Process

– Environmental Impact Statement (EIS)

- Any adverse environmental effects which cannot be avoided should the proposal be implemented
- Alternatives to the proposed action
- Relationship between local short-term uses of environment and the maintenance and enhancement of long-term productivity
- Any irreversible and irretrievable commitments of resources which would be involved in the proposed action should it be implemented

Environmental Review Process

- NUREG-1437, Generic Environmental Impact Statement for License Renewal of Nuclear Plants
 - Prepared in anticipation for license renewal
 - Assesses environ. Impacts for additional 20 years
 - Based on > 1000 reactors-years of operating experience in U.S.
 - Provided technical basis for revision of 10 CFR 51, “Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions” with regard to license renewal

Environmental Review Process

- NUREG-1437, Generic Impact Statement for License Renewal of Nuclear Plants
 - Examines potential impacts of refurbishment activities in preparing to continue to operate
 - Total of 92 potential environmental impacts associated with license renewal identified and evaluated
 - Significance
 - Category

Environmental Review Process

- Terms defined by NRC defining issues in NUREG-1437
 - Significance Level
 - Small: Environmental effects not detectable/so minor that they will neither destabilize nor noticeably alter any important attribute of the resource.
 - » Radiological impacts, those impacts that do not exceed permissible level in the regulations
 - Moderate: Environmental effects are sufficient to alter noticeably, but not to destabilize important attributes of the resource
 - Large: Environmental effects are clearly noticeable and are sufficient to destabilize important attributes of the resource



Environmental Review Process

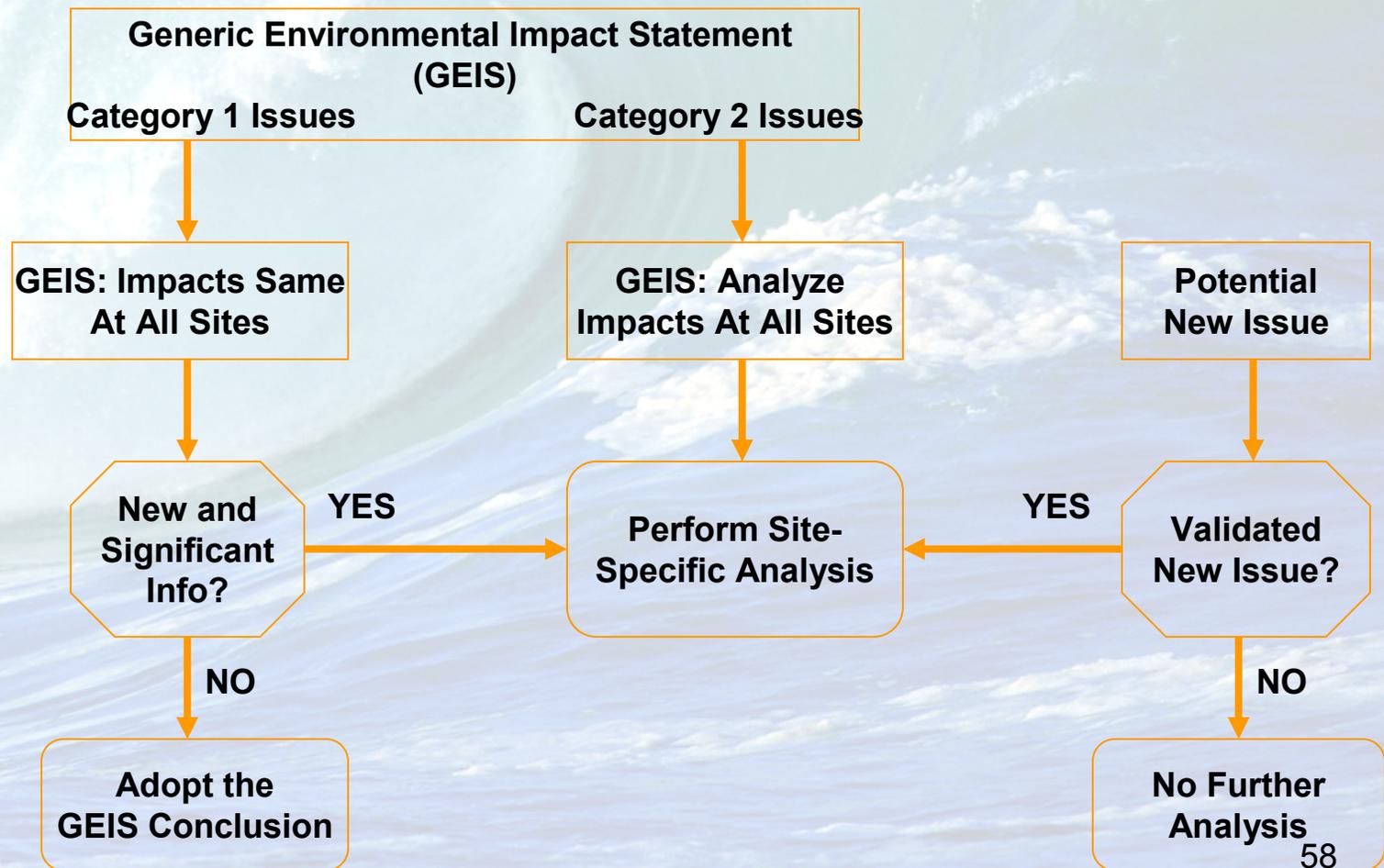
- Terms defined by NRC defining issues in NUREG-1437
 - Category I (meet all 3 criteria)
 1. Environmental impacts associated w/ the issue have been determined to apply either to all plants or, for some issues, to plants having a specific type of cooling system or other specified plant or site characteristics
 2. A single significance level has been assigned to the impacts (except for collective off-site radiological impacts from the fuel cycle and from high waste and spent fuel disposal)
 3. Mitigation of adverse impacts associated with the issue has been considered in the analysis, and it has been determined that additional plant-specific mitigation measures are likely not be sufficiently beneficial to warrant implementation



Environmental Review Process

- Terms defined by NRC defining issues in NUREG-1437
 - Category II
 - Issues that do not meet Category I
 - Meet one or more criteria in Category I

Environmental Review Process



License Renewal Review Process

- Applicant planning license renewal
 - 10 CFR Part 51.53 (c), submit with its application a separate document “Applicant’s Environmental Report – Operating License Renewal Stage”

Environmental Review Process

- What is SAMAs?
 - Analyses are used to identify cost-beneficial severe accident mitigation alternatives (SAMAs)
 - SAMAs are potential changes in plant design, procedures, and training that would reduce plant risk
 - Reduce core damage frequency (CDF), large early release frequency (LERF), or overall severe accident consequences

Environmental Review Process

- Summary of License Renewal Impacts and Mitigation Actions
 - License Renewal Impacts
 - Mitigation
 - Unavoidable Adverse Impacts
 - Irreversible or irretrievable resource commitments
 - i.e., energy and materials used, waste material
 - Short-Term Use Versus Long-Term Productivity of the Environment

Environmental Review Process

- Environmental Review – NUREG-1555, Supplement 1
 - Format
 - Areas of Review
 - Acceptance Criteria
 - Review Procedures
 - Evaluation Findings
 - Implementation
 - References

License Renewal Review Process

- Schedule

Projected Schedule of License Renewal Applications Through FY09

	Plant	Submit	FY05				FY06				FY07				FY08				FY09			
			1Q	2Q	3Q	4Q																
FY05																						
1	Oyster Creek	Jul-05				■	■	■	■	■	■	■	■	■	■	■	■	■				
FY06																						
1	Pilgrim	Jan-06						■	■	■	■	■	■	■	■	■	■	■				
2	Vermont Yankee	Jan-06						■	■	■	■	■	■	■	■	■	■	■				
3	FitzPatrick	Aug-06								■	■	■	■	■	■	■	■	■				
4	Susquehanna 1,2**	Sep-06								■	■	■	■	■	■	■	■	■	TBD	■	■	TBD
FY07																						
1	Wolf Creek *	Oct-06									■	■	■	■	■	■	■	■				
2	Harris *	Nov-06									■	■	■	■	■	■	■	■	■	■	■	■
3	Indian Point 2,3 *	Apr-07																				
4	Vogtle 1,2 *	Jun-07																				
5	Beaver Valley 1,2 *	Aug-07																				
FY08																						
1	Three Mile Island - 1	2Q																				
2	Kewaunee	3Q																				
3	Prairie Island 1,2	3Q																				
4	Cooper	Sep-08																				
FY09																						
1	Duane Arnold	1Q																				
2	STARS Plant	1Q																				
3	Entergy Plant	Jan-09																				
4	Crystal River	2Q																				
5	Salem 1,2	Sep-09																				
6	Hope Creek	Sep-09																				

License Renewal Review Process

- Schedule
 - 22 month review schedule without hearing
 - 30 month schedule with hearing
 - Unique schedule for non-standard applications
 - Continuously monitor effort to identify process improvements
 - Improved safety review process being implemented



License Renewal Application (LRA)

License Renewal Application

- To be included:
 - Scoping and Screening (10 CFR 54.4)
 - Integrated plant assessment (10 CFR 54.21)
 - Time-limited aging analyses
 - Update final safety analysis report
 - Programs and activities for aging effects
 - Evaluation of time-limited aging analyses
 - Revisions to operating technical specification

Scoping and Screening

- Scoping
- Screening
 - “Passive”
 - “Long-Lived”
- Review Process
 - Scoping
 - Screening
 - Review Procedures

Scoping and Screening

- Scoping
 - Identification of the SSCs within the scope of LR
- Screening
 - For those SSCs within the scope of license renewal, the identification of “passive”, “long-lived” structures and components that are subject to an AMR

Scoping and Screening

Typical LRA Table of Contents

- 2.1 SCOPING AND SCREENING METHODOLOGY
- 2.2 PLANT LEVEL SCOPING RESULTS
- 2.3 SCOPING AND SCREENING RESULTS:
MECHANICAL SYSTEMS
- 2.4 SCOPING AND SCREENING RESULTS:
STRUCTURES AND COMPONENTS
SUPPORTS
- 2.5 SCOPING AND SCREENING RESULTS:
ELECTRICAL AND INSTRUMENTATION AND
CONTROLS SYTEMS

Scoping and Screening

- Scoping methodology should be consistent with NEI 95-10 Section 3.0, “Identify the SSCs Within the Scope of License Renewal and Their Intended Functions”
- Screening methodology should be consistent with NEI 95-10 Section 4.1, “Identification of Structures and Components Subject to an Aging Management Review and Intended Functions”

Scoping

- Process
 - Define systems and structures
 - Provide descriptions and listed all function to define all systems and structures in the plant using USAR, MR scoping documents, design drawings, and other design documents
 - Evaluate systems and structures against scoping criteria in 10 CFR 54.4(a)(1), (2) and (3)
- Systems and structures meeting criteria in 10 CFR 54.4(a)(1)(2)(3) are within scope of LR

Scoping

- Considerations - SSCs governed by an applicant's technical specs. that are relied upon to remain functional during a DBE
 - Materials used for scoping
 - UFSAR
 - Applicable NRC regulations
 - License conditions
 - NRC orders
 - Exemptions
 - Any generic communication, SE, or licensee commitment

Scoping

Example

TABLE 2.2-1
PLANT LEVEL SCOPING RESULTS

Mechanical Systems		
System or Commodity	Within Scope of License Renewal?	Comments
Administration Building Heating, Ventilation, and Air Conditioning (HVAC) System (Section 2.3.3.A.1)	Yes	
Automatic Depressurization System (Section 2.3.2.A.1)	Yes	
Circulating Water System (Section 2.3.3.A.2)	Yes	Includes the following subsystems: <ul style="list-style-type: none"> • Screen Washing • Main Condenser Circulating Water • Hydraulic Fluid to Tempering Gate Actuator • Main Condenser Circulating Water Box Vents
City Water System (Section 2.3.3.A.3)	Yes	
Compressed Air Systems (Section 2.3.3.A.4)	Yes	Includes the following subsystems: <ul style="list-style-type: none"> • Breathing Air System • House Service Air System • Instrument Air System

Scoping

Yes: Passive
No: Active

TYPICAL STRUCTURE, COMPONENT AND COMMODITY GROUPINGS
AND ACTIVE/PASSIVE DETERMINATIONS FOR THE
INTEGRATED PLANT ASSESSMENT

NEI 95-10 Revision 6
June 2005

ITEM	CATEGORY	STRUCTURE, COMPONENT, OR COMMODITY GROUPING	STRUCTURE, COMPONENT, OR COMMODITY GROUPING MEETS 10CFR54.21(a)(1)(i) (YES/NO)
1	Structures	Category I Structures Note: If a dam is included in this category – see Appendix C, Reference 4 for guidance on an acceptable aging management program	Yes
2	Structures	Primary Containment Structure	Yes
3	Structures	Intake Structures	Yes

Screening

- Process
 - Establish structure and component lists for in-scope systems and structures using master equipment list, drawings, design documents, and plant walkdowns
 - Review structure and component list and identify those that are passive, long-lived, and support intended functions as subject to AMR
 - Identify component level intended functions for all structures and components subject to AMR
 - Prepare a list of all structure and components subject to AMR with associated component level intended functions

Screening

- “Passive” structures and components
 - Perform their intended functions without moving parts or change in configurations or properties
 - Do not display “a change in state”
 - LR rule focuses on “passive” structures and components because they generally do not have performance and condition characteristics that are readily observable

Screening

- “Long-lived” SCs
 - Not subject to periodic replacement based on qualified life or specified time period
 - Replacement programs may be based on vendor recommendations, plant experience, or any means that establishes a specific replacement frequency under controlled program
 - Passive SCs that are not replaced on the basis of a qualified life or specified time require an AMR

Screening

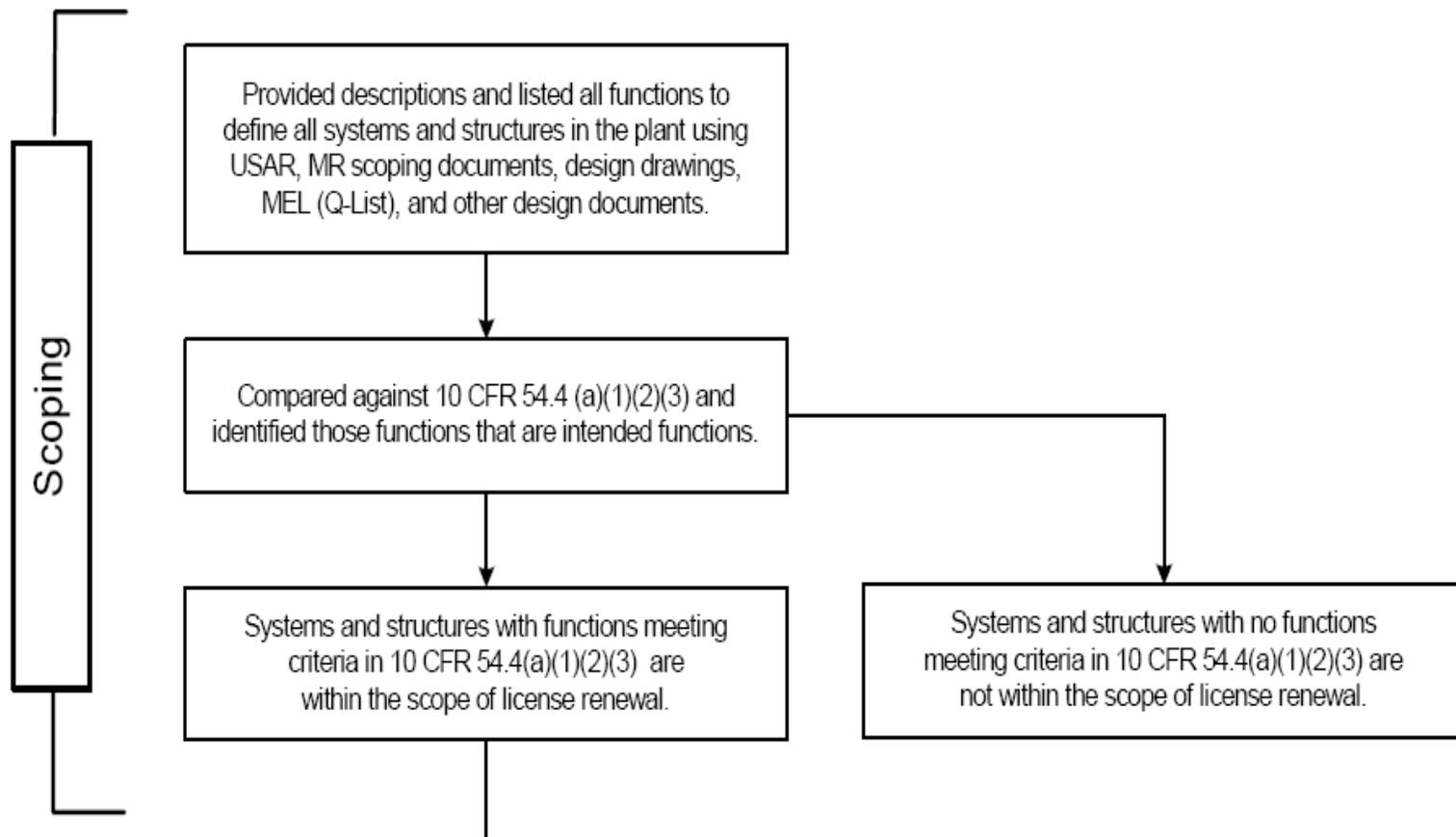
- Example of screening result

**Table 2.3.1.A.1-1
Reactor Pressure Vessel**

Component Type	Intended Functions
Bottom Head	Pressure Boundary, Structural Support
Nozzles	Pressure Boundary
Nozzle Safe Ends	Pressure Boundary
Penetrations: <ul style="list-style-type: none">• Core Differential Pressure• CRD Stub Tube• Flux Monitor• Instrumentation• Vessel Drain	Pressure Boundary
Support Skirt and Attachment Welds	Structural Support
Thermal Sleeves	Structural Integrity
Top Head	Pressure Boundary
Top Head (Closure Studs and Nuts)	Pressure Boundary
Top Head (Flanges)	Pressure Boundary
Top Head (Leak Detection Line)	Leakage Boundary (Spatial) Structural Integrity (Attached)

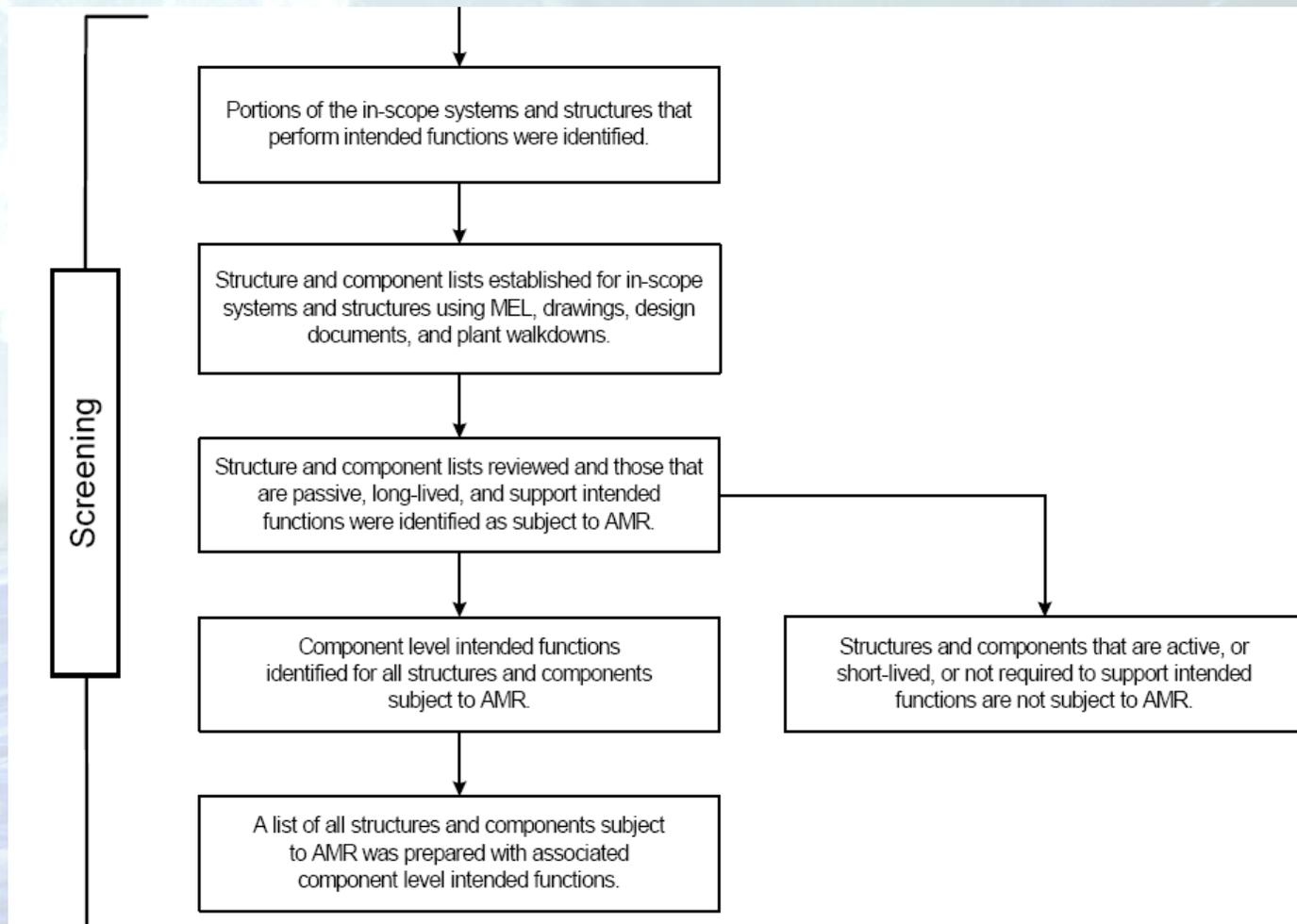
Scoping and Screening

Scoping and Screening Review - Scoping



Scoping and Screening

Scoping and Screening Review - Screening



Review of Scoping and Screening

- NUREG-1800
 - Section 2.1, “Screening and Screening Methodology”
 - To ensure that the applicant describes a process for identifying SSCs that are in scope of LR, in accordance with the requirements of 10 CFR 54.4(a)
 - Section 2.2, “Plant-Level Scoping Results”
 - To ensure that the applicant describes a process for determining the SCs that are subject to an AMR in accordance with the requirement of 10 CFR 54.21(a)(1) and (a)(2)

