



Renewed ISFSI License Renewals and Aging Management Programs

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NRC 2013 INMM Presentation: Aging Management for License Renewal



- Establish team to investigate guidance update needs
 - Interim Staff Guidance NUREG-1927 update
- Develop learning, proactive, and responsive regulatory path forward to address the 3 current and >11 future ISFSI license and storage CoC renewals
- Focused on operational experience loop rather than RAI loop for extensive technical bases development
- Focused on achievable operational methodologies:
 - Condition based monitoring and/or intelligent in-service inspections based on technically defensible criteria
- Publish NUREG-1927R1 for Public Comment (12/31/14)

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2013-14 Accomplishments



- Updated Storage Renewal Framework:
 - Operations-focused Aging Management
 - Learning, Proactive, & Responsive Aging Management
 - Aging Management Programs that consider and respond to operating experience and results of confirmatory research
- High-Priority Aging Management Programs:
 - Localized Corrosion and Stress Corrosion Cracking of Welded Stainless Steel Dry Storage Canisters
 - Reinforced Concrete Structures
 - HBU Fuel Monitoring Program

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2013-14 Accomplishments



- ISG-24: HBU Fuel Demonstration Program
- Extensive Stakeholder Engagement:
 - Over 20 NRC Public Meetings on renewal topics
 - Numerous conferences, workshops, and meetings
- Storage Renewals using Updated Framework:
 - Calvert Cliffs License Renewed – 10/2014
 - Prairie Island License Renewal Review – Hearing
 - VSC-24 CoC Renewal Review – Ongoing
 - NUHOMS 72-1004 CoC Renewal Review – Initiated

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Current Efforts: Updating NUREG-1927R1



- NUREG-1927R1 Guidance Publication:
 - Incorporated lessons learned from storage renewal reviews
 - Public Availability Expected by Q1 CY 2015
- Reviews of Industry and DOE reports/guidance:
 - NEI-14-03: Guidance for Operations-Based Aging Management
 - EPRI Failure Modes and Effects Analysis of Welded Stainless Steel Canisters for DCSS, EPRI-3002000815, 12/13
 - EPRI Literature Review of Environmental Conditions & Chloride-Induced Degradation Relevant to Stainless Steel Canisters in Dry Cask Storage Systems, EPRI-30020025282014, 5/14
 - EPRI Flaw Growth and Flaw Tolerance Assessment for Dry Cask Storage Canisters, EPRI-3002002785, 10/14
 - ANL Aging Managing Report Rev. 2: FCRD-UFD-2014-000476

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NUREG-1927R1: Chapter 1 – General Information Review



- Expanded guidance on application content, particularly for CoC renewals (1.4.4)
- Added section on timely renewal (1.4.5)
- Added new section (1.4.6) on amendment applications submitted during renewal reviews and after the renewal is issued
- Added new section (1.4.7) on conditions for licenses and CoCs during renewal period
- Revised evaluation findings (1.5)

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NUREG-1927R1: Chapter 2 – Scoping Evaluation



- Clarified needed information for scoping evaluation (2.4.1)
- Clarified sources of information that may be used to support an application (2.4.1)
- Expanded guidance for review of SSC subcomponents (2.4.2)
- Expanded section on SSCs within scope to discuss fuel internals (2.4.2.1) and concrete pads (2.4.2.2)
- Clarified guidance for ensuring exclusions provide a technical bases (2.4.3)
- Revised evaluation findings (2.5)

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NUREG-1927R1: Chapter 3 – Aging Management Review



- Bulk of changes made in this chapter
- Revised AMR process flowchart (3.2) and applicable regulatory requirements (3.3)
- Expanded guidance on environmental data (3.4.1.1) and identification of aging effects and mechanisms (3.4.1.2)
 - Use of maintenance records, operating experience specific to material/service environment (site-specific, industry-wide)
 - NRC reports
 - Use of consensus codes/standards
- Revised evaluation findings (3.4.2)

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NUREG-1927R1: Chapter 3 – Aging Management Review



- Updated TLAA section (3.5) to ensure consistency with rule and provide guidance for review of calculations and analyses not part of approved design bases
- Revised AMP section (3.6) to expand discussion on each AMP element, provide new guidance on learning AMPs, and use of operating experience
 1. Scope of the Program
 2. Preventive Actions
 3. Parameters Monitored/Inspected
 4. Detection of Aging Effects
 5. Monitoring and Trending
 6. Acceptance Criteria
 7. Corrective Actions
 8. Confirmation Process
 9. Administrative Controls
 10. Operating Experience
- Included feedback on NEI 14-03 Guidance
- Deleted Retrievability section (formerly 3.7)

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Updating NUREG-1927R1: Appendices



- Appendix A – minor editorial changes
- Deleted appendices:
 - Appendix B “Example of ISFSI Material and Components” deleted
 - Appendix C “Example of AMR Results” was replaced with 3 example AMPs for CISCC, concrete structures, and HBU fuel (Appendix B)
 - Appendix D “Aging Effects Table”
 - Appendix E “Component Specific Aging Management”
- Added new appendices:
 - **Example AMPs (Appendix B)**
 - **Lead system inspections (Appendix C)**
 - HBU Fuel Demonstration Program (ISG-24) (Appendix D)
 - Special considerations for CoC renewals (Appendix E)
 - Storage terms (Appendix F)

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NUREG-1927R1: Appendix B – High Priority AMPs



- High-Priority Aging Management Plans:
 - Localized Corrosion and Stress Corrosion Cracking of Welded Stainless Steel Dry Storage Canisters
 - Reinforced Concrete Structures
 - HBU Fuel Monitoring Program
- Guidance: NUREG-1927 AMP Elements:

1. Scope of the Program	6. Acceptance Criteria
2. Preventive Actions	7. Corrective Actions
3. Parameters Monitored/Inspected	8. Confirmation Process
4. Detection of Aging Effects	9. Administrative Controls
5. Monitoring and Trending	10. Operating Experience

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Aging Management Program for Welded Stainless Steel Canisters



- Scope: Welded stainless steel canisters
 - Fabrication and closure welds, heat affected zones, crevices
- Parameters Monitored/Inspected: Canister condition
 - Localized corrosion, CISCC, and atmospheric deposits
- Detection of Aging Effects: Canister inspection
 - American Society of Mechanical Engineers Boiler and Pressure Vessel (ASME B&PV) Code Section XI - Rules For Inservice Inspection Of Nuclear Power Plant Components
- Acceptance Criteria: Evaluation of canister inspection
 - Based on and supported by consensus codes and standards
- Corrective Actions: Repair, replace or mitigate
 - Maintain compliance with 10 CFR 72 regulatory requirements

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Aging Management Program for Reinforced Concrete Structures



- Scope: Reinforced Concrete Structures
 - Above-grade (accessible, inaccessible) and below-grade (underground) concrete areas
- Parameters Monitored/Inspected: Concrete condition
 - Cracking, material loss (spalling and scaling), loss of bond, increased porosity/permeability
- Detection of Aging Effects: Visual inspection
 - Commensurate with American Concrete Institute 349.3R
 - Alternative inspection frequencies require a valid technical basis (engineering justification, operational experience data) for any deviation from ACI 349.3R
- Acceptance Criteria: Evaluation of concrete visual inspection
 - Commensurate with the 3-tier quantitative criteria in ACI 349.3R
- Corrective Actions: Repair, replace or mitigate
 - Maintain compliance with 10 CFR 72 regulatory requirements

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NUREG-1927R1: Appendix C – Lead System Inspections



- Lead Canister/Cask Inspections to Date:
 - Calvert Cliffs NUHOMS 24P (PWR)
 - Hope Creek HISTORM MPC-68 (BWR)
 - Diablo Canyon HISTORM MPC-32 (PWR)
 - Three Mile Island Unit 2 (INL) NUHOMS 12T
 - Palisades VSC-24 (PWR)
- DCSS Multiple Aging Effects:
 - Coating degradation Concrete aging
 - Evidence of water intrusion Accumulated deposits
 - Corrosion products on stainless steel canisters

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NUREG-1927R1: Appendix C – Lead System Inspections



- Inspection of multiple systems may be necessary to capture variations in systems, designs, environments, loading, and aging effects
- Revisions to Lead System Inspection Guidance:
 - Purpose of the Lead System Inspection
 - Selecting System(s) for Inspection
 - Guidelines for the Lead System Inspection
 - Use of Surrogate Inspections
 - Special Considerations for Lead System Inspections for CoC Renewals

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Implementation of Welded SS Canister & Concrete AMPs



- Identify lead system(s) most susceptible to the specific canister and concrete aging effects for inspection
- Use consensus codes and standards where they exist for the examination methods, including equipment calibration and personal qualifications, and acceptance criteria
- Acceptance criteria:
 - Acceptable Acceptable with Defects
 - Unacceptable (ASME Section XI Table IWB-3514-2/ACI 349.3R)
- Reliance on licensee QA and CAP programs for further evaluation, characterization, and other actions as needed to preserve the ITS SSC functions
- Calvert Cliffs Renewal Documentation – ML14274A022

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Future Efforts



- Further guidance development
 - Managing Aging Processes for Storage (GALL-like report)
 - Additional AMPs Additional NDE inspection guidance
 - Guidance for NRC inspections of licensees' AMA
- HBU Fuel Demonstration Program
 - Exemption Request Program Technical Reviews
- Continuing Stakeholder Engagement:
 - NEI 14-03 Guidance on Operations-Based Aging Management
 - LRA Format and Content Guidance
 - Additional inspections / OpE / data collection
 - Increase coverage/location-specific/capabilities/Lead system selection
 - Atmospheric Deposit Environmental Characterization
 - EPRI Susceptibility / FMEA / Flaw Growth & Tolerance analyses

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Summary



- Has it been a year already?
- Creating a stable, predictable, & efficient renewal regulatory framework with clear, open, transparent, & reliable expectations
- Developed and Implemented a Learning, Proactive, & Responsive Operations-focused Aging Management Strategy
 - AMPs that consider and respond to operating experience and incorporate results of long term confirmatory research
- Significant stakeholder efforts (NEI, Licensees, CoC Holders, EPRI, DOE, Vendors, and Public) in improving our knowledge, capabilities, and assessments for addressing aging effects
- Not there yet, but, we're moving the ball down the field....

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Acronyms



- AMP: Aging Management Program
- ANL: Argonne National Laboratory (DOE)
- CFR: Code of Federal Regulations
- CISCC: Chloride Induced Stress Corrosion Cracking
- CoC: Certificate of Compliance
- DLR: Division of License Renewal
- DOE: Department of Energy
- FSAR: Final Safety Analysis Report
- HBU: High Burnup
- GTCC: Greater than Class C
- ISFSI: Independent Spent Fuel Storage Installation
- MRS: Monitored Retrievable Storage
- NEI: Nuclear Energy Institute
- NMSS: Office of Nuclear Material Safety and Safeguards
- NRR: Office of Nuclear Reactor Regulation
- RES: Office of Nuclear Regulatory Research
- RIS: Regulatory Issue Summary
- SRP: Standard Review Plan
- TLAA: Time-Limited Aging Analysis
- VEPCO: Virginia Electric and Power Company
- VSC: Ventilated Storage Cask