Review of Scoping and Screening

Preparation for review of scoping and screening

- SER for the initial operating license
- UFASR
- Facility's PRA
- Individual plant examination of external events study
- Applicant's docketed correspondence related to
 - Fire protection
 - Environmental qualification of electrical equipment
 - Fracture toughness req. for protection against pressurized thermal shocks
 - Req. for reduction of risks from anticipated transients without scram
 - Loss of alternating current power (PWR only)

Review of Scoping and Screening

- Scoping
 - Safety-related (SR)
 - Reviewer to ensure that the SR SSCs are identified to satisfactorily accomplish any of the intended functions identified in 10 CFR 54.4(a)(1)
 - Nonsafety-related (NSR)
 - Reviewer to ensure that NSR SSCs whose failure could prevent satisfactory accomplishment of any of the functions identified in 10 CFR 54.4(a)(1) are identified as being within the scope of license renewal
 - “Regulated Events”
 - Reviewer to ensure that SSCs relied on safety analyses or plant evaluations to performed functions that demonstrate compliance with requirements of FP, EQ, PTS, ATWS, and SBO are identified

Review of Scoping and Screening

- Table 2.1-2 Specific Staff Guidance on Scoping -(NUREG-1800, Rev. 1)

Issue	Guidance
Hypothetical failures	<p>For 10 CFR 54.4(a)(2), an applicant should consider those failures identified in (1) the documentation that makes up its CLB, (2) plant-specific operating experience, and (3) industry-wide operating experience that is specifically applicable to its facility. The applicant need not consider hypothetical failures that are not part of CLB and that have not been previously experienced.</p> <p>For example, an applicant should consider including (1) the portion of a fire protection system identified in the UFSAR that supplies water to the refueling floor that is relied upon in a DBA analysis as an alternate source of cooling water that can be used to mitigate the consequences from the loss of spent fuel pool cooling, (2) a nonsafety-related, non-seismically-qualified building whose intended function as described in the plant's CLB is to protect a tank that is relied upon as an alternate source of cooling water needed to mitigate the consequences of a DBE, and (3) a segment of nonsafety-related piping identified as a Seismic II/I component in the applicant's CLB (Ref. 8).</p>

Review of Scoping and Screening

- Screening
 - “Passive”
 - Reviewer to ensure that “passive” SCs are identified as those that perform their intended functions without moving parts or a change in configuration or properties in accordance with 10 CFR 54.21(a)(1)(i)
 - “Long-Lived”
 - Reviewer to ensure that “long-lived” SCs are identified as those that are not subject to periodic replacement based on a qualified life or specified time period

Review of Scoping and Screening

Example of “passive” structure intended function

Structures	
Intended Function	Description
Direct Flow	Provide spray shield or curbs for directing flow (e.g., safety injection flow to containment pump)
Expansion/Separation	Provide for thermal expansion and/or seismic separation
Fire Barrier	Provide rated fire barrier to confine or retard a fire from spreading to or from adjacent areas of the plant
Flood Barrier	Provide flood protection barrier (internal and external flooding event)
Gaseous Release Path	Provide path for release of filtered and unfiltered gaseous discharge
Heat Sink	Provide heat sink during station blackout or design-basis accidents
HELB Shielding	Provide shielding against high-energy line break (HELB)
Missile Barrier	Provide missile barrier (internally or externally generated)
Pipe Whip Restraint	Provide pipe whip restraint
Pressure Relief	Provide over-pressure protection
Shelter. Protection	Provide shelter/protection to safety-related components
Shielding	Provide shielding against radiation

See glossary list for complete list of intended functions (& definitions)

Review of Scoping and Screening

Example - Identifying whether SCs meet 10 CFR 54.21(a)(1)(i)

Item	Category	Structure, Component, or Commodity Grouping	Structure, Component, or Commodity Group Meets 10 CFR 54.21(a)(1)(i) (Yes/No)
28	Reactor Coolant Pressure Boundary Components	Reactor Coolant Pumps	Yes (Casing)
29	Reactor Coolant Pressure Boundary Components	Control Rod Drives	No
30	Reactor Coolant Pressure Boundary Components	Control Rod Drive Housing	Yes
31	Reactor Coolant Pressure Boundary Components	Steam Generators	Yes
32	Reactor Coolant Pressure Boundary Components	Pressurizers	Yes

Example of Scoping and Screening (a)(2) Issue

- NS piping attached to SR (NS/SR) piping methodology

Summary of Results

- As a result of the reviewed (a)(2) methodologies, an applicant:
 - Added eight additional Unit systems to the scope of LR
 - Expanded the LR boundary on several Unit systems, and
 - Added new components types as a result of the revised LR boundaries in both units and gave them limited structural integrity (LSI) function

Summary of Results (Cont.)

- Only one new Material, Environment, Aging Effect, AMP (MEAP) combination identified
- New MEAP is related to the internal environment of the Unit groundwater underdrains storage tank (SS, raw water, loss of material, tank inspection program)
- Other MEAP combinations were previously submitted in the LRA or as supplemented by letters to the NRC
- One new structure added to scope (primary makeup storage tank foundation)
- MEAP for this structure was previously submitted in the LRA

Original Approach

- Scoping and screening approach
 - NS/SR piping was included within the scope of LR up to the first equivalent anchor beyond the NS/SR interface
 - Assumed anchors (equivalent anchors) were pipe supports
 - The piping segments that performed a structural support function were not uniquely identified in the screening process or highlight on the LR drawings

Original Approach (Cont.)

- Aging management review methodology
 - General structural supports (including anchors) were evaluated on a commodity basis
 - The NS piping segments are fabricated from similar materials, experience similar environments and aging effects, and are managed with the same AMPs as the SR portion of the piping to which they are attached

NRC Concerns with Original Approach

- Did not define an equivalent anchor
- It was not clear in the LRA that equivalent anchors are included within the scope of LR
- The LRA did not address equipment that may provide support for NS/SR piping

Enhanced Methodology

- Defined an equivalent anchor as a rigid restraint in each of the three orthogonal directions
- Identified NS/SR piping up to and including the first equivalent anchor
- Provides a bounding approach to identification of NS/SR piping up to and including the first equivalent anchor
- Bounding approach establishes conservative boundary end-points such that the first equivalent anchor is achieved

Enhanced Methodology (Cont.)

- Bounding approach consisted of extending LR boundary to:
 - A base mounted component (e.g., pump)
 - A flexible connection
 - Another SR component
 - A point where buried piping exits the grounds
 - A smaller branch line where the moment of inertia or the larger piping to the small piping is ≥ 10
 - The end of a piping run when the above does not apply (e.g., drain line)

Enhanced Methodology (Cont.)

- In selected cases (where the bounding approach increased the LR boundary significantly), applicant reviewed isometric drawings or performed walkdowns using experienced plant personnel to specifically identify an anchor or the first equivalent anchor

Results of Enhanced Methodology

- Most of the NS/SR piping was already included in scope
- In most of cases where the piping systems were extended the component types were already evaluated (e.g., piping and valves)
- In other cases where new component types were identified, included the new component types within scope and assigned them an LSI function
- Identified a few cases where equipment is credited for providing anchorage

Results of Enhanced Methodology (Cont.)

Examples of component types that were added to scope for NS/SR piping:

- RWST heat exchanger
- Steam gen. blowdown tank
- Aux. steam. feedwater surge tank
- TBCCW heat exchangers
- Coolant waste monitoring tanks
- Coolant drains transfer tank
- Primary drains transfer tank
- SI hydro test pump
- Primary makeup water tank & foundation
- Containment vacuum ejector

Review of Scoping and Screening

- When the review of the information in the LRA is completed, and the reviewer has determined that it is satisfactory and in accordance with the acceptance criteria in Subsection 2.1.2, a statement of the following type should be included in the staff's SER:
 - On the basis of its review, as discussed above, the staff concludes that there is reasonable assurance that the applicant's methodology for identifying the systems, structures, and components within the scope of license renewal and the structures and components requiring an aging management review is consistent with the requirements of 10 CFR 54.4 and 10 CFR 54.21(a)(1).

Integrated Plant Assessment

- Identify and list SCs subject to an AMR
 - Passive - Perform intended function without moving parts or without a change in configuration or properties
 - Long-lived - Not subject to replacement based on a qualified life or specified time period

Integrated Plant Assessments

- Identify intended functions a SC must perform
- Describe/justify methods used to identify SCs subject to an AMR from those SCs within scope
- Demonstrate: effects of aging will be adequately managed so that the intended function will be maintained consistent with the CLB for the PEO



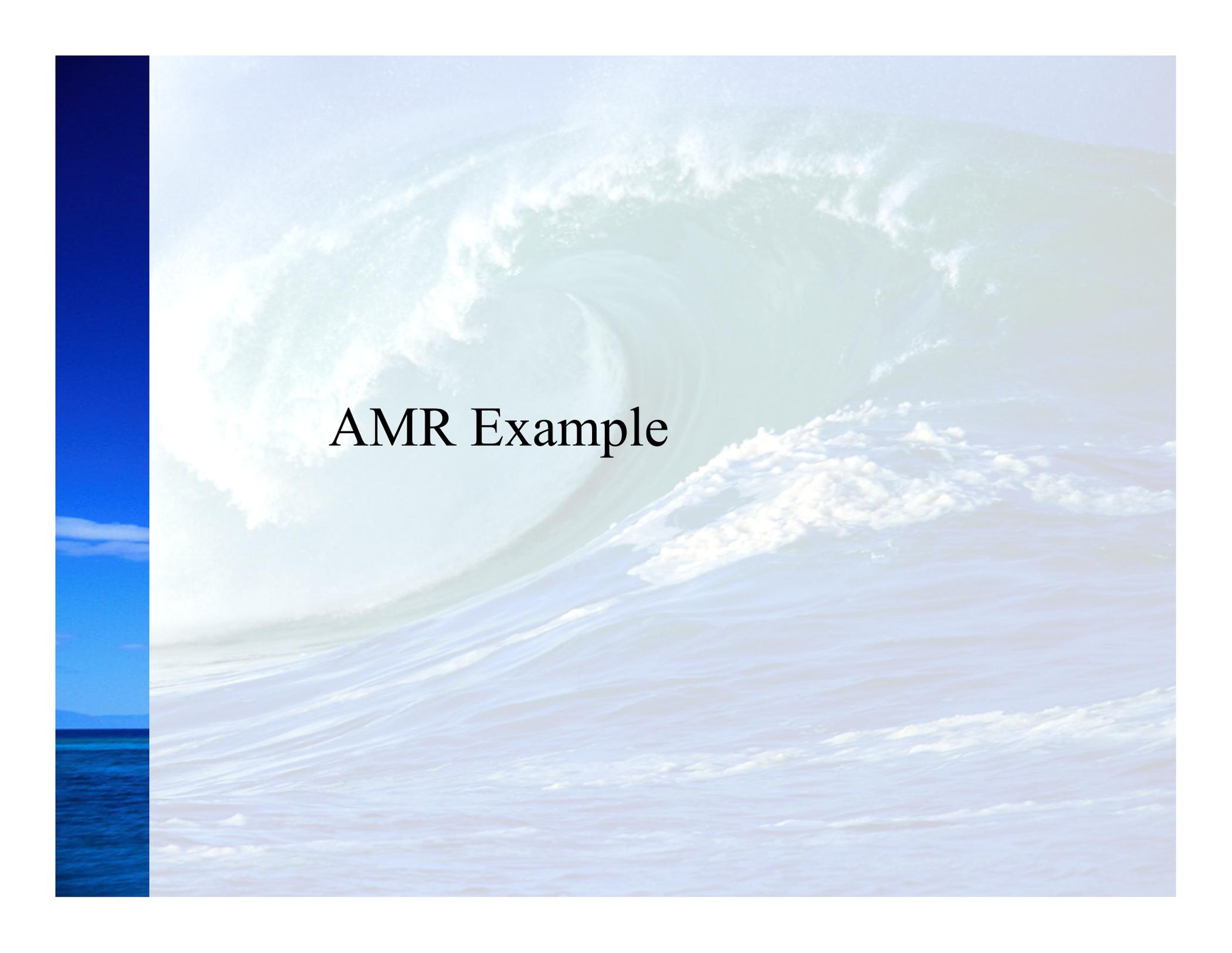
Aging Management Reviews (AMRs) and
Aging Management Programs (AMPs)

AMR Results

- AMR results are summarized into 6 sections:
 - 3.1 Reactor coolant system
 - 3.2 Engineering safety features
 - 3.3 Auxiliary systems
 - 3.4 Steam and power conversion system
 - 3.5 Structures and component supports
 - 3.6 Electrical and instrument controls

AMR Summary Tables

- Preparation of tables follows the guidance in NEI 95-10
- Two types of tables (Table 1 and Table 2) work together to present all of the needed information to summarize AMRs.
- Table 1 provides a summary comparison
 - Additional evaluation required
 - Cross reference to details in SRP-LR
- Table 2 provides the detailed results of AMRs
 - Component
 - Material
 - Environment
 - Aging Effect
 - AMP



AMR Example

Table 1 example

Table 3.2.1 Summary of Aging Management Evaluations in Chapter V of NUREG-1801 for Engineered Safety Features

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-01	Piping, fittings, and valves in emergency core cooling system	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA (see [SRP] subsection 3.2.2.2.1)	Further evaluation documented in Section 3.2.2.2.1 .
3.2.1-02	Piping, fittings, pumps, and valves in emergency core cooling system	Loss of material due to general corrosion	Water chemistry and one-time inspection	Yes, detection of aging effects is to be further evaluated (see [SRP] subsection 3.2.2.2.2.1)	Aging effect is managed by the One-Time Inspection Program , or the combination of the Plant Chemistry Program and One-Time Inspection Program . Further evaluation documented in Section 3.2.2.2.2.1 . Exceptions apply to NUREG-1801 recommendations for Plant Chemistry Program implementation (refer to Appendix B, Section B2.1.25).
3.2.1-03	Components in containment spray (PWR only), standby gas treatment (BWR only), containment isolation, and emergency core cooling systems	Loss of material due to general corrosion	Plant specific	Yes, plant specific (see [SRP] subsection 3.2.2.2.2.2)	Aging effect is managed by the One-Time Inspection Program or the System Condition Monitoring Program . The System Condition Monitoring Program is applied to manage the aging effect in an air/gas external environment. The One-Time Inspection Program is applied to manage the aging effect in an air/gas internal environment. Further evaluation documented in Section 3.2.2.2.2.2 .
3.2.1-04	Piping, fittings, pumps, and valves in emergency core cooling system	Loss of material due to pitting and crevice corrosion	Water chemistry and one-time inspection	Yes, detection of aging effects is to be further evaluated (see [SRP] subsection 3.2.2.2.3.1)	Aging effect is managed by the One-Time Inspection Program , or the combination of the Plant Chemistry Program and One-Time Inspection Program . Further evaluation documented in Section 3.2.2.2.3.1 . Exceptions apply to NUREG-1801 recommendations for Plant Chemistry Program Implementation (refer to Appendix B, Section B2.1.25).

Table 2 example

Table 3.2.2-3 Engineered Safety Features - Core Spray System - Summary of Aging Management Evaluation

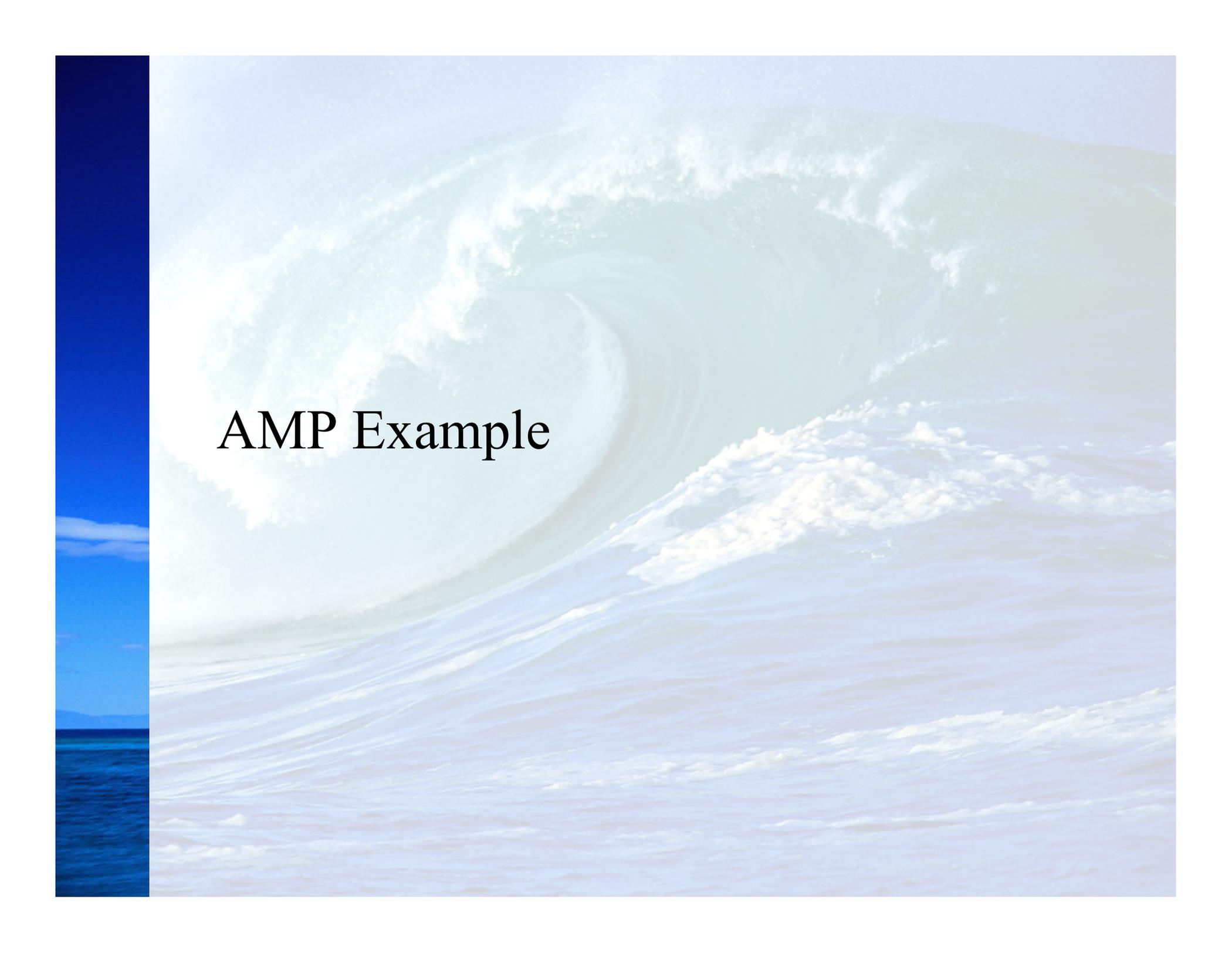
Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG -1801 Volume 2 Line Item	Table 1 Item	Notes
Piping and Fittings	Pressure Boundary	Stainless Steel	Plant Indoor Air (Ext)	None	None			J, 227
			Primary Containment Air (Ext)	None	None			J, 227
			Treated Water (Int)	Loss of Material - Crevice Corrosion	One-Time Inspection	VII.E4.1-a	3.3.1-08	A, 226
					Plant Chemistry Program	VII.E4.1-a	3.3.1-08	B, 226
				Loss of Material - MIC	One-Time Inspection	VII.E4.1-a	3.3.1-08	A, 212, 226
					Plant Chemistry Program	VII.E4.1-a	3.3.1-08	B, 212, 226
					Loss of Material - Pitting Corrosion	One-Time Inspection	VII.E4.1-a	3.3.1-08
Plant Chemistry Program	VII.E4.1-a	3.3.1-08	B, 226					
Pump Casings	Pressure Boundary	Carbon Steel	Plant Indoor Air (Ext)	Loss of Material - Galvanic Corrosion	System Condition Monitoring Program	V.E.1-b	3.2.1-10	A, 212
				Loss of Material - General Corrosion	System Condition Monitoring Program	V.E.1-b	3.2.1-10	A
			Treated Water (Int)	Loss of Material - Crevice Corrosion	One-Time Inspection	V.D2.2-a	3.2.1-04	A
					Plant Chemistry Program	V.D2.2-a	3.2.1-04	B
				Loss of Material - Galvanic Corrosion	One-Time Inspection	V.D2.2-a	3.2.1-02, 3.2.1-04	A, 212
					Plant Chemistry Program	V.D2.2-a	3.2.1-02, 3.2.1-04	B, 212

What's Involved in the AMP Reviews?

- Plant AMPs consistent with GALL AMPs
 - Verify consistency by comparing 10 program elements
 - Review “exceptions” and “enhancements” -
Provide technical basis to accept inconsistency
- Plant specific AMPs
 - Review per Appendix A of SRP-LR
 - Technical review to 10 CFR 54.21(a)(3)
- NRC approved precedents

Ten Attributes for Acceptable AMP

- Scope
- Preventive actions
- Parameters monitored or inspected
- Detection of aging effects
- Monitoring and trending
- Acceptance criteria
- Corrective actions
- Confirmation process
- Administrative controls
- Operating experience



AMP Example

Correlation between NUREG-1801 programs and plant's programs are shown below

NUREG-1801 PROGRAM NUMBER	NUREG-1801 PROGRAM	MNGP Program
NUREG-1801 Chapter X		
X.E1	Environmental Qualification (EQ) of Electrical Components	Environmental Qualification (EQ) of Electrical Components [Section B3.1]
X.M1	Metal Fatigue of Reactor Coolant Pressure Boundary	Metal Fatigue of Reactor Coolant Pressure Boundary [Section B3.2]
X.S1	Concrete Containment Tendon Prestress	Not credited for License Renewal at Nuclear Plant uses a BWR Mark I steel containment.
NUREG-1801 Chapter XI		
XI.E1	Electrical Cables & Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Electrical Cables & Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements [Section B2.1.15]
XI.E2	Electrical Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrument Circuits	Electrical Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrument Circuits [Section B2.1.16]
XI.S8	Protective Coating Monitoring & Maintenance Program	Protective Coating Monitoring & Maintenance Program [Section B2.1.27]
Plant Specific Programs		
NA	Plant-Specific Program	Bus Duct Inspection Program [Section B2.1.6]
NA	Plant-Specific Program	System Condition Monitoring Program [Section B2.1.32]



Time-Limited Aging Analyses

What is a TLAA?

- TLAAAs are plant-specific safety analyses that are based on assumed 40-year life
 - The applicant must show
 - The analyses will remain valid for the EPO
 - The analyses have been projected to then end of EPO
 - Or effects of aging will be adequately managed for the EPO
 - Applicant must provide a list of TLAAAs as defined in 10 CFR 54.3

NRC Review of TLAAAs

- Not all TLAAAs have been reviewed by NRC
 - FSAR states that the design meets a national code and standard which calls for an analysis or calculation (may be a TLAA) that has not previously been reviewed by the NRC staff
 - A licensee responds to a Generic Letter and commits to perform a TLAA. The NRC had not documented the review of the response and had not reviewed the actual analysis

Analyses not TLAAs

- Examples of analyses that are not TLAAs
 - Population projections
 - Cost-benefit analysis for plant modifications
 - Time-limited analyses where the time period is short of the current operating term

Plant-Specific Exemptions

- A plant-specific exemption for a TLAA may be granted pursuant to 10 CFR 50.12 if the exemption will not present an undue risk to the public health and safety and is consistent with common defense and security
- No exemptions to date have been requested under this provision

Evaluation of Findings

- The reviewer determines if sufficient information has been provided to conclude in the SER:
 - On the basis of its review, the staff concludes that the applicant has provided an acceptable list of TLAAAs as defined in 10 CFR 54.3, and that no 10 CFR 50.12 exemptions have been granted on the basis of a TLAA, as defined in 10 CFR 54.3

Example TLAAAs

- Fatigue analyses
- Reactor vessel neutron embrittlement (PWRs)
- Environmental qualification of electrical equipment
- Metal corrosion allowance
- Inservice flaw growth analysis demonstrating structural stability for 40 years

Example TLAAAs (Cont.)

- High-energy line-break postulated based on fatigue cumulative usage factor
- Low-temperature overpressure protection (LTOP) analyses
- Leak before break
- Containment penetration pressurization cycles

Example TLAAAs

- PWR specific TLAAAs
 - Pressurized thermal shock
- BWR specific TLAAAs
 - Elimination of circumferential weld inspections
 - Axial welds

Examples: Identification & Disposition of Potential TLAA

Example	Disposition
<p>NRC correspondence requests a utility to justify that unacceptable cumulative wear did not occur during the design life of control rods.</p>	<p>Does not qualify as a TLAA because the design life of control rods is less than 40 years. Therefore, does not meet criterion (3) of the TLAA definition in 10 CFR 54.3</p>
<p>Maximum wind speed of 100 mph is expected to occur once per 50 years</p>	<p>Not a TLAA because it does not involve an aging effect.</p>
<p>Correspondence from the utility to the NRC states that the membrane on the containment basement is certified by the vendor to last for 40 years.</p>	<p>The membrane was not credited in any safety evaluation, and therefore the analysis is not considered a TLAA. This example does not meet criterion (4) of the TLAA definition in 10 CFR 54.3.</p>
<p>Fatigue usage factor for the pressurizer surge line was determined not to be an issue for the current license period in response to NRC Bulletin 88-11.</p>	<p>This example is a TLAA because it meets all 6 criteria in the definition of TLAA in 10 CFR 54.3. The utility's fatigue design basis relies on assumptions defined by the 40-year operating life for this component, which is the current operating term.</p>
<p>Containment tendon lift-off forces are calculated for the 40-year life of the plant. These data are used during Technical Specification for comparing measured to predicted lift-off forces.</p>	<p>This example is a TLAA because it meets all 6 criteria in the definition of TLAA in 10 CFR 54.3. The lift-off force curves are currently limited to 40-year values, and are needed to perform a required Technical Specification surveillance.</p>

TLAA Example

- NRC Bulletin 88-11, “Pressurizer Surge Line Thermal Stratification”
 - Describes conditions that may affect compliance with the requirements associated with 10 CFR 50.55a and functions related to this regulation that must be considered in the scoping process

Thermal Stress Effects

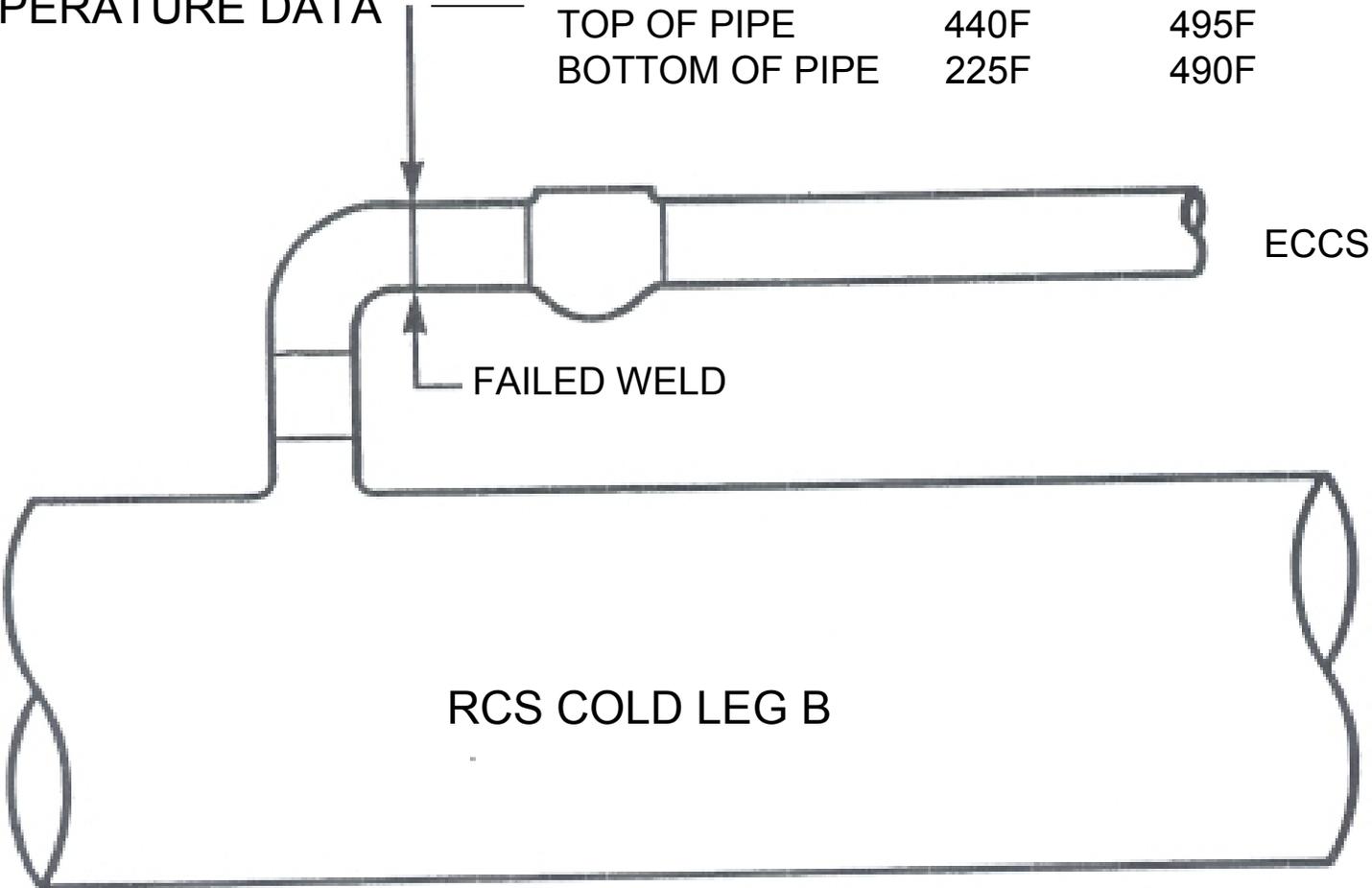
- NRC Bulletin 88-08 reported that Farley 2 developed a circ. through-wall crack in a short, unisolable section of ECCS piping connected to the cold leg of loop B in the RCS
 - Cause was cold water leaking through a closed globe valve
 - Temperature stratification and temp fluctuations caused thermal fatigue
 - Examination of sections of piping that could have been subjected to excessive thermal stresses

NRC Bulletin 88-08

FARLEY 2
TEMPERATURE DATA

	WITH LEAKAGE	WITHOUT LEAKAGE
--	-----------------	--------------------

TOP OF PIPE	440F	495F
BOTTOM OF PIPE	225F	490F



Thermal Stress Effects (Cont.)

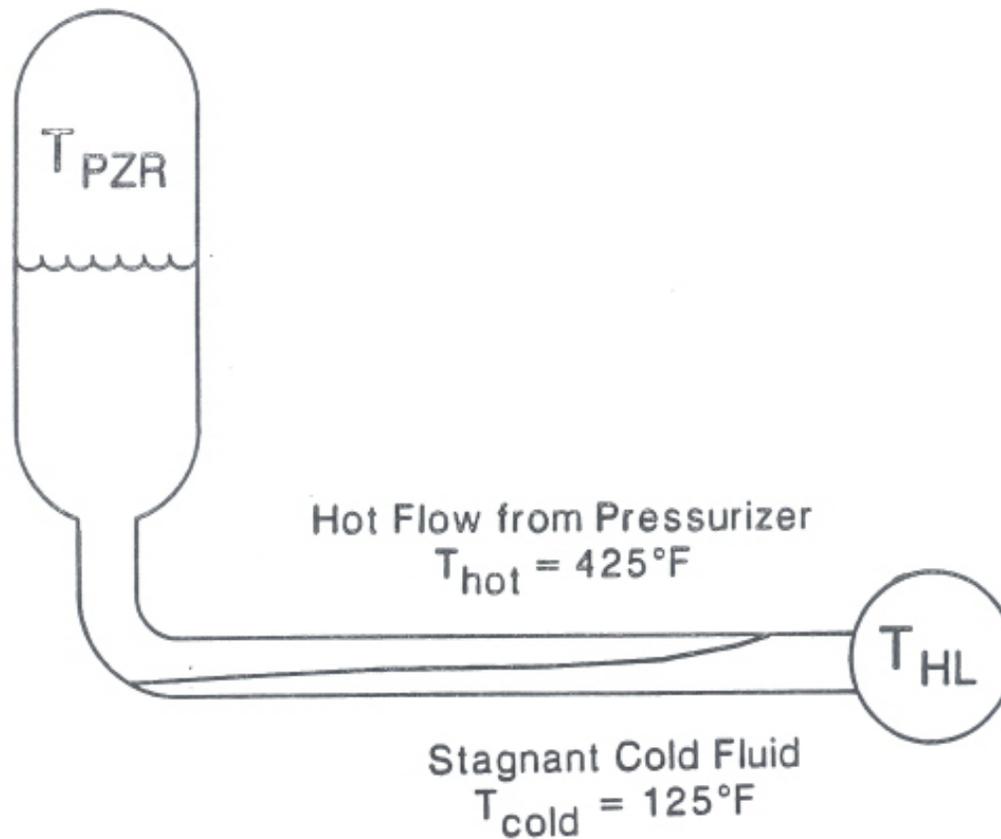
- NRC Bulletin 88-08 supplement 1 – similar situation observed at Tihange 1, leak observed in a short, unisolable section of ECCS piping
 - Also attributed to thermal fatigue

Thermal Stratification

- NRC Bulletin 88-11 – pressurizer surge line thermal stratification
 - Trojan plant observed unexpected movement of the pressurizer surge line
 - Movement caused by thermal stratification
 - Beaver Valley 2 observed similar movement
 - PWR licensees required to conduct visual examinations (VT-3) of pressurizer surge line and verification of applicable design codes

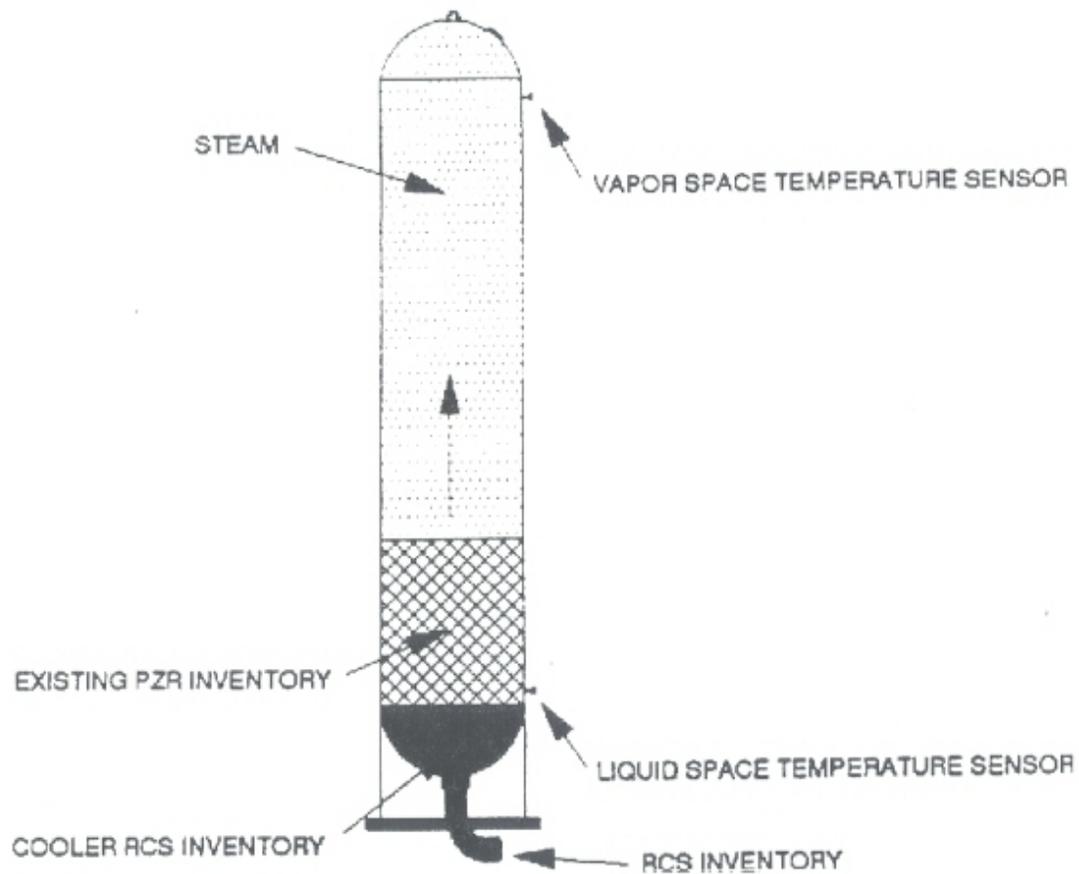
NRC Bulletin 88-11

Surge Line Stratification



NRC Bulletin 88-11

PRESSURIZER STRATIFICATION



TLAA Example – Metal Fatigue Analysis

- Areas of review

- Metal components may fail because of fatigue
- Metal fatigue analyses may contain: service flaw growth analyses, reactor vessel underclad cracking, reactor vessel internals fatigue, leak-before-break, RCP flywheel, and metal bellows



TLAA Example – Metal Fatigue Analysis

- Metal components designed or analyzed based on requirements of ASME B&PVC or ANSI guidance
 - ASME Section III, Class 1
 - ANSI B31.1
 - Other evaluations based on CUF
 - ASME Section III, Class 2 and 3



TLAA Example – Metal Fatigue Analysis

- IE Bulletin 79-13 along with Rev. 1 and Rev. 2 were issued to address cracking in feedwater system piping
 - Environmental effects were thought to be involved, shortening the life to less than design-life
 - D.C. Cook 1 & 2, Diablo Canyon, San Onofre 1, Robinson 2, Beaver Valley 2, Kewaunee, Point Beach, Salem 1, Surry 1, Ginna, Milestone 2, Palisades, Yankee Rowe, Main Yankee



TLAA Example – Metal Fatigue Analysis

- Generic safety issue (GSI)
 - Fatigue analysis conducted to the Code of Record
 - NRC decided the adequacy of the Code of Record was a potential safety issue because environmental effects on fatigue were not considered
 - GSI-78 and GSI-166 were created to address the initial 40-year operating license period
 - NRC concluded based on component and risk assessments, that backfitting environmental fatigue data to operating plants was not justified



TLAA Example – Metal Fatigue Analysis

- GSI-190 was established to address fatigue analyses of metal components for a 60-year life
 - The probability of fatigue failure and its effect on CUF were determined for selected metal components for a 60-year life
 - Some components have cumulative probabilities of crack initiation and through-wall growth that approach 1 within the 40 to 60 year period



TLAA Example – Metal Fatigue Analysis

- GSI-190 (Cont.)
 - Failures were associated with high cumulative usage factor locations and components with thinner walls
 - Leakage from through-wall is small and not likely to lead to core damage
 - GSI-190 was resolved based on PRA and sensitivity studies, interactions with industry (NEI and EPRI) and approaches to manages the effects of aging
 - Applicants consideration of the effects of coolant environment on fatigue life for LR is an area of review



Example

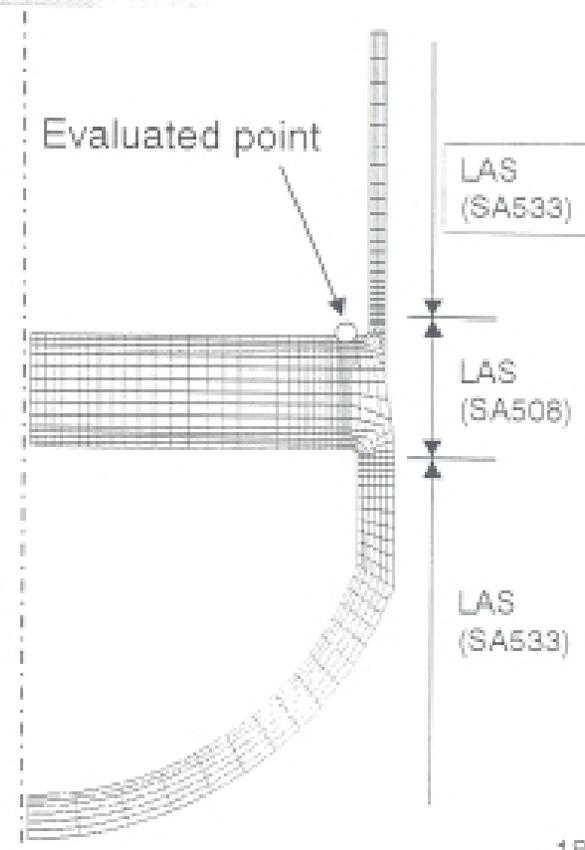
Sample of Fen calculation (LAS)

【Component】

- Steam generator tubesheet
- Temperature: 280°C
- Low-alloy steel
- Sulfur content: <0.01%

【Results】

Evaluation method	Fen
Factor multiplication	2.3



FSAR Supplement

- The summary description of the evaluation of the metal fatigue TLAA for the PEO in the FSAR supplement is appropriate such that changes can be controlled by 10 CFR 50.59

Evaluation Findings

- On the basis of its review, the staff concludes that the applicant has provided acceptable demonstration, pursuant to 10 CFR 54.21 (c)(1) that, for metal fatigue TLAA,
 - (i) the analyses remain valid for the PEO
 - (ii) the analyses have been projected to the end of PEO
 - (iii) the effects of aging on the intended function(s) will be adequately managed for the PEO

Summary

- TLAA was defined
 - Plant-specific safety analyses based on explicitly assumed time period
- Six criteria for acceptance were reviewed
 - Consider the effects of aging
 - Involve time-limited assumptions
 - Determined to be relevant for a safety determination
 - Conclusions about the capability of a SSC to perform its intended function (10 CFR54.4(b))
 - Involve SSC within the scope of LR
 - Contained in or incorporated by reference in CLB



Summary (Cont.)

- NRC review of TLAAAs
 - Design meets National Code and Standard
 - Response to a Generic Letter
- Plant-specific exemptions
 - 10 CFR 50.12 exemption with no undue risk to public health and safety and consistent with common defense and security



Summary (Cont.)

- Evaluation of findings
 - Sufficient information provided to conclude that applicant has provided an acceptable list of TLAAAs with no exemptions
- Example TLAAAs
- Discussion on thermal stress effects
 - NRC Bulletin 88-08
 - NRC Bulletin 88-11



Summary (Cont.)

- TLAA example
 - Metal fatigue analysis
 - Generic safety issue – environmental effects on fatigue
 - GSI-78 and GSI-166 for current operating license period
 - GSI-190 for the PEO
- FSAR supplement



Summary (Cont.)

- Evaluation findings
 - On the basis of its review, the staff concludes that the applicant has provided acceptable demonstration, pursuant to 10 CFR 54.21 (c)(1) that, for metal fatigue TLAA,
 - (i) the analyses remain valid for the PEO
 - (ii) the analyses have been projected to the end of PEO
 - (iii) the effects of aging on the intended function(s) will be adequately managed for the PEO





Final Safety Analysis Report (FSAR)

Final Safety Analysis Report

- FSAR update
- FSAR (LR) supplement
- Commitment list

FSAR

- Scope
 - FSAR shall include information that:
 - Describes the facility
 - Presents the design bases and the limits on its operation
 - Presents the safety analyses of the SSCs of the facility

FSAR

- Regulatory requirements
 - 10 CFR 50.34(a): application for a construction permit must include a preliminary safety analysis report (PSAR)
 - 10 CFR 50.34(b): application for an operating license must include a FSAR report
- Reg. Guide 1.70: provides the layout and content of FSAR

FSAR Update

- Regulatory requirements
 - 10 CFR 50.59: provide regulations for changes tests and experiments to FSAR (as update)
 - 10 CFR 50.71(e): holders of operating licenses required to periodically update the FSAR
- License Renewal
 - 10 CFR 54.21(d): Provide FSAR supplement

Final Safety Analysis Report Supplement

- 10 CFR 54.21 (d): provide a summary description of the programs and activities for managing the effects of aging and evaluation of TLAA for the PEO
- SRP-LR (NUREG-1800, Rev. 1)
 - Provides the specific criteria for meeting 10 CFR 54.21(d)
 - Examples of the type of information to be included are also provided in various tables of this SRP-LR

Example of Commitment List

Item Number/Title	Commitment	LRA Appendix A (UFSAR)	Implementation Schedule	Source
1. Accessible Non-Environmental Qualification Cables and Connections	Develop and implement new program.	A.1.1	Prior to the period of extended operation	• LRA Section B.2.1.1
2. Electrical Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program	Revise implementing documents for LPRM cable system aging to reference existing Technical Specification requirements and license renewal reference(s).	A.1.2	Prior to the period of extended operation	• LRA Section B.2.1.2 • Response to followup to RAI 2.5-2 dated March 2, 2005
	Develop and implement new program to manage IRM cable system aging.		Prior to the period of extended operation	• LRA Section B.2.1.2 • Response to followup to RAI 2.5-2 dated March 2, 2005
3. Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Programs	Develop and implement new program to manage the medium-voltage cables to the Residual Heat Removal Service Water pumps.	A.1.3	Prior to the period of extended operation	• LRA Section B.2.1.3 • Response to RAI 3.6-3(a) dated December 9, 2004 • Response to followup RAI 3.6-3 dated January 18, 2005
4. ASME Section XI Inservice Inspection Subsections IWB, IWC, and IWD Program	Revise implementing documents to include license renewal reference(s).	A.1.4	Prior to the period of extended operation	• LRA Section B.2.1.4
5. Chemistry Control Program	Revise implementing documents to include license renewal reference(s).	A.1.5	Prior to the period of extended operation	• LRA Section B.2.1.5



License Renewal Inspections Activities

License Renewal Inspections Activities

- Objective: to ensure important SSCs continue to perform their intended function during PEO

License Renewal Inspections

- Scoping and screening inspections
 - review of supporting documents
 - walk-down of selected systems
- Aging management programs inspection
 - for selected SCs, verify the AMPs will ensure the aging effects will be managed
 - review the description of AMPs
 - verify the applicant evaluated site-specific information
 - perform walk-downs of selected in-scope SSCs
 - review of past tests and inspections, if applicable



License Renewal Inspections

- Annual update/open item inspection
 - select a sample of modifications since the original LRA submittal, determine that these changes were included in annual LRA update
 - Determine if the issue raised by previous RAIs has been resolved
 - Determine that the applicant has compiled a list of future tasks to be accomplished as a result of commitments made during the license renewal process and loaded this list into tracking system

License Renewal Inspections

- Inspections results
 - Scoping and screening
 - Majority of systems appropriately scoped
 - Applicant's program for mechanical system not completely defined at time of inspection
 - Additional information submitted to NRR
 - Need for further inspection to be determined following NRR review

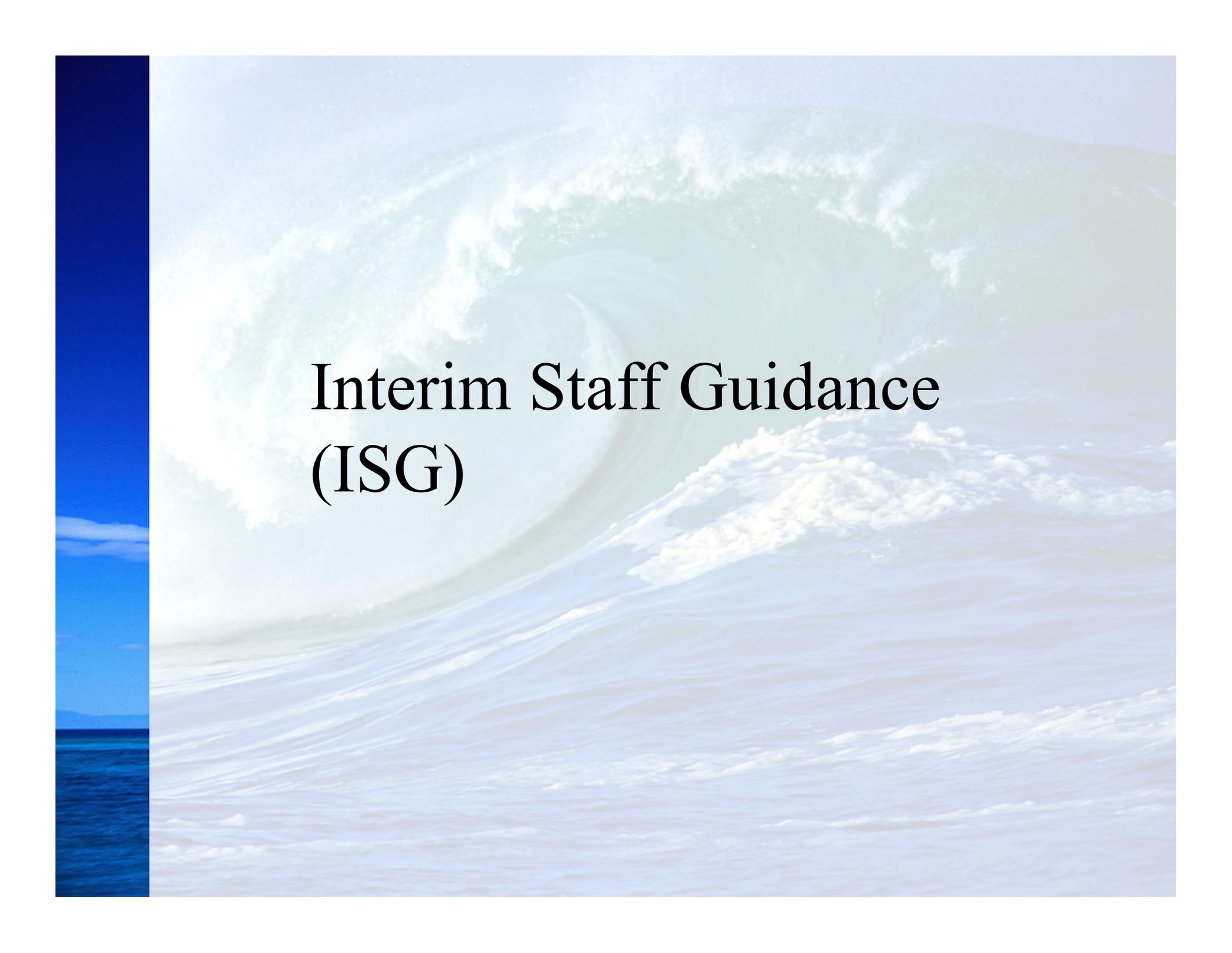


Post License Renewal Inspections

- Post renewal inspections
 - modifications to existing programs
 - programs for managing commitments associated with LRA
 - Outstanding commitments identified during the LRA review process
 - FSAR Supplement
 - Addition or deletion, if any, of commitments identified during the LRA review process
- to be scheduled prior or shortly after PEO

License Renewal Inspections Activities

- Inspection Procedures
 - IP 71002
 - IP 71003
 - Available on <http://www.nrc.gov/reading-rm/doc-collections/insp-manual/inspection-procedure/index.html>
- Regions responsible for inspections
- Currently, 4 plants are expected to enter PEO in 2009



Interim Staff Guidance (ISG)

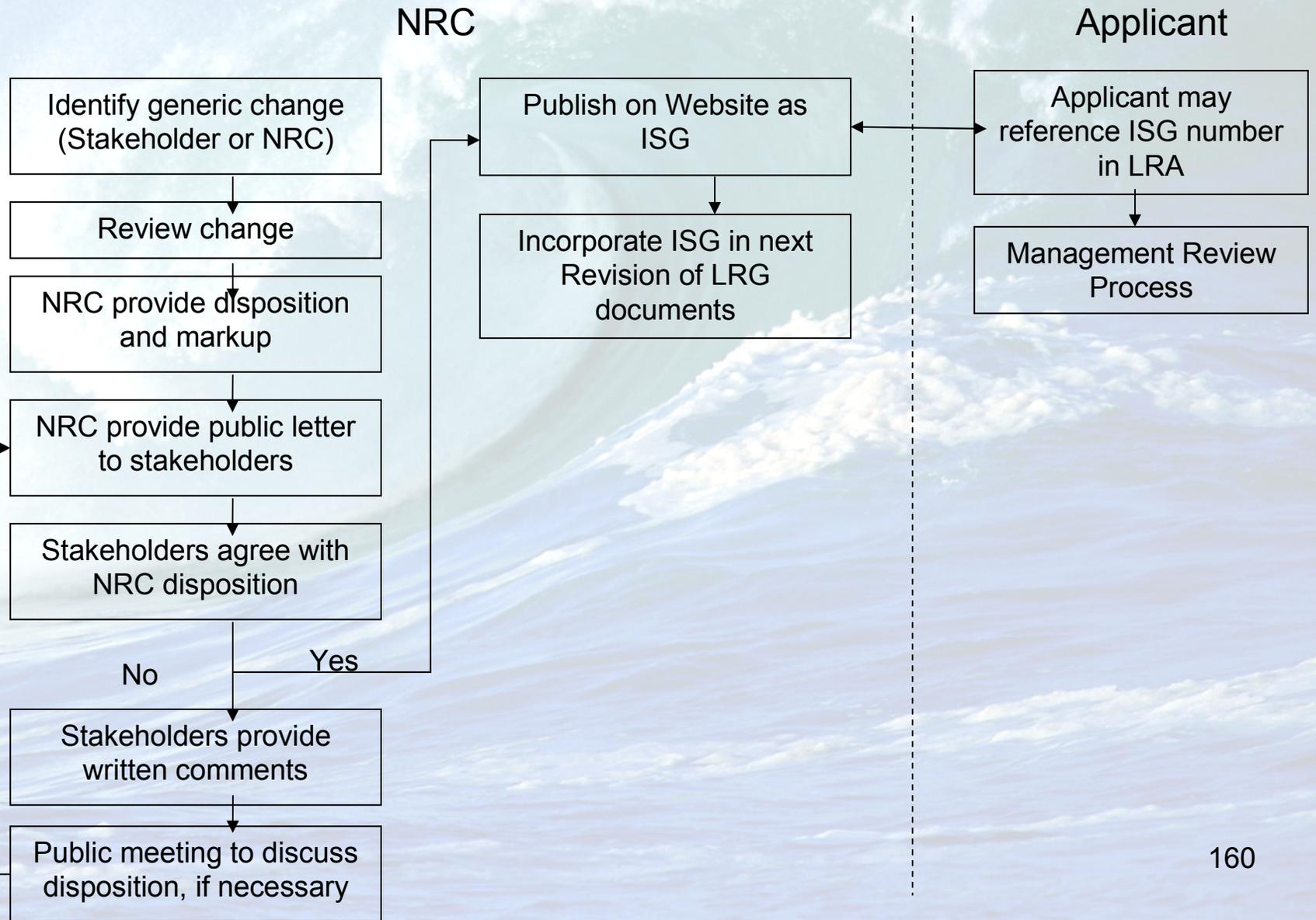
Interim Staff Guidance

- An ISG is a guidance developed after the improved license renewal guidance documents were issued
- ISGs contain guidance the staff believes that current or future applicant need to address
- ISGs may result in the need to backfit licensees with renewed licenses

ISG Process

- Provides a structured approach to developing an ISG
- Allows for stakeholder input
- Addresses implementation for current and future applicants
- Addresses FSAR update for newly-identified information and backfit issue for plants with renewed licenses

Interim Staff Guidance Process Flow Chart



Implementation

Three groups effected by the ISGs:
future applicants, current applicants and
licensees with renewed licenses

Future applicants

- Are expected to address all approved ISGs in their LRA

Current applicants

- Are required to address all approved ISGs, and are encouraged to address the proposed ISGs to avoid a potential backfit during the review process

Implementation (Cont.)

- Licensees with renewed licenses
 - In accordance with 10 CFR 54.37(b), after the renewed license is issued, the FSAR update must include any newly identified SSCs that would have been subject to an AMR
 - Therefore, 10 CFR 54.37(b) requires licensees with a renewed license to include this newly-identified information in its FSAR update.

ISG - Status

- ISGs closed prior to September 2005 have been incorporated into Revision 1 of the LRGDs
- Currently, one ISG is open and two are potential
 - ISG 19B – Cracking of nickel-alloy components in the RCPB
 - ISG 23 – Replacement parts to meet 10 CFR 50.48.
 - ISG 2006-01 – Corrosion of Mark I Drywell Shell.
- Status of open ISGs are available on the NRC website.

ISG for License Renewal Status date: March 2007

Item No.	Purpose / Description	Position ISG No. and Title	Status Resolution	Affected License Renewal Guidance Documents (LRGDs)
01	How to credit plant programs and activities	Clarification ISG-01, "Proposed Staff Guidance on the Position of the GALL Report Presenting One Acceptable Way to Manage Aging Effects for License Renewal," dated November 23, 2001 (ADAMS Accession No. ML013300531)	Incorporated into LRGDs	SRP-LR, Chapter 3.0
02	Station blackout scoping Add station blackout scoping	Compliance ISG-02, "Staff Guidance on Scoping of Equipment Relied on to Meet the Requirements of the Station Blackout (SBO) rule (10 CFR 50.63) for License Renewal," dated April 1, 2002 (ADAMS Accession No. ML020920464)	Incorporated into LRGDs	SRP-LR, Chapter 2.0
03	Concrete aging management program To clarify the concrete aging management programs in GALL and SRP-LR documents	Clarification ISG-03, "Proposed Revision of Chapters II and III of Generic Aging Lessons Learned (GALL) Report on Aging Management of Concrete Elements," dated November 23, 2001 (ADAMS Accession Nos. ML013300440 and ML013300445)	Incorporated into LRGDs	GALL Volume 2, AMPs XI.S2, and XI.S6
04	Fire protection system piping To clarify AMP XI.M26 and AMP XI.M27	Clarification ISG-04, "Interim Staff Guidance (ISG)-04: Aging Management of Fire Protection Systems for License Renewal," dated December 3, 2002 (ADAMS Accession No. ML023440137)	Incorporated into LRGDs	GALL Volume 2, AMPs XI.M26 and AMP XI.M27

ISG for License Renewal Status date: March 2007

Item No	Purpose/Description	Position ISG No. and Title	Status Resolution	Affected License Renewal Guidance Documents (LRGDs)
05	<p>Electrical fuse holder</p> <p>To include fuse clips and fuse block for fuse holders and to add a new AMP for fuse clips (i.e., metallic)</p>	<p>Compliance</p> <p>ISG-05, "Interim Staff Guidance (ISG)-5 on the Identification and Treatment of Electrical Fuse Holders for License Renewal," dated March 10, 2003 (ADAMS Accession No. ML030690512, ML030690518)</p>	Incorporated into draft LRGDs	SRP-LR, Table 2.1-5, GALL Volume 2, AMP XI.E5 (new)
06	<p>Housing for active components</p> <p>To clarify a need for aging management review (AMR) for housing for fans, dampers, and H/C coils</p>	<p>Compliance</p> <p>ISG-06, "Proposed Interim Staff Guidance on Identification and Treatment of Housing for Active Components for License Renewal," dated April 8, 2003 (ADAMS Accession No. ML031010423)</p>	Incorporate in LRGDs	SRP-LR, Table 2.1-5, Chapter 3.0, and GALL Volume 2, IX.B Table
07	<p>Scoping guidance</p> <p>To clarify the fire protection systems, structures, and components scoping. To clarify whether the scope would expand to include (BTP) APSCB 9.5-1</p>	<p>Clarification</p> <p>Proposed Staff Guidance on the Scoping of Fire Protection Equipment for License Renewal, dated November 13, 2002 (ADAMS Accession No. ML023190479)</p>	Staff concluded that GALL adequately addressed this issue – no ISG is needed	

ISG for License Renewal Status date: March 2007

Item No.	Purpose/Description	Position ISG No. and Title	Status Resolution	Affected License Renewal Guidance Documents (LRGDs)
08	The ISG process To update and establish the interim staff guidance process	Clarification Process for Interim Staff Guidance Development and Implementation, dated December 12, 2003 (ADAMS Accession No. ML023520620)	Closed	N/A
09	Scoping criteria 54.4(a)(2) Scoping of non-safety-related systems, structures, and components conducted for license renewal is in accordance with the requirement of 54.4(a)(2)	Clarification Industry Guidance on Revised 54.4(a)(2) Scoping Criterion for license renewal, dated June 6, 2003 (ADAMS Accession No. ML031570613)	Closed – Reg Guide 1.188, Revision 1 issued	
10	License renewal application format To standardize license renewal application format for 2003 applicants	Clarification Standardized Format for License Renewal Application, April 7, 2003 (ADAMS Accession No. ML030990204)	Closed	N/A

ISG for License Renewal Status date: March 2007

Item No.	Purpose/Description	Position ISG No. and Title	Status Resolution	Affected License Renewal Guidance Documents (LRGDs)
11	<p>Environmental fatigue for carbon/low-alloy steel</p> <p>To review the aging management of environmental fatigue in the ISG process, as agreed at the September 18, 2002, meeting: eliminate evaluation of carbon and low alloy steel components for the effects of the reactor coolant environment for LRA</p>	<p>Clarification</p> <p>Evaluation of Proposed Interim Staff Guidance (ISG)-11: "Recommendations for Fatigue Environmental Effects in a License Renewal Application," dated January 21, 2004 (ADAMS Accession No. ML040220124)</p>	<p>Closed</p> <p>Staff concluded there is insufficient technical basis provided to justify the elimination of the evaluation of carbon and low alloy steel components for the effects of the reactor coolant environment for LRA</p>	<p>N/A</p>
12	<p>Cracking of Class 1 small-bore piping</p> <p>To capture the operational experience related to the cracking of Class 1 small-bore piping</p>	<p>Clarification</p> <p>Proposed Interim Staff Guidance (ISG)-12: "Addition of Generic Aging Lessons Learned (GALL) Aging Management Program (AMP) XI.M35, 'One-time Inspection of Small-Bore Piping,' for License Renewal," dated November 3, 2003 (ADAMS Accession No. ML033100516)</p>	<p>Incorporated in final LRGDs</p>	<p>GALL Volume 2, AMP XI.M35 (new) and corresponding AMR line items</p>
13	<p>The loose parts monitoring system</p> <p>To review the use of the loose parts monitoring (XI.M14) system for the management of the loss of preload on reactor vessel internal bolting</p>	<p>Clarification</p> <p>ISG-13</p>	<p>Incorporated into LRGDs</p>	<p>GALL Volume 2, corresponding AMR line items</p>

ISG for License Renewal Status date: March 2007

Item No.	Purpose/Description	Position ISG No. and Title	Status Resolution	Affected License Guidance Documents (LRGDs)
14	Cracking in bolting To capture the operational experience related to the cracking of bolting	Clarification ISG-14	Incorporated into LRGDs	GALL Volume 2, AMP XI.M18 and the corresponding AMR line items
15	To incorporate NEI's proposed revision to GALL AMP XI.E2 (i.e., replaced TS surveillance with specific calibrations or surveillance)	Clarification ISG-15, "Proposed Interim Staff Guidance (ISG)-15: Revision of Generic Aging Lessons Learned (GALL) Aging Management Program (AMP) XI.E2, 'Electrical Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits,' for License Renewal," dated August 12, 2003 (ADAMS Accession No. ML032250579)	Incorporated into LRGDs	GALL Volume 2, AMP XI.E2
16	To maximize the efficiency of the LRA review process and minimize RAIs using time-limited aging analyses (TLAAs) supporting information	Clarification ISG-16, "Proposed Interim Staff Guidance (ISG)-16: Time-Limited Aging Analyses (TLAAs) Supporting Information for License Renewal Applications," dated May 12, 2003 (ADAMS Accession No. ML031320798)	Incorporated into LRGDs	SRP-LR Chapter 4
17	Bus ducts To review bus insulation due to water intrusion in bus ducts and bus bar connection due to thermal cycles. To develop GALL AMP XI.E4 for bus ducts	Clarification ISG-17, "Interim Staff Guidance (ISG)-17: Proposed Aging Management Program (AMP) XI.E4, 'Periodic Inspection of Bus Ducts,' for License Renewal" See FRN/Vol. 69, No. 246, page 76960, dated December 23, 2004	Incorporated into draft LRGDs	GALL Volume 2, AMP XI.E4 (new) and corresponding AMR line items

ISG for License Renewal Status date: March 2007

Item No.	Purpose/ Description	Position ISG No. and Title	Status Resolution	Affected License Renewal Guidance Documents (LRGDs)
18	Inaccessible cable To develop aging management procedure to prevent moisture collection in man hole and to revise GALL AMP XI.E3	Clarification ISG-18	Incorporated into LRGDs	GALL Volume 2, AMP XI.E3
19A	Nickel-alloy Revise aging management program XI.M11 to include nickel-alloy upper vessel heads (primary water stress corrosion cracking in nickel-alloy upper reactor vessel head penetration nozzles)	Clarification ISG-19A: "Proposed Aging Management Program XI.M11-A, 'Nickel-Alloy Penetration Nozzles Welded to the Upper Reactor Vessel Closure Heads of Pressurized Water Reactors (PWRs Only),' for License Renewal"	Incorporate into LRGDs	GALL Volume 2, AMP XI.M11-A (new) and corresponding AMR line items
19B	Cracking of nickel-alloy components in the reactor coolant pressure boundary	Clarification ISG-19B, "Proposed Aging Management Program XI.M11-B, 'Nickel-Alloy Base-Metal Components and Welds in the Reactor Coolant Pressure Boundary,' for License Renewal"	Open - On hold until NEI and EPRI-MRP activities completed	
20	Steam Generator Tube Integrity Revise aging management program XI.M19 to include steam generator tube integrity	Clarification ISG-20	Incorporated into LRGDs	GALL Volume 2, AMP XI.M19

ISG for License Renewal Status date: March 2007

Item No.	Purpose/Description	Position ISG No. and Title	Status Resolution	Affected License Renewal Guidance Documents (LRGDs)
21	Reactor vessel internals Revise Chapter IV tables, AMP XI.M9 and AMP XI.M16, to provide improved guidance on reactor vessel internals	Clarification ISG-21	Incorporated into LRGDs	GALL Volume 2, AMP XI.M9 and corresponding AMR line items
22	Lower plenum components To address thermal aging embrittlement of CASS components	Clarification An ISG is not needed	Closed Staff concluded that GALL adequately addressed this issue - no ISG is needed	
23	Replacement parts necessary to meet 10 CFR 50.48 (Fire Protection)	To provide guidance on how to handle replacement parts for 10 CFR 50.48	The staff has determined LR-ISG- 23 is not needed	
LR- ISG- 2006 - 01	Corrosion of Mark I Containment Drywell Shell	To detect and monitor corrosion in the inaccessible areas of the drywell shell	The staff has issued final LR-ISG-2006-01 . Type: Clarification	

ISG for License Renewal Status date: March 2007

Item No.	Purpose/Description	Position ISG No. and Title	Status Resolution	Affected License Renewal Guidance Documents (LRGDs)
LR-ISG-2006-02	Proposed staff guidance on acceptance review for environmental requirements.	<p>Clarification</p> <p>The staff has issued for public comments proposed LR-ISG-2006-02. Comments should be submitted by April 17, 2007.</p>	Waiting for comments	Review of applicable sections of NUREG-1555, Supplement 1, Standard Review Plans for Environmental Reviews for Nuclear Power Plants, Supplement 1: Operating License Renewal
LR-ISG-2006-03	Staff guidance for preparing severe accident mitigation alternatives (SAMA) analyses	<p>Clarification</p> <p>The staff has issued for public comments proposed LR-ISG-2006-03. Comments should be submitted by September 18, 2006.</p>		Supplement 1 to Regulatory Guide 4.2, -Preparation of Supplemental Environmental Reports for Applications To Renew Nuclear Power Plant Operating Licenses."



License Renewal Guidance Documents (LRGDs)

LRGDs

- Standard Review Plan for License Renewal (SRP-LR, NUREG-1800), Rev. 1
- Generic Aging Lessons Learned Report (NUREG-1801), Rev. 1
- Regulatory Guide 1.188, Rev. 1
- NEI 95-10, Rev. 6

LRGDs – NUREG 1800

- SRP-LR 1800, Rev. 1
 - Sept. 2005
 - Purposes:
 - Ensure the quality and uniformity of staff reviewers and to present a well-defined base from which to evaluate applicant programs and activities for the PEO
 - Make the information about regulatory matters widely available, enhance communication with interested members of the public and the nuclear power industry, and to improve their understanding of the staff review process



LRGDs – NUREG 1800

- SRP-LR 1800, Rev. 1
 - Divided into 4 major chapters
 1. Administrative information
 2. Scoping and screening methodology for identifying structures and components subject to aging management review, and implementing results
 3. Aging management review results
 4. Time-limited aging analyses
 - Appendices
 - List branch technical positions



LRGDs – NUREG 1800

- SRP-LR 1800, Rev. 1
 - SRP-LR section is organized into six subsections, which is generally consistent with NUREG-0800
 1. Area of review
 2. Acceptance criteria
 3. Review procedures
 4. Evaluation findings
 5. Implementation
 6. References
 - SRP-LR incorporates the staff experience in the review of the initial LRA

LRGDs – NUREG 1801

- GALL, Rev. 1
 - Sept. 2005
 - Report evaluates existing programs generically to documents
 - The conditions under which existing programs are considered adequate to manage identified aging effects without change
 - The conditions under which existing programs should be augmented for this purpose



LRGDs – NUREG 1801

- GALL evaluation process
 - Which existing programs are adequate without modification
 - Which existing programs should be augmented for license renewal
 - Existing programs evaluated against a set of 10 element criteria defined in Branch Technical Position RLSB-1 in the SRP-LR
 - GALL is referenced in the SRP-LR as a basis for determining the adequacy of existing programs

LRGDs – Reg. Guide

- Regulatory Guide 1.188, Rev. 1
 - Sept. 2005
 - Endorses NEI 95-10, rev. 6
 - Spells out how the application should include
 1. General information
 2. Integrated plant assessment
 3. Evaluation of TLAAs
 4. Supplement to the plant's FSAR
 5. Changes to the plant's technical specification
 6. Supplement to the plant's environmental report
 - SRP-LR sections are numbered consistent with the regulatory guide standard format

LRGDs – NEI 95-10

- NEI 95-10 Rev. 6
 - Guidance on how to write a LRA
 - June 2005
 - Developed by NEI LR implementation guideline task force and NEI LR working group
 - Guideline founded on industry experience and expertise in implementing the LR Rule
 - Applicant may choose to use other suitable methods or approaches for satisfying the Rule's requirement and completing a LRA



LRGDs – NEI 95-10

- NEI 95-10 Rev. 6
 - Major elements include
 - Identifying the SSCs within the scope of LR
 - Identifying the intended functions of SSCs within the scope of LR
 - Identifying the SCs subject to AMR and intended functions
 - Assuring that effects of aging are managed
 - Application of new programs and inspections for LR
 - Identifying and resolving TLAAs
 - Identifying and evaluating exemptions containing TLAAs
 - Identifying a standard format and content of a LRA



Original LRGDs – NEI 95-10

- NEI 95-10 Rev. 6

1.0 ADMINISTRATIVE INFORMATION

The following information, required by §54.17 and §54.19 is consistent with the information contained in the facility's original operating license application as delineated in 10 CFR 50.33(a) through (e), (h), and (i):

1. Name of Applicant
2. Address of Applicant
3. Description of Business or Occupation of Applicant
4. Organization and Management of Applicant

Note that the license renewal rule prohibits any person who is a citizen, national, or agent of a foreign country, or any corporation, or other entity which the Commission knows or has reason to know is owned, controlled, or dominated by an alien, a foreign corporation, or a foreign government, from applying for and obtaining a renewed license.

5. Class of License, the Use of the Facility and the Period of Time for which the License is Sought.
6. Earliest and latest dates for alterations, if proposed

LRGDs updates

Lessons learned from reviews of license renewal applications led to updates of LR guidance documents

Categories of changes

- Technically-verified staff positions previously approved in other documents, i.e. SERs and ISG
- Operating experience
- Technical or process clarifications

Draft version of the SRP-LR and the GALL report issued Feb 1, 2005 Regulatory Guide and NEI 95-10 on Feb 2, 2005

LRGDs updates

- Background of Effort
 - Integrated participation
 - Multi-Office within NRC
 - Office of Nuclear Regulatory Research (RES)
 - Office of Nuclear Reactor Regulation (NRR)
 - » Division of Regulatory Improvement Programs
 - » Division of Inspection Program Management
 - » Division of System Safety & Analysis
 - » Division of Engineering
 - Contractors
 - NEI
 - Public groups
 - Multi-disciplinary teams

LRGDs updates

Supporting documents provide justification for changes

- NUREG-1832, Analysis of Public Comments on the Revised License Renewal Guidance Documents
- NUREG-1833, Technical Bases for Revision to the License Renewal Guidance Documents:
 - NUREG-1800, Rev. 1
 - September 2005
 - NUREG-1801, Rev. 1
 - September 2005
 - Regulatory Guide 1.188, Rev. 1
 - September 2005

LRGDs updates

- NUREG-1800, Rev. 1
 - Provides technical justification for both revised and new AMR line items added to GALL
 - Explains justification for technical changes in NUREG-1800 and NUREG-1801, Vol. 1
 - Captures pick lists used in GALL relational database for MEAPs (materials, environments, aging effects/mechanisms, programs) and SSCs
 - Illuminates changes in TLAAs and AMPs
 - Provides summary and observations of update changes for all related LRG documents
 - Appendix includes system-specific audit tools



LRGDs updates

- NUREG-1801, Rev. 1
 - Standardization of parameters in AMR line-items
 - New Chapter IX defining generalized materials, environments, aging effects/mechanisms
 - Reduction of thousands of AMR line-items to < 685 unique MEAP combinations
 - AMP revised and expanded
 - Reduce dependency on plant-specific evaluations
 - Incorporation of generic precedents and established staff positions
 - Interim staff guidance for license renewal (ISG-LR)
 - Precedents established earlier SERs
 - New subsections for common material/environment combinations where aging effects are not expected to degrade SSC performance and hence AMPs are not needed

LRGDs updates

- NUREG 1832
 - Analysis of the comments received on the draft LRGDs
 - Draft GALL, Rev. 1
 - Draft SRP-LR, Rev. 1
 - Draft Reg. guide DG-1104
 - Organization of report
 - Appendix A: specific written comments by NEI
 - Appendix B: comments by ACRS
 - Appendix C: comments by participant from LR public workshop on March 2, 2005
 - Appendix D: Written comments by various stakeholders
 - Appendix E: comparison of Unique AMR in September 2005 revision of the GALL Report, to that presented in the January 2005 Draft Revision of the GALL Report issued for public comment

LRGDs updates

- NUREG 1833
 - Establishes the basis for the changes in Rev.1 to NUREG 1801 and Rev. 1 to NUREG 1800
 - NRC positions previously approved in other documents, such as safety evaluation reports and approved interim staff guidance
 - Lessons learned
 - Operating experience
 - Technical clarifications or corrections
 - Clarifications to the audit and review process (SRP-LR only)
- Chapter II, “Justification for Inclusion of new AMR Line-Items”
- Chapter III, “Justification for Technical Changes”, changes to the existing AMR line-items and basis to the guidance document

LRGDs Maintenance

- ISG for License Renewal
 - Current LRGDs may be revised to capture new insights or address emerging issues
 - The LR-ISG process documents these lessons learned.
 - The LR-ISG process improves the efficiency and effectiveness of the LR process by providing guidance to future applicants, until emerging issues can be incorporated into the next revision of the improved LRGDs
 - <http://www.nrc.gov/reactors/operating/licensing/renewal/guidance.html#interim>
- Periodic supplements will be issued to LRGDs



AMP/AMR Review and Audits

AMP/AMR Review and Audits

- Overview of review and audit process
- Formation of audit team
- Training
- Audit implementation
 - Prepare audit plan
 - Audit question and answer data base
 - Individualized exercise in using LRGDs
 - Audit entrance meeting
 - Daily debriefing
- Audit summary
- Guidelines for performing peer review
- Peer review
- Resolution of comments

Overview

- Project team activities are to demonstrate compliance with 10 CFR 54.21(a)(3)

“For each structures and components identified in paragraph (a)(1) of this section, demonstrate that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the CLB for the period of extended operation”

Overview

- Audit vs. Reviews
 - Both demonstrate compliance with 10 CFR 54.21(a)(3)
 - Audit – Conformance of LRA consistency with criteria contained in GALL Report
 - Review – Technical review to demonstrate compliance with 10 CFR 54.21(a)(3)
 - NRC approved precedents are a review tool or roadmap, not a basis for demonstrating compliance

Formation of Audit Team

- Current model consist of 8 people
 - 5 NRC staff
 - Team leader
 - Backup team leader
 - 3 Technical assistance contractors
- Mix of NRC and contractor personnel can be shifted provided the decision is made well before audit and review process starts

Training

- General Orientation
- Contract Kick-off meeting
- Project specific audit training
- On-site pre-audit refreshment
- Lessons Learned



Audit Implementation

Audit

- Prepare audit plan
- Audit question and answer (Q&A) database
- Individualized exercise in using LRGDs
- Audit entrance meeting
- Daily debriefing
- End of site visit exit briefing

Audit Plan Template

- Used to prepare a plant-specific audit and review plan
- Preparer use template to create a draft plan for team leader review's and comments
- Preparer incorporates comments and deliver a final audit and review plan
- Submit to applicant, on docket, one week ahead of 1st audit

Audit Plan Template

- What's included?
 1. Introduction
 2. Background
 3. Objectives
 4. Summary of information in the LRA
 5. Overview of audit, review, and documentation
 6. Planning, audit, review and documentation procedures

Audit Plan Template

- Induction and background
 - Summary of LR requirements
 - Summary of documents to be used in audit and review process
- Objectives
- Summary of information provided by LRA
 - Information in the LRA that is applicable to this plan

Audit Plan Template

- Overview of the audit, review, and documentation procedure
 - Summary of process in reviewing the LRA
- Procedure that the project team will use to plan and schedule its work, to audit and review the LRA information

Audit Q&A Database

- Questions and Answer
 - All questions generated either prior to or during the site visit must be docketed
 - Applicant's response to the questions must be clear and complete before being accepted by the project team
 - The database is referred to later when preparing the Audit report
 - Database, when revised, must be re-docketed

Audit Q&A Database - example

NPP Unit 1, License Renewal

NRC Audit: September 1 through 20 and October 6 through 8, 2005

Plant Aging Management Programs and Reviews

NRC Audit Issues:

Doe, Jane

NPP_No:	NRC ID	NPP Resp:	Source:	Issue Type	Opened:
NPP-A1-01	3.1.1.A-01-02	XX/YY	Email(9/02)	Request Inf.	9/02/2005

NRC Request

On page 3.1-78 and -79, the LRA states that loss of fracture toughness of vessel shells (beltline, lower shell, upper nozzle shell and upper RPV shell and vessel shell welds (including attachment welds) is to be managed using RV surveillance program. Please provide discussion to confirm that all these areas have a neutron fluence exceeding $1 \text{ E}17 \text{ n/sq.cm}$ ($E > 1 \text{ MeV}$) at end of the license renewal period and identify which attachment welds are addressed.

(Identify which components of the vessel shell are managed by the RV Surveillance AMP and which are not.)

NPP Response

For NMP2, only the lower shell (Shell 1) and lower intermediate shell (Shell 2), and those vessel welds located in the beltline region have a neutron fluence exceeding $1 \text{ E}17 \text{ n/cm}^2$ (thus are managed by the RV Surveillance Program) The beltline welds are currently not identified as a separate component type but are included under the component type 'Vessel Welds (including attachment welds)' Loss of fracture toughness does not apply to attachment welds that receive $1 \text{ E}17 \text{ n/cm}^2$ or greater because these welds are nickel-based alloys or stainless steel, not ferritic material. The only carbon/low alloy steel attachment welds in either unit are the steam dryer holdown bracket attachment welds in the NPP2 upper head, which are low-fluence welds.

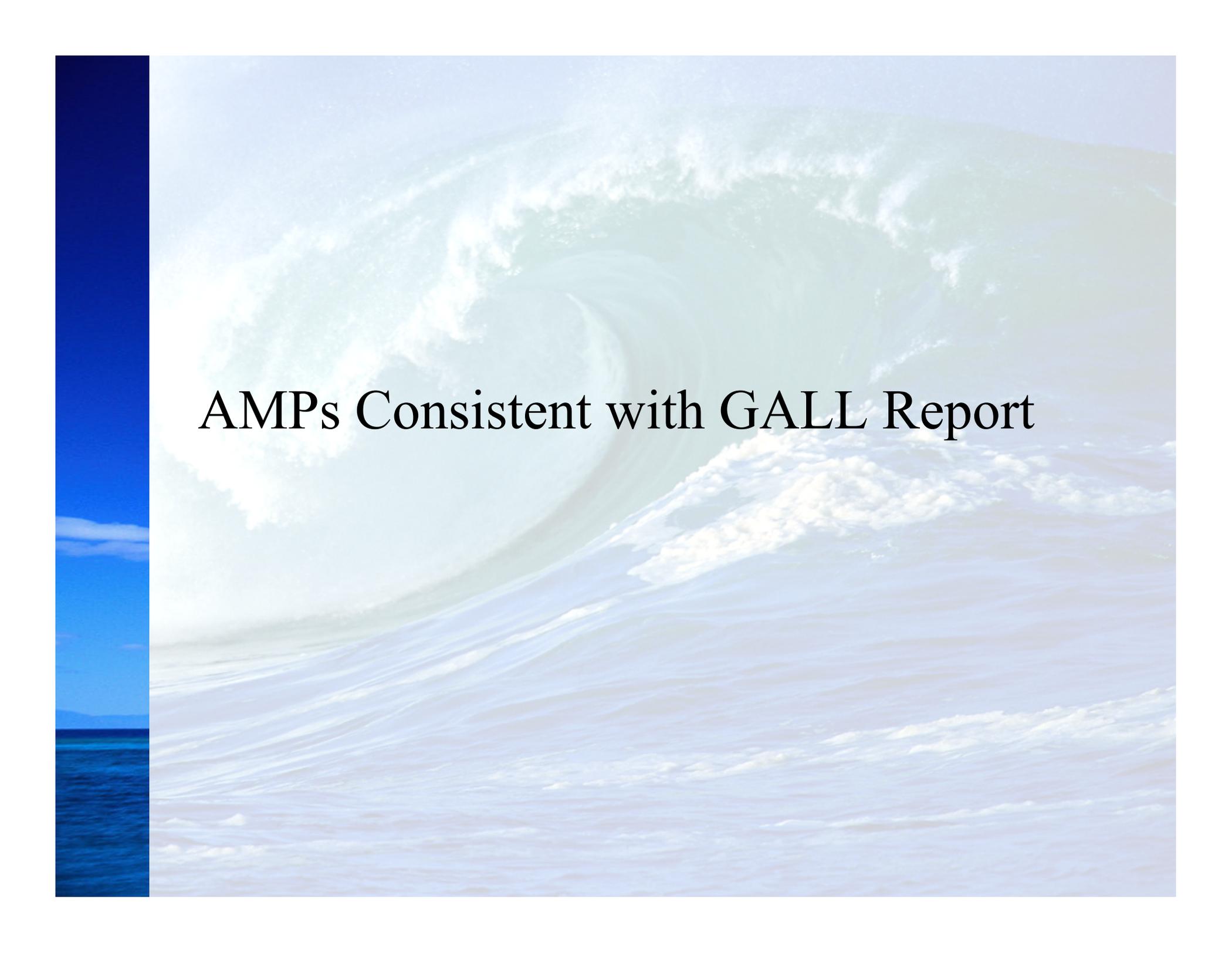
Status/evaluation

Use of AMP Worksheet

3. Parameters Monitored/Inspected:	A The parameters to be monitored or inspected should be identified and linked to the degradation of the particular structure and component intended function(s).	Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria: Comment:
“	B For a condition monitoring program, the parameter monitored or inspected should detect the presence and extent of aging effects. Some examples are measurements of wall thickness and detection and sizing of cracks.	Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria: Comment
“	C For a performance monitoring program, a link should be established between the degradation of the particular structure or component intended function(s) and the parameter(s) being monitored. A performance monitoring program may not ensure the structure and component intended function(s) without linking the degradation of passive intended functions with the performance being monitored.	Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria: Comment
“	D For prevention and mitigation programs, the parameters monitored should be the specific parameters being controlled to achieve prevention or mitigation of aging effects.	Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria: Comment
4. Detection of Aging Effects:	A The parameters to be monitored or inspected should be appropriate to ensure that the structure and component intended function(s) will be adequately maintained for license renewal under all CLB design conditions.	Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria: Comment:

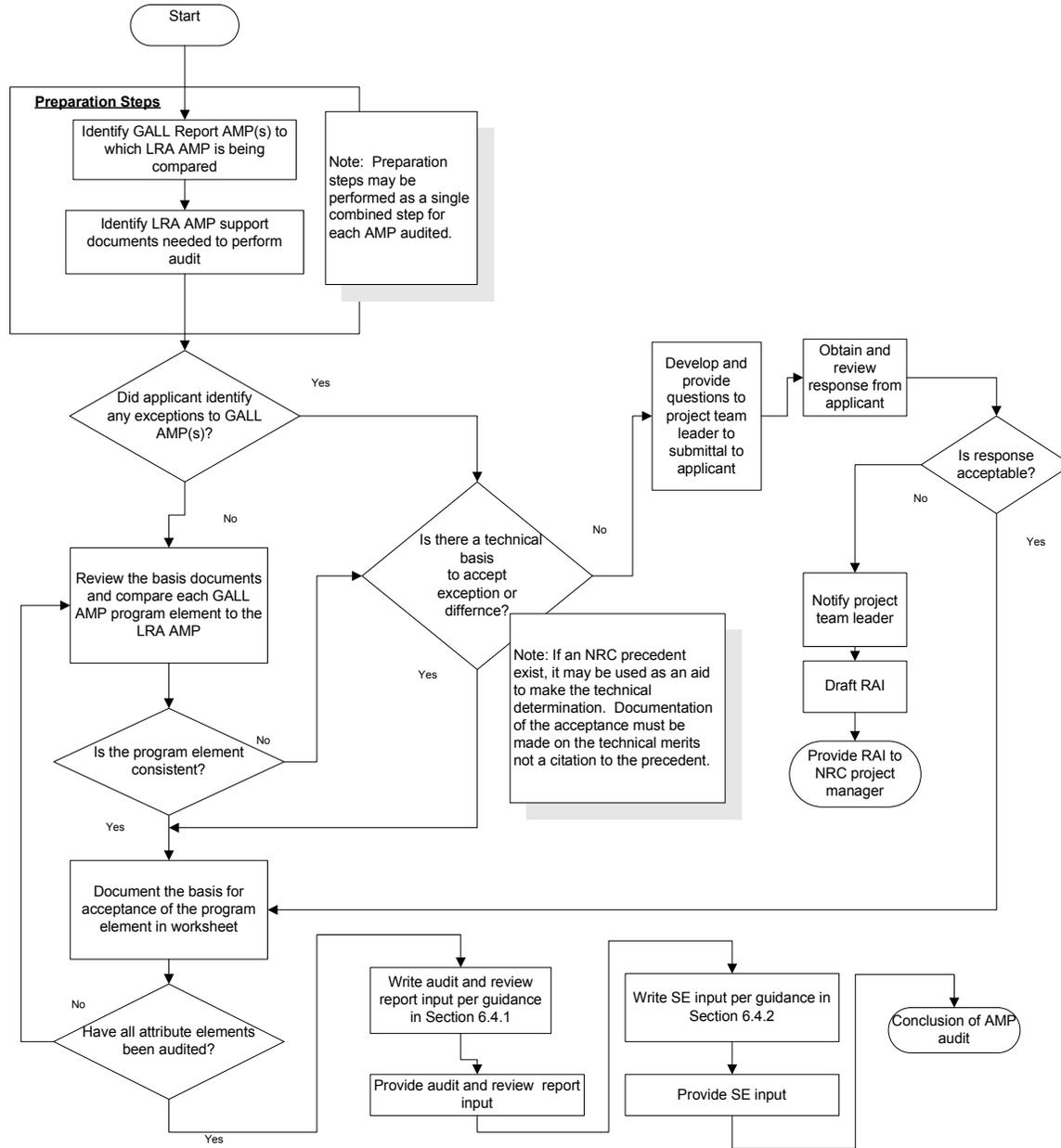
Developing Questions for Site Visit

- Example for AMP
 - **In the plant A LRA, the applicant does not have an AMP which is equivalent to XI.M13, “Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)”. Please explain how to manage loss of fracture toughness due to thermal aging, neutron irradiation embrittlement and void swelling of CASS reactor vessel internals.**



AMPs Consistent with GALL Report

AMP Audit Flow Diagram



Auditable AMP Details – Consistent with GALL

- NUREG-1801, Vol. 2, Chapter XI
 - 53 PWR/BWR AMP consistent with GALL
- Applicant's choice to use in LRA
 - One or more AMPs in LRA → one or more GALL AMPs
 - LRA AMP may have exceptions and/or enhancement to GALL AMP

GALL AMP – Elements

- SRP-LR defines 10 program element for each AMP (Appendix A)
- GALL AMPs provide explicit details
 - Each program element has one or more criteria to be audited

GALL AMP – Program Elements

Element	Description
1. Scope of program	Scope of program should include the specific structures and components subject to an AMR for license renewal.
2. Preventive actions	Preventive actions should prevent or mitigate aging degradation.
3. Parameters monitored or inspected	Parameters monitored or inspected should be linked to the degradation of the particular structure or component intended function(s).
4. Detection of aging effects	Detection of aging effects should occur before there is a loss of structure or component intended function(s). This includes aspects such as method or technique (i.e., visual, volumetric, surface inspection), frequency, sample size, data collection and timing of new/one-time inspections to ensure timely detection of aging effects.
5. Monitoring and trending	Monitoring and trending should provide predictability of the extent of degradation, and timely corrective or mitigative actions.
6. Acceptance criteria	Acceptance criteria, against which the need for corrective action will be evaluated, should ensure that the structure or component intended function(s) are maintained under all CLB design conditions during the period of extended operation.
7. Corrective actions	Corrective actions, including root cause determination and prevention of recurrence, should be timely.
8. Confirmation process	Confirmation process should ensure that preventive actions are adequate and that appropriate corrective actions have been completed and are effective.
9. Administrative controls	Administrative controls should provide a formal review and approval process.
10. Operating experience	Operating experience of the aging management program, including past corrective actions resulting in program enhancements or additional programs, should provide objective evidence to support the conclusion that the effects of aging will be managed adequately so that the structure and component intended function(s) will be maintained during the period of extended operation.

GALL AMP

XI.M3 Reactor Head Closure Studs

Program Description

This program includes (a) inservice inspection (ISI) in conformance with the requirements of the American Society of Mechanical Engineers (ASME), Code, Section XI, Subsection IWB (2001 edition² including the 2002 and 2003 Addenda), Table IWB 2500-1, and (b) preventive measures to mitigate cracking.

Evaluation and Technical Basis

1. **Scope of Program:** The program includes (a) ISI to detect cracking due to stress corrosion cracking (SCC) or intergranular stress corrosion cracking (IGSCC), loss of material due to wear, and coolant leakage from reactor vessel closure stud bolting for both boiling water reactors (BWRs) and pressurized water reactors (PWRs); and (b) preventive measures of NRC Regulatory Guide 1.65 to mitigate cracking. The program is applicable to closure studs and nuts constructed from materials with a maximum tensile strength limited to less than 1,172 MPa (170 ksi) (Nuclear Regulatory Commission [NRC] Regulatory Guide [RG] 1.65).
2. **Preventive Actions:** Preventive measures include avoiding the use of metal-plated stud bolting to prevent degradation due to corrosion or hydrogen embrittlement, and to use manganese phosphate or other acceptable surface treatments and stable lubricants (RG 1.65). Implementation of these mitigation measures is can reduce SCC or IGSCC, thus making this program effective.
3. **Parameters Monitored/Inspected:** The ASME Section XI ISI program detects and sizes cracks, detects loss of material, and detects coolant leakage by following the examination and inspection requirements specified in Table IWB-2500-1.
4. **Detection of Aging Effects:** The extent and schedule of the inspection and test techniques prescribed by the program are designed to maintain structural integrity and ensure that aging effects will be discovered and repaired before the loss of intended function of the component. Inspection can reveal cracking, loss of material due to corrosion or wear, and leakage of coolant.

The program uses visual, surface, and volumetric examinations in accordance with the general requirements of Subsection IWA-2000. Surface examination uses magnetic particle, liquid penetration, or eddy current examinations to indicate the presence of surface discontinuities and flaws. Volumetric examination uses radiographic or ultrasonic examinations to indicate the presence of discontinuities or flaws throughout the volume of material. Visual VT-2 examination detects evidence of leakage from pressure-retaining components, as required during the system pressure test.

Components are examined and tested as specified in Table IWB-2500-1. Examination category B-G-1 for pressure-retaining bolting greater than 2 in. diameter in reactor vessels specifies volumetric examination of studs in place, from the top of the nut to the bottom of

the flange hole, and surface and volumetric examination of studs when removed. Also specified are volumetric examination of flange threads and visual VT-1 examination of surfaces of nuts, washers, and bushings. Examination category B-P for all pressure-retaining components specifies visual VT-2 examination of all pressure-retaining boundary components during the system leakage test and the system hydrostatic test.

5. **Monitoring and Trending:** The Inspection schedule of IWB-2400, and the extent and frequency of IWB-2500-1 provide timely detection of cracks, loss of material, and leakage.
6. **Acceptance Criteria:** Any indication or relevant condition of degradation in closure stud bolting is evaluated in accordance with IWB-3100 by comparing ISI results with the acceptance standards of IWB-3400 and IWB-3500.
7. **Corrective Actions:** Repair and replacement are performed in conformance with the requirements of IWB-400 and IWB-7000, respectively, and the material and inspection guidance of RG 1.65. As discussed in the appendix to this report, the staff finds the requirements of 10 CFR Part 50, Appendix B, acceptable to address the corrective actions.
8. **Confirmation Process:** Site quality assurance (QA) procedures, review and approval processes, and administrative controls are implemented in accordance with the requirements of 10 CFR Part 50, Appendix B. As discussed in the appendix to this report, the staff finds the requirements of 10 CFR Part 50, Appendix B, acceptable to address the confirmation process and administrative controls.
9. **Administrative Controls:** See Item 8, above.
10. **Operating Experience:** The SCC has occurred in BWR pressure vessel head studs (Stoller 1991). The aging management program (AMP) has provisions regarding inspection techniques and evaluation, material specifications, corrosion prevention, and other aspects of reactor pressure vessel head stud cracking. Implementation of the program provides reasonable assurance that the effects of cracking due to SCC or IGSCC and loss of material due to wear will be adequately managed so that the intended functions of the reactor head closure studs and bolts will be maintained consistent with the current licensing basis (CLB) for the period of extended operation.

Audit Worksheet

<p>1. Scope of Program</p>	<p>A The program includes periodic monitoring and control of known detrimental contaminants such as chlorides, fluorides (PWRs only), dissolved oxygen, and sulfate concentrations below the levels known to result in loss of material or crack initiation and growth. Water chemistry control is in accordance with the guidelines in BWRVIP-29 (EPRI TR-103515) for water chemistry in BWRs; EPRI TR-105714, Rev. 3 and PWRs; EPRI TR102134, Rev. 3, for primary water chemistry in PWRs; EPRI TR-102134, Rev. 3, for secondary water chemistry in PWRs; or later revisions or updates of these reports as approved by the staff.</p>	<p>Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria:</p> <p>Comment:</p>
<p>2. Preventive Actions:</p>	<p>A The program includes specifications for chemical species , sampling and analysis frequencies, and corrective actions for control of reactor water chemistry.</p>	<p>Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria:</p> <p>Comment:</p>
<p>“</p>	<p>B System water chemistry is controlled to minimize contaminant concentration and mitigate loss of material due to general, crevice and pitting corrosion and crack initiation and growth caused by SCC.</p>	<p>Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria:</p> <p>Comment:</p>

GALL AMP - Elements Site Documents

- Program Basis Documents (PBDs) and implementation procedures
 - PBDs provide justification of statements in LRA and are available at the applicant's office
 - May not be removed unless docketed
 - May transcribe information for use in Audit Report
- Need to retain reference identification of all public and non-public reviewed documents
 - Number
 - Title
 - Issue document
 - Revision

Exceptions to GALL Report AMP

- Applicant may take exception to criteria of GALL program element
 - If project team identifies difference treat as exception, even if not identified by applicant
- Applicant to provide justification for exception
- Project team to review justification and determine if basis is acceptable

Enhancement to Plant's AMP

- Enhancement is applicant action necessary to bring AMP to be consistent with GALL
- Applicant to provide basis for enhancement
- Project team to review basis and determine if acceptable
- Enhancement action shall be documented in UFSAR updated (LRA, Appendix A)
 - Need commitment to implement enhancement prior to extended period of operation

Operating Experience Element

- Purpose
 - To assess whether AMP will or has adequately addressed plant and industry experience associated with the aging effects
- Document relevant plant and industry operating experience
 - Indicate basis for concluding that AMP would be expected to appropriately manage aging effects during the extend period of operation
- New AMPs may have special consideration
- Plant Operating Experience (OE) program

Operating Experience Element

- From NEI 95-10 – Industry Guideline for Implementing the Requirement of 10 CFR 54 – The License Renewal Rule:
 - Industry and plant-specific operating experience requires review to identify aging effects requiring management that are not identified by the industry guidance documents (such as EPRI tools) and to confirm the effectiveness of aging management programs
 - Operating Experience – plant specific aging management requirements
 - A plant-specific operating experience review should assess the operating and maintenance history. A review of the prior five to ten years of operating and maintenance history should be sufficient. The results of the review should confirm consistency with documented industry operating experience. Differences with previously documented industry such as new aging effects or lack of aging effects allows consideration of plant-specific aging management requirements

Operating Experience Element

- Operating experience with AMP
 - Plant-specific operation with existing programs should be considered. The operating experience of AMP, including past corrective actions resulting in program enhancements or additional programs, should be considered. The review should provide objective evidence to support the conclusion that the effects of aging will be managed so that the intended function(s) will be maintained during the PEO.
 - Guidance for reviewing industry operating experience in BTP RLSB-1 in Appendix A.1 of the Branch Technical Positions in NUREG-1800

Operating Experience Element

- Industry operating experience
 - Industry operating experience and its applicability should be assessed to determine whether it changes plant-specific determinations. NUREG-1801 is based upon industry prior to its date of issue. Operating experience after the issue date of NUREG-1801 should be evaluated and documented as part of the aging management review
- In particular, generic communications such as a Bulletin or an Information Notice should be evaluated for impact upon the new component or location experiencing an already identified aging effect

Operating Experience – GALL text

3.1.3.1 AMR Results Consistent with the GALL Report

The applicant may reference the GALL Report in its LRA, as appropriate, and demonstrate that the AMRs and AMPs at its facility are consistent with those reviewed and approved in the GALL Report. The reviewer should not conduct a re-review of the substance of the matters described in the GALL Report. If the applicant has provided the information necessary to adopt the finding of program acceptability as described and evaluated in the GALL Report, the reviewer should find acceptable the applicant's reference to the GALL Report in its LRA. In making this determination, the reviewer confirms that the applicant has provided a brief description of the system, components, materials, and environment. The reviewer also confirms that the applicant has stated that the applicable aging effects and industry and plant-specific operating experience have been reviewed by the applicant and are evaluated in the GALL Report.

Furthermore, the reviewer should confirm that the applicant has addressed operating experience identified after the issuance of the GALL Report. Performance of this review requires the reviewer to confirm that the applicant has identified those aging effects for the reactor vessel, internals, and reactor coolant system components that are contained in the GALL Report as applicable to its plant.

UFSAR – Appendix A Review

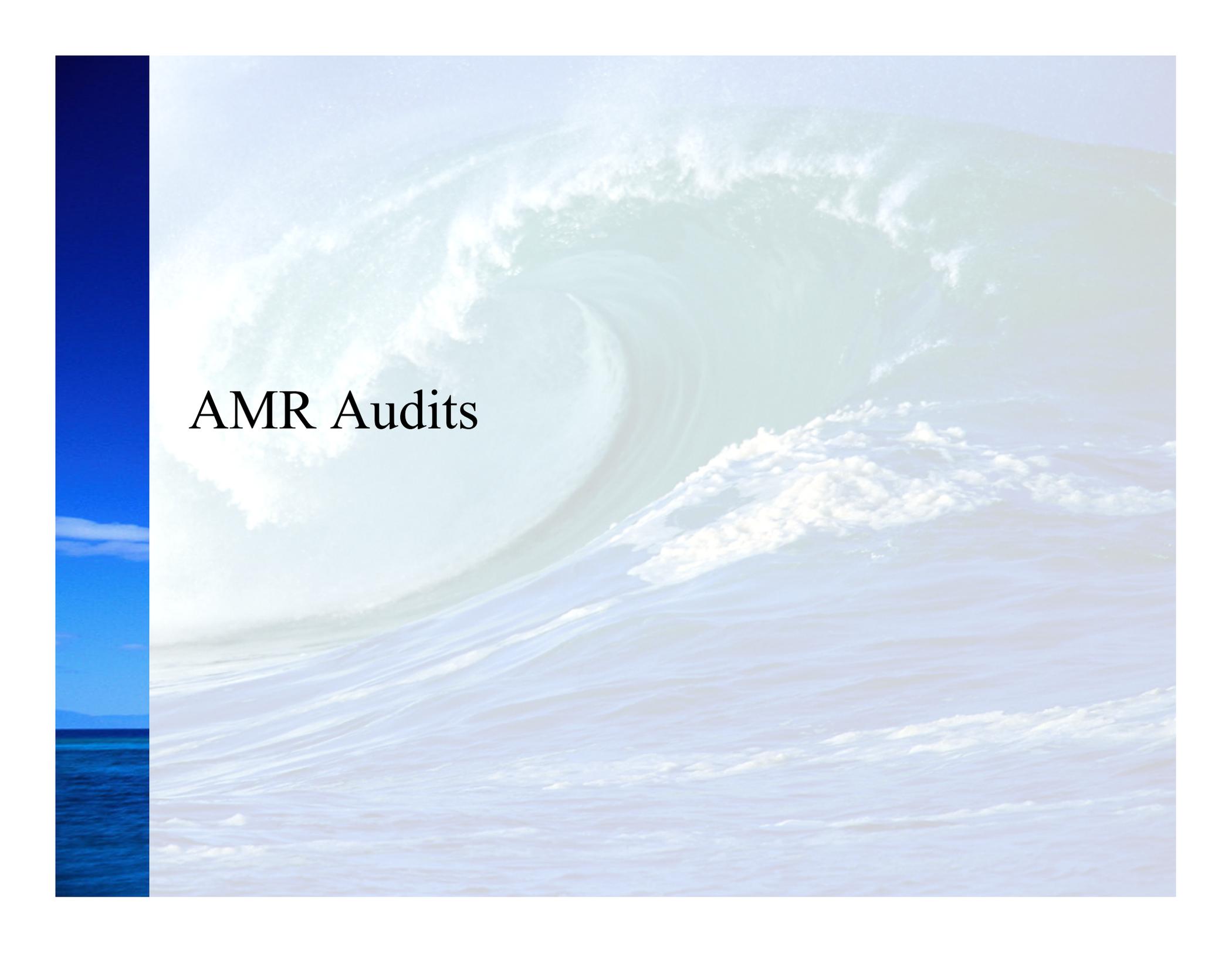
- Establishes the formal regulatory commitment to implement the AMP
 - For an existing AMP, the UFSAR commitment is likely to be sufficient; simply confirm that AMP will be continued through PEO
 - Use of 10 CFR 50.59 is a key consideration
- Must confirm that applicant has appropriately documented any enhancement

A large, powerful ocean wave is the central focus of the image, captured in a dynamic, mid-break state. The wave's crest is a thick, white foam that is beginning to curl over, creating a sense of movement and power. The water below the crest is a deep, vibrant blue, contrasting sharply with the white foam. The background shows a clear, light blue sky, suggesting a bright, sunny day. The overall composition is energetic and visually striking.

Plant-Specific AMP Review

SRP elements – Plant-Specific AMP Reviews

- Appendix A, SRP-LR
 - Defines the 10 programs elements against which plant-specific AMPs are to be reviewed
 - Project team review is to confirm that AMP is
 - Consistent with criteria defined in SRP-LR
 - Satisfies 10 CFR 54.21(a)(3)



AMR Audits

Regulatory Purpose

- 10 CFR 54.21(a)(3)
 - “For each structures and components identified in paragraph (a)(1) of this section, demonstrate that the effects of aging will be adequately managed so that the intended functions will be maintained consistent with the CLB for the period of extended operation.”

AMR Audits Consistent With the GALL Report

- Table 1 and Table 2 – GALL Report
 - Tables 2s
 - Component
 - Material
 - Environment
 - Aging effect
 - AMP
 - Table 1s
 - Additional evaluation required
 - Cross reference in details in SRP-LR

SRP-LR Example of Additional Evaluation Required

- **3.1.2.2.5 Crack Growth due to Cyclic Loading**

Crack growth due to cyclic loading could occur in reactor vessel shell forgings clad with stainless steel using a high-heat-input welding process. Growth of intergranular separations (underclad cracks) in the heat affected zone under austenitic stainless steel cladding is a TLAA to be evaluated for the period of extended operation for all the SA 508-C1 2 forgings where the cladding was deposited with a high heat input welding process. The methodology for evaluating the underclad flaw should be consistent with the current well-established flaw evaluation procedure and criterion in the ASME Section XI Code. See the SRP-LR, Section 4.7, “Other Plant-Specific Time-Limited Aging Analysis,” for generic guidance for meeting the requirements September 2005 3.1-5 NUREG-1800, Rev. 1 of 10 CFR 54.21(c).



AMR Reviews based on NRC-approved precedents

Regulatory Requirement and Guidance

- 10 CFR 54.21(a)(3)
- Audit plan
 - Defines process

SRP-LR, Appendix A

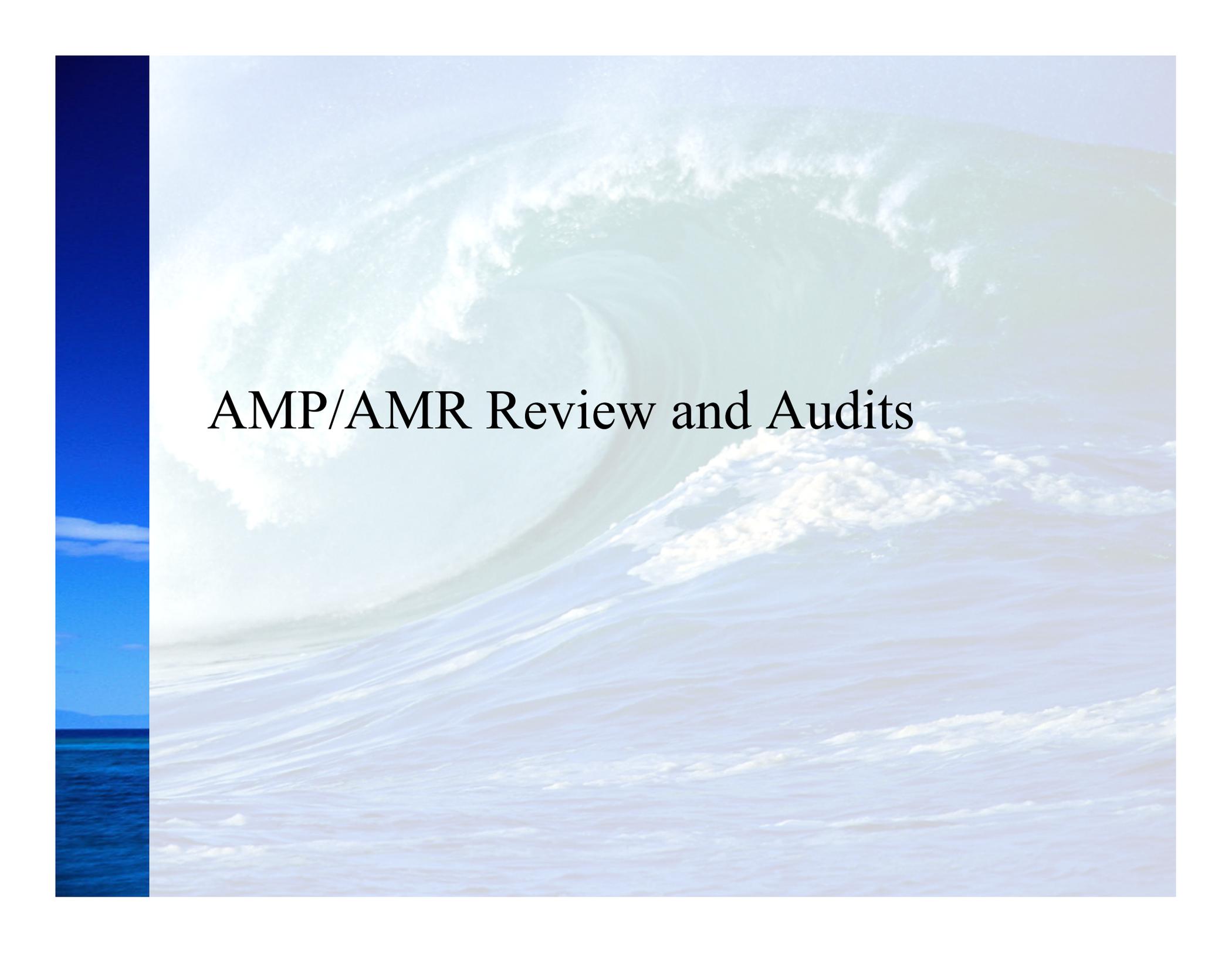
- No relevant specific guidance
 - Perform review to confirm compliance with 10 CFR 54.21(a)(3)

NRC-Approved Precedents

- Applicant identifies NRC-approved precedents
 - Reviews prior LRA SER to determine if there is adequate technical basis in the other plant's SER
 - Uses other plant's documented basis as a basis for why precedent is acceptable
- Project team performs a technical review to confirm appropriateness of the precedent
 - Unacceptable to just cite precedent or reference other plant's LRA SER

Past Precedent

- Check if adequate justification is in the LRA
- Check if adequate justification is in the reference plant's SER
- If not, contact project team leader and applicant's supporting staff to determine if there are any other references to past precedent
- If this fails to come up with adequate justification, contact team leader. It may be appropriate to contact the NRC technical staff for information and references
- If the above steps fail and the project team member has sufficient expertise on the issue, try to generate a justification based on public information, docketed information, and/or the bases documents provided by the applicant. It is suggested that the justification for past precedents generated this way be reviewed by another staff knowledgeable in the field
- If the above steps fail, the AMR will be sent to technical staff for further evaluation



AMP/AMR Review and Audits

SER Outline

1. Introduction and general discussion
2. Structures and components subject to aging management review
3. Aging management results
4. Time-limited aging analyses
5. Review by the Advisory Committee on Reactor Safeguards (ACRS)
6. Conclusions



Issues of Interest

1. Use of ISI in lieu of BWRVIP for AMR items

Issue

- Inadequacy of ISI Program for managing IGSCC of Class 1 piping

Background

- Some applicants credited the ISI program in lieu of BWRSCC
- BWRSCC references GL 88-01, NUREG-0313, Rev. 2, and BWRVIP-75
- BWRVIP-75 recommends examination in addition to ASME Section XI

Resolution

- The applicant amended the LRA to credit BWRSCC Program and Water Chemistry Control Program

2. BWRVIPs

Issue

- BWRVIP applicant action items (AAIs)

Background

- The requirement for BWR vessel internal inspections are documented in ASME Code and BWRVIP reports
- In some cases, BWRVIPs provide more stringent or specific inspection requirements
- BWRVIPs now provided with AAIs identified in the final license renewal SER (FLRSER)

Resolution

- The applicant must address AAIs identified in FLRSERs for all BWRVIPs

3. Non-EQ neutron monitoring cables (E2)

Issue

- LR scope of E2 neutron monitoring cables

Background

- Neutron monitoring cables are within the scope of LR
- At one audit, the scope of E-2 AMP was found inconsistent between Unit 1 and Unit 2 due to erroneous safety classification

Resolution

- The applicant revised program basis document and associated scoping documents

4. Inaccessible medium-voltage cables (E3)

Issue

- Identification of medium voltage underground cable

Background

- E-3 AMP applies to cable subjected to the following conditions:
 1. Within the scope of LR
 2. Medium voltage (2kV to 35 kV), and
 3. Inaccessible (e.g., underground)
- Safety concern – water tree formation
- One original LRA stated that Units 1 and 2 have no E-3 cables
- During the NMP audit, 18 cables subjected to E-3 AMP were identified

Resolution

- In the LRA supplement, E-3 AMP, “Non-EQ Inaccessible Medium Voltage Cables Program” was added

5. Metal Enclosed Bus (MEB) – E4

Issue

- No re-torque on MEB

Background

- Buses in MEBs may experience loosening of bolted connections
- The LRA indicated that the applicant would re-torque the accessible bolted connections
- Vendors do not typically recommend re-torque of bolted connections unless the joint requires service or the bolted connections are clearly loose

Resolution

- The applicant revised its E4 AMP to delete the torque test/torque checks
- A visual inspection for the accessible bolted connection covered with insulation material (heat shrink tape, sleeving, insulation boots, etc) will be added

6. Electrical cable connections (metallic parts) – E6

- Issue
 - No aging management for electrical cable connections
- Background
 - Electrical bolted cable connections may experience loosening or high resistance
 - The LRA indicated that no aging required management for electrical cable connections
 - GALL Report recommends inspection of bolted connections for loosening or high resistance
- Resolution
 - The applicant submitted an AMP for bolted cable connections

7. Fatigue Monitoring Program (FMP)

Issue

- Proper selection of fatigue sensitive components locations

Background

- Location identified in NUREG/CR-6260 are generic and minimum for monitoring and evaluation of environmental effects
- Some plants have own plant-specific locations

Resolution

- NUREG/GR-6260 locations need to be monitored, as a minimum. Plant specific critical components for fatigue shall be considered for fatigue and evaluated for environmental effects

8. Fatigue Monitoring Program (FMP)

Issue

- Project component $CUF > 1.0$ during EPO

Background

- The CUF has to be less than 1
- In case of calculated $CUF > 1$, do either replacement, repair, refine calculation or use aging management technique
- Normally, plants performing refined calculation prior to repairing or replacement
- Cycle counting vs transient monitoring

Resolution

- The applicant shall demonstrate that the aging effect on the intended functions will be adequately managed during PEO

9. Flow-Accelerated Corrosion (FAC) Program

Issue

- Minimum wall thickness for further evaluation
- Criteria for additional examinations

Background

- Some applicants have owner-defined acceptance criteria without a solid basis

Resolution

- Minimum allowable wall thickness
 - Fabrication minimum (87.5% nominal) or the ASME Code Section III allowable wall thickness
 - If the ASME Code requirements cannot be met, the applicant must justify the lower allowable wall thickness by using ASME Operating Code (Section XI).
 - If degradation is detected:
 - Additional examinations are performed in advancement areas to bound the thinning for the same inspection period

10. Use of ASME Code Cases and Relief Requests

Issue

- Use of ASME Code cases and relief requests (RRs) as justification for exception to a GALL Report AMP

Background

- LRA cited RRs as justification to exceptions to the GALL Report recommendations
- Some applicant added the following statement to their LRAs, “Exceptions to ASME Code requirements that have been granted by approved Code Cases or relief requests are not considered to the exceptions to NUREG-1801 criteria.”
- ASME Code RRs do not suffice as a technical basis for taking exception to the GALL Report.
- RRs are granted for 10-year inspection interval only

Resolution

- The staff will not agree to an exception to a GALL Report element based on a previously NRC approved RR
- The applicant may request an exception only based on technical merits
- Any unnecessary statement regarding the use of RRs should be removed from LRA

11. CASS Thermal Aging Embitterment

Issue

- Leak-before-break (LBB) analysis credited as a flaw tolerance evaluation to manage CASS thermal aging embitterment

Background

- The GALL report recommendation:
 - Either enhanced volumetric examination or
 - Component-specific flaw tolerance evaluation
- Some applicants take credit of LBB analysis

Resolution

- The NRC project team identified that using LBB to demonstrate management of CASS piping is a misinterpretation
- For flaw tolerance evaluation, the GALL report recommended partial through-wall flaw evaluation. Therefore, the LBB analysis is not a flaw tolerance evaluation

12. Bolting Integrity Program

Issue

- Aging management program for closure bolting

Background

- The original LRAs for several plants did not have Bolting Integrity Program
- The Bolting Integrity Program should contain the recommendations specified in NUREG-1339

Resolution

- Bolting Integrity AMP was added to the LRA through supplements
- The AMP XI.M18, “Bolting Integrity” in the 2005 GALL Report has been extensively revised to include various bolting, and thus make the program more broadly applicable

13. Selective Leaching

Issue

- Selective leaching aging effect cannot be managed with visual inspection only

Background

- Some LRAs indicated that selective leaching is to be inspected by visual inspection only
- One LRA stated that there is no suitable equipment for performing hardness measurement
- Staff determined that selective leaching degradation requires hardness measurements

Resolution

- Selective leaching is difficult to detect by visual inspection
 - A Brinell hardness test on the inside surface of selected components is recommended
 - Alternately, a destructive test can be performed
 - GALL AMP XI.M33, “Selective Leaching of Materials,” recommends a combination of one-time inspection and hardness measurement

14. Buried Piping and Tank Inspection

Issue

- Inspection requirement (frequency, sample locations)
- Buried piping and inspection cannot depend on opportunistic inspection only

Background

- Some LRAs indicated that aging effects of buried piping and tank are to be managed by opportunistic inspection only. In some cases, the LRA does not provide inspection frequency

Resolution

- The AMP XI.M34, “Buried Piping and Tank Inspection” in the 2005 GALL report has been revised to clarify:
 - Prior to entering the PEO, the applicant is to verify that there is at least one opportunistic or focused inspection performed within the past 10 years
 - Upon entering the PEO, the licensee is to perform a focus inspection within 10 years. The inspections are to be performed in the areas with the highest likelihood of corrosion problems, and in areas with a history of corrosion problems

15. Validation of Water Chemistry Control

Issue

- Water Chemistry Control AMP – augmented by other AMPs

Background

- Water Chemistry Control AMP is generally effective in removing impurities from intermediate and high flow areas
- GALL report identifies that the AMP needs to be augmented for validation

Resolution

- Reference to GALL Report
- Cases where augmented validation of a Water Chemistry AMP is not needed, if
 - Gall report water chemistry AMP incorporates inspection activities as standard actions, such as CCCW and OCCW AMPs
 - The applicant has made a technical case that augmented inspection are not necessary, such as high flow or dry steam

16. Inaccessible Concrete Inspection

Issue

- Inspection to be performed for inaccessible concrete

Background

- Some applicants stated that no inspection is required for the inaccessible concrete, because there is no aggressive environment, and concrete construction met ACI Code.
- ISG-03 was completed in 2001

Resolution

- The AMP columns in the revised GALL report chapter 2 (Containment Structures) and chapter 3 (Structures and component supports) address concrete element in both accessible and inaccessible areas

17. Corrosion of the Mark I Drywell Shell

Issue

- NRC staff is proposing an ISG on Corrosion of Mark I Drywell Shell

Background

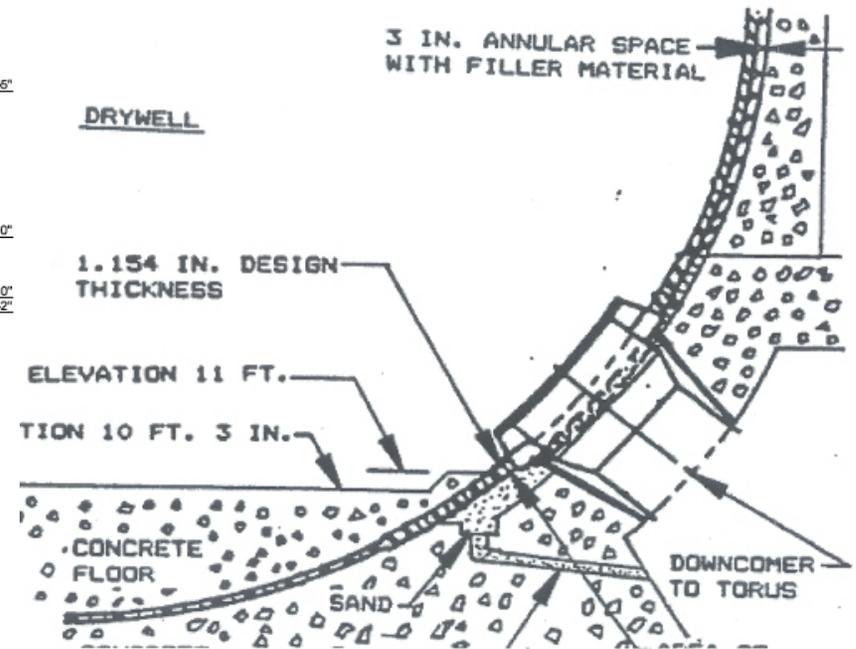
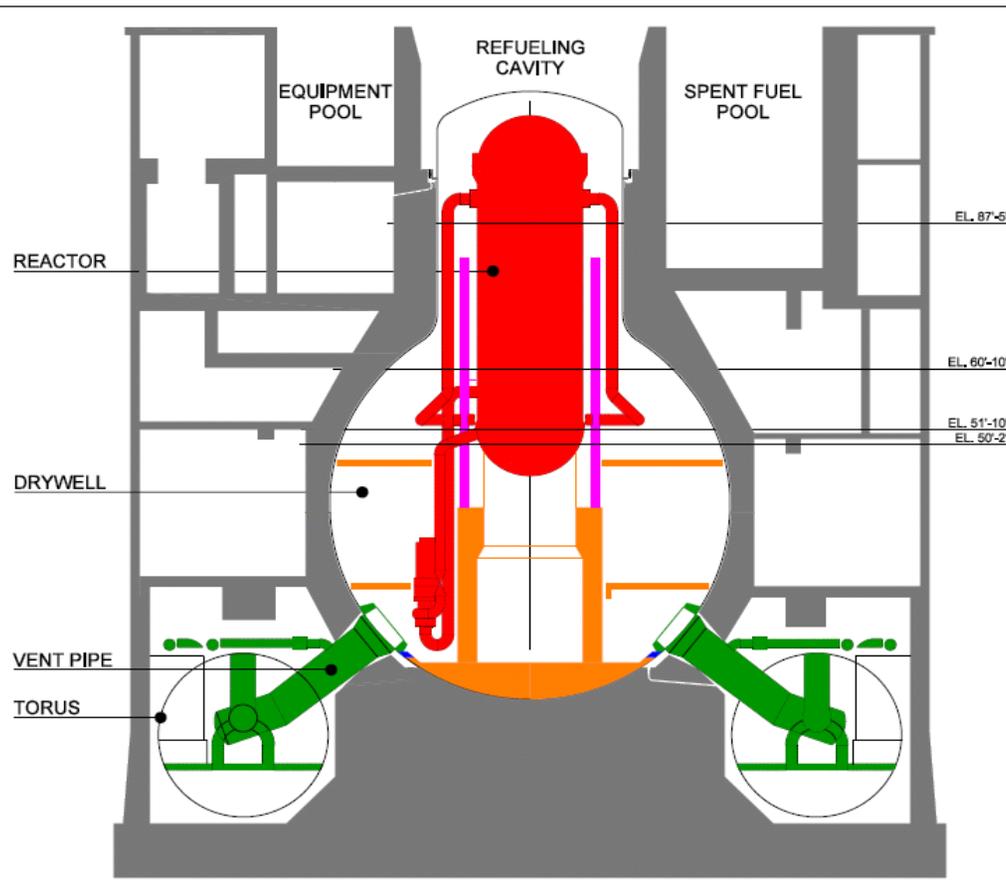
- Operating experience indicates torus and drywell of BWR Mark 1 containments are subjected to pitting and general corrosion
- GALL report only addresses embedded steel containment shell or liner
- The GALL report does not provide sufficient guidance when the drywell shell area is surrounded by concrete structure and the distance between the shell and the surrounding concrete is too small for performing visual examination (VT)

Resolution

- The staff is proposing an ISG to address detecting and monitoring of corrosion in the inaccessible areas of the drywell shell



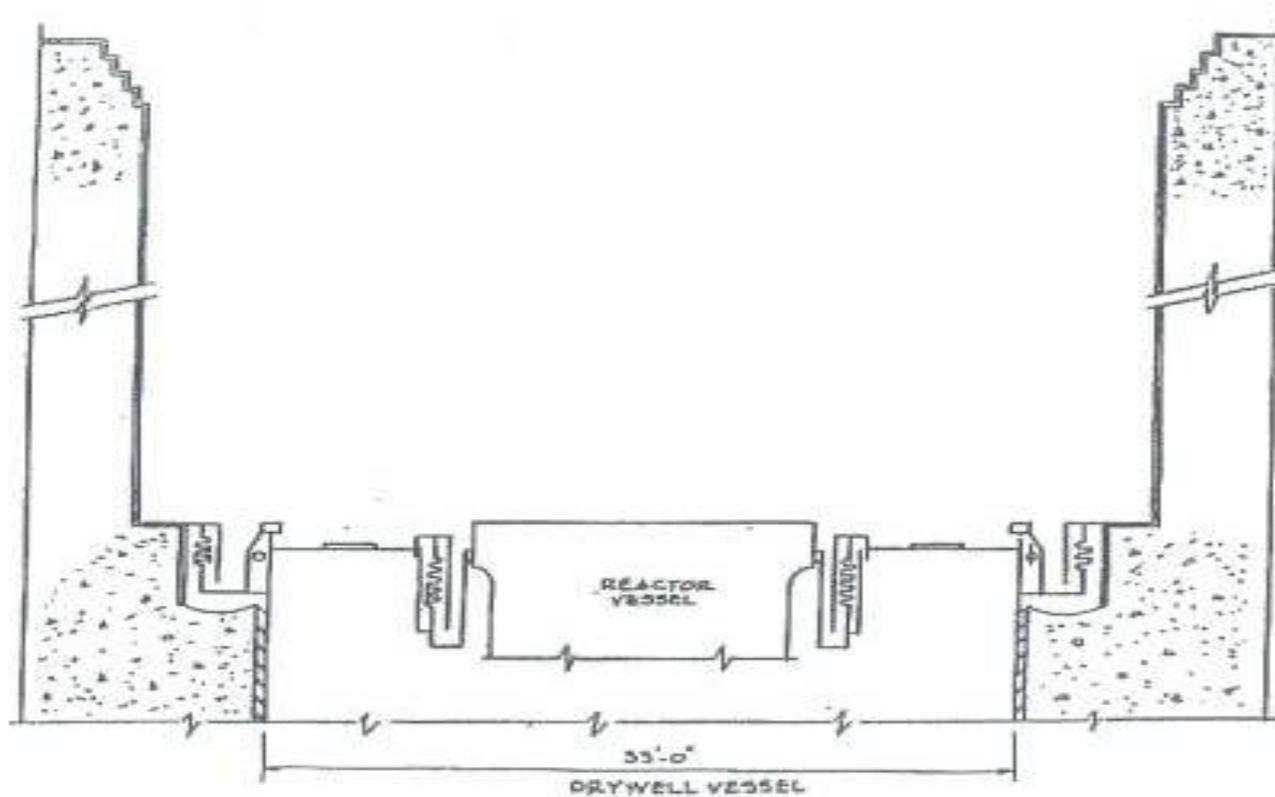
17. Corrosion of the Mark I Drywell Shell



Sketch of Typical Drywell



17. Corrosion of the Mark I Drywell Shell



Sketch of Typical Refueling Seals

18. One-Time Inspection for ASME Code Class 1 Small-Bore Piping

Issue

- Class 1 small-bore piping requires supplemental volumetric examination at sufficient locations

Background

- Class 1 small-bore piping is exempted from volumetric examinations as identified in ASME Code Section XI

Resolution

- For plants having no cracking experience in Class 1 small-bore piping, the One-Time Inspection Program (2005 GALL Report XI.M35) shall be used.
- For plants having cracking experience in Class 1 small-bore piping, a plant-specific program shall be provided to manage cracking
- Risk informed ISI can be applied to select locations, but not to eliminate inspection

19. Volumetric Inspection of Socket Welds in Small-Bore Piping

Issue

- Aging management of socket welds in small-bore piping

Background

- Some plants exclude volumetric inspection for the socket welds in small-bore piping
- ASME code specify surface examination or visual inspection for socket welds in small-bore piping
- GALL report recommends using:
 - One-Time Inspection to detect cracking (XI.M35)
 - Volumetric examination (XI.M35)
 - Inspection at sufficient locations
 - Sample size based on susceptibility, inspectability, dose considerations, operating experience, and total population



19. Volumetric Inspection of Socket Welds in Small-Bore Piping

Background (cont.)

- The volumetric examination is not an issue for the butt weld in the small-bore piping
 - However, the GALL report is silent on volumetric examination of socket welds in small-bore piping
 - Inspection techniques are being developed for socket welds
- Some plants claimed the socket welds examination is not needed based on plant-specific safety evaluation and their corrective actions

Resolution

- Determination: Socket welds inspections is not required
- NRC staff concludes that inspections is not effective in determining cracks

20. Aging management of RV Top Guide

Issue

- Inspection of RV top guide

Background

- BWRVIP-26A, “BWR Top Guide Inspection and Flaw Evaluation Guidelines”:
 - Provides generic guidelines for inspection recommendations, and
 - Provide information on potential failure locations
- The current GALL (item IV.B1-17) recommends:
 - Inspection of 5% of locations using EVT-1, within 6 years after entering the PEO
 - An additional 5% of the locations will be inspected within 12 years after entering the PEO
 - No reference to the remaining PEO

Resolution

- The NRC project teams questioned applicants the inspection commitments during the remaining PEO 259

21. Metal fatigue analyses cycles

Issue

- Transient Cycles for Metal fatigue Analyses

Background

- Some LRAs assigned zero cycles to some transients that had been included in the original (40 year) design.
- 3.2 of ANS-51.1, "Nuclear Safety Criteria for the Design of Stationary Pressurized Water Reactor Plant," stated that events with a best-estimated frequency of occurrence of less than $10E-6$ per reactor year need not be considered for design.

Resolution

- The NRC audit requested the applicant to justify the methodology for cycle projection to 60 years.
- Provide a calculation supporting the conclusion that the frequency of transient occurrence is negligible (per ANS 51.1) for dropped events.



21. Metal fatigue analyses cycles

Table 4.3-1 Significant Transient Cycle Limits Tracked by the WCGS Fatigue Management Program

Transient Boldface are Technical Specification surveillance transients. "(M)" are manually recorded, all others are recorded automatically.	Design Limit	Cycles to 12/31/2005	Estimated Cycles to 60-Year EOL⁽³⁾
20. Reactor Trip, 100% to 0% of Rated Thermal Power <ul style="list-style-type: none"> • No Inadvertent Cooldown, or • Cooldown with Safety Injection, or • Cooldown with No Safety Injection • No Inadvertent Cooldown, with Turbine Overspeed (Included in the 230 with No Inadvertent Cooldown) 	400 230 10 160 (20 of 230)	55 55 0 0 NS ⁽⁹⁾	99⁽¹⁰⁾ 99 0 0 -
21. Auxiliary Spray Actuation, Spray Water Differential ≥ 320 °F	10	0	0
22. Inadvertent RCS Depressurization (M)	20	0	0
23. Inadvertent Startup of Inactive Loop (M)	10	0	0
24. Excessive Feedwater Flow (M)	30	0	0
25. Operating Basis Earthquake (OBE) (M)	200 ⁽¹¹⁾	0	0
Test Events			

22. Carbon steel components

Issue

- AMP for carbon steel components exposed to raw water environment

Background

- Some LRAs credit One-Time inspection program to manage carbon steel components exposed to raw water environment..
- One-Time inspection program is credited to confirm the insignificance of an aging effect.

Resolution

- The NRC audit requested the applicant to justify that general corrosion is insignificant for carbon steel under raw water environment.
- Applicant revised LRA with other AMP to manage this item effectively.

23. Power Operated Relief Valve (PORV)

- Issue
 - Recent operating experience of Wolf Creek Pressurizer PORV Nozzle to safe end weld cracking
- Background
 - The largest defect was located on a nozzle-to-safe end weld in a 6” PORV line. It measured 12” in length and was characterized as 30% through wall
- Resolution
 - The NRC audit requested the applicant to justify that general corrosion is insignificant for carbon steel under raw water environment
 - Applicant revised LRA with other AMP to manage this item effectively

24-25. Miscellaneous Issues

Issues

- Use of industry practice and plant-specific operating experience as a sole basis for accepting applicant's claim
 - Subsequently used in SER conclusion
- Insufficient plant basis documents provided for LR audit
 - One applicant provided only implementation procedures for NRC audit team to review
 - The GALL report states: " The above verifications must be documented onsite in an auditable form."

Issues of interest

- Applicant needs only to show that plant can operate safely in accordance with its CLB until the regulatory process resolves the issue
- Once an issue is resolved generically, the NRC will require whatever action is appropriate for all affected operating reactors



Point Peach license renewal

Point Beach LR

- Westinghouse 2-loop PWRs
- Major Improvements
 - Steam generator replacement
 - Split pin replacement
 - Unit 2 baffle-former bolt replacement
 - Reactor vessel head replacement

Point Beach LR

- Reactor vessel irradiation embrittlement TLAAAs
 - pressurized thermal shock (PTS)
 - Projected to exceed PTS screen criteria
 - Commitments for PTS TLAA
 - upper shelf energy (USE)
 - USE value less than required 50 ft-lb
 - Satisfied 10 CFR50 Appendix G requirements by performing Equivalent Margin Analysis (Reg. 1.161)

Point Beach LR

- Metal Fatigue (SG)
 - CUF of 4.65 was listed for the bolts of the Unit 1 SG secondary inspection ports.
 - The above bolts are managed by replacement on a periodic basis.

Point Beach LR

- Metal Fatigue
 - NUREG/CR-6260 identified fatigue-critical locations for evaluation of environmental impacts
 - Fatigue Monitoring program counted transient cycles
 - FatiguePro calculated stress and CUF at selected location

Point Beach LR

- Leak Before Break (LBB)
 - 10 CFR50 Appendix A, GDC 4 rule change
 - SRP Section 3.6.3
 - PWSCC

Point Beach LR

- RCS Alloy 600 Program
- Reactor Vessel Internal Program
 - Commitments to submit the program for NRC review 24 months prior to entering PEO

Point Beach LR

- Relief Requests (RR)
 - PBNP used approved RRs to justify exceptions to GALL
 - Approximated 20 RRs were cited
 - This is not acceptable. Exceptions to GALL must be justified from technical merits
 - All except 1 were not exceptions to GALL, administrative in nature, with no bearing on aging management etc.
 - PBNP complied with NRC recommendations and made a presentation to the ASME XI SWG - PLEX



Ginna license renewal

Ginna LR

- Metal fatigue for old plants
 - CUF for equipment
 - No explicit fatigue analysis for B31.1 piping
 - Cycles embed in “f” of the code stress equation
 - $f = 1.00$ up to 7000 cycles
 - Full and partial range thermal cycles
 - Acceptable if actual cycles $<$ design or 7000
 - Only exception may be the nuclear sampling line

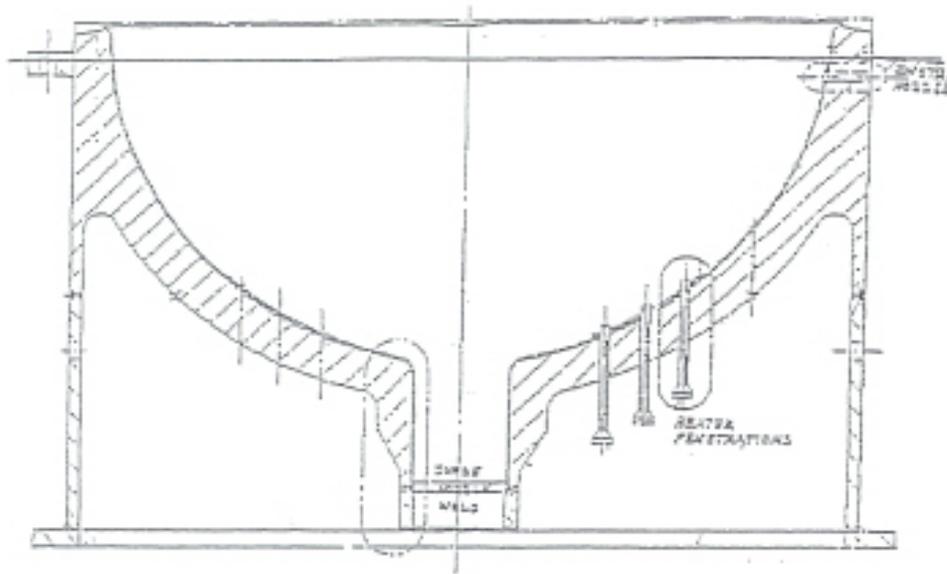
Ginna LR

- Environmental Impacts
 - Design CUFs need to be multiplied by Fen defined in
 - NUREG/CR – 6583 for carbon & low-alloy steels
 - NUREG/CR – 5704 FOR austenitic stainless steels
 - Fen on CUF need to be evaluated, as a minimum, NUREG/CR – 6260 locations (6)
 - CUFs were not calculated for piping components (4)

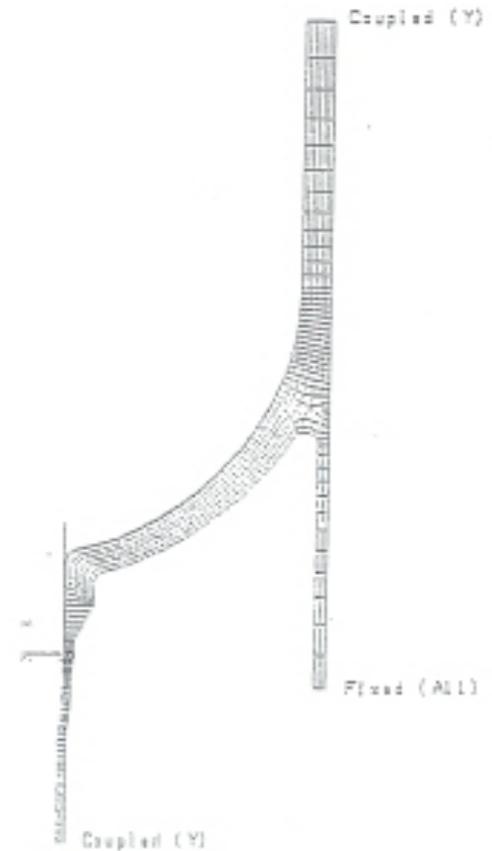
Ginna LR

- Ginna performed fatigue analysis during LR for
- NUREG/CR – 6260 locations additional plant specific fatigue critical locations
- Design & new transients are both included
- Cycles were projected to 60 years
- Transients, even if did not occur, can not be eliminated
- Results: including Fen, CUF < 1.0 at all locations

Ginna LR



Pressurizer Lower Head



Pressurizer Lower Head

Ginna LR

- Options when complete transient analyses are not available
 - Extrapolate from existing plant transient analysis
 - Extrapolate from available transient analysis from other plant
 - Perform additional analysis
 - Repair
 - Replace
 - Aging management



Questions