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Elements of an Aging Management Program

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Meeting to Obtain Stakeholder Input on Potential Changes to Guidance for Renewal of Spent Fuel Dry Cask Storage System Licenses and Certificates of Compliance

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Regulatory Basis

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- **10 CFR 72.42(a), 72.240(c):**
  1. TLAAs that demonstrate that ITS SSCs will continue to perform their intended function for the period of extended operation.
  2. A description of the AMP for management of issues associated with aging that could adversely affect ITS SSCs.

- **Guidance: NUREG-1927 AMP Elements:**
  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

- **For specific ITS SSCs, detailed AMPs addressing the 10 elements lead to efficient staff reviews and effective management of aging effects**

NRC Efforts in License Renewal Work

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- **Revision of NUREG-1927**
  1. Updates of review guidance
- **Generic guidance for AMP development:**
  1. Proactive and forward-looking
  2. Responsive and adaptive
- **Sample AMPs for NUREG-1927 Revision**
  1. Fuel Performance
  2. Concrete Performance
  3. Stress Corrosion Cracking
  4. Lead System Baseline & In-service Inspections

AMP Elements

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1. Scope of the Program

NUREG-1927: *The scope should identify the specific Systems, Structures, and Components subject to the AMP with respect to:*

- Material of construction
- Service environment
- Aging mechanisms for material/environment combination
- Aging effects caused by specific aging mechanisms

2. Preventive Actions

NUREG-1927: *Preventive actions should prevent or control the identified aging on in-scope SSCs*

- Actions to prevent adverse service environments
- Actions to avoid chemical reactions
- Actions to control allowable physical conditions

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3. Parameters Monitored or Inspected

NUREG-1927: *Parameters monitored or inspected should be linked to the effects of aging on the intended functions of the particular structure and component*

- Identify parameters that can be measured or inspected:
  1. Parameters (e.g., size of cracks, rate of loss of material, temperature, neutron fluence, etc.)
  2. Location (e.g., at highest heat location, neutron fluence at 1 m from cask)
  3. Focuses on systems, structures, and components with service environments that are more susceptible to aging
- Learning AMP
  1. Proactive – forward looking
  2. Adaptive and tiered approach

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3. Parameters Monitored or Inspected (Continued)

Learning AMP

- Proactive adaptive: continuous effort to look for:
  1. New knowledge in SSC aging mechanisms and/or degradation rates
  2. New parameters to monitor
  3. New techniques for parameter monitoring or inspection
  4. New equipment
- Tiered approach
  1. Based on Operating Experience, reexamine and change monitoring method if unexpected results are found
     - Adjust parameters monitored or inspected
     - Increase inspection frequency to detect potential loss of intended functions
  2. Reexamine corrective actions if acceptance criteria are not met

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4. Detection of aging effects

NUREG-1927: *Detection of aging effects should occur before there is a loss of any structure and component intended function*

- Method/technique (e.g. visual, surface, and/or volumetric inspections or surveys)
- Selection and calibration of equipment
- Frequency of inspection (e.g. inspection intervals)
- Sample size (dependent on operational experience trending)
- Data collection (clearinghouse for operational experience)
- Timing (when to inspect)
- Learning AMP – tiered approach
    1. Examine and improve trending method
    2. Find new method/technique for detecting aging if the current method fails or is ineffective

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5. Monitoring & Trending

NUREG-1927: *Should provide for prediction of the extent of the effects of aging and timely corrective or mitigative actions*

- Trending of aging effects (e.g. corrosion rate, crack growth rate, etc.)
- Assess effects per prior inspections and industry-wide operational experience
- Need to establish a baseline against which the above two determinations are made
- Learning AMP – tired approach
  1. Feed back to elements 3 and 4 when trending indicates:
     - a potential loss of intended function
     - more aggressive than expected aging
     - inadequate monitoring method or apparatus
  2. Adjustment to the current monitoring & trending method when trending indicates:
     - a need for adjustment of the current trending analyses
     - a need for new method for trending analyses

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6. Acceptance Criteria

NUREG-1927: *Acceptance criteria, against which the need for corrective action will be evaluated, should ensure SSC intended function is maintained under the current licensing-basis design conditions during the renewal period*

- Acceptance criteria
  1. Criteria for evaluating inspection results for operable aging effects
  2. Domestic and International consensus codes and standards, or previously used criteria if relevancy is justified and established
  3. Technical basis for these criteria should be provided
  4. Separate criteria should be provided for each aging effect
- Learning AMP – this element should include triggers for:
  1. modification of acceptance criteria
  2. modification of parameters monitored
  3. modification of trending methodology and technique

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7. Corrective Actions

NUREG-1927: *Corrective actions, including root cause determination and prevention of recurrence, should be timely*

- CAP commensurate with 10 CFR 72 Subpart G, or 10 CFR 50 Appendix B
- Maintenance plans, corrective actions for specific degradation effects (e.g. repair, replacement, mitigation activities, and extent of condition)
    1. Actions to prevent reoccurrence
    2. Justification for deferral actions such as repair, replace, and/or mitigate
    3. Analysis of how the corrective action may affect other subcomponents
    4. Possible increased inspection frequency and sample size
- Plans for OE incorporation into the remediation actions
- Learning AMP – tiered approach

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8. Confirmation Process

NUREG-1927: *Confirmation process should ensure that preventive actions are adequate & appropriate corrective actions have been completed & are effective*

- Method to confirm actions required are taken
- Follow up action to determine success
- Feedback to Operating Experience
- QA Program consistent with 10 CFR 72 Subpart G, or 10 CFR 50 Appendix B

9. Administrative Controls

NUREG-1927: *Administrative controls should provide a formal review and approval process*

- QA program commensurate with 10 CFR 72 Subpart G, or 10 CFR 50 Appendix B
- Personnel qualification requirements
- Record retention requirements
- Review process of examination results
- Frequency/methods for reporting inspection results to NRC
- Periodic self assessments for updating AMPs based on industry-wide operational experience

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10. Operating Experience

NUREG-1927: *Include past corrective actions resulting in program enhancements; objective evidence to support a determination that the effects of aging will be adequately managed so that the structure and component intended functions will be maintained during the period of extended operation*

- A critical element of an AMP
- Adaptive to new knowledge and experience
- Provide specific industry-wide operational experience that supports the use of an examination method, inspection frequency, and/or acceptance criteria
- Frequency/methods for reporting inspection results to NRC?
- Frequency for updating AMP based on industry-wide operational experience?

Nexus among AMP Elements

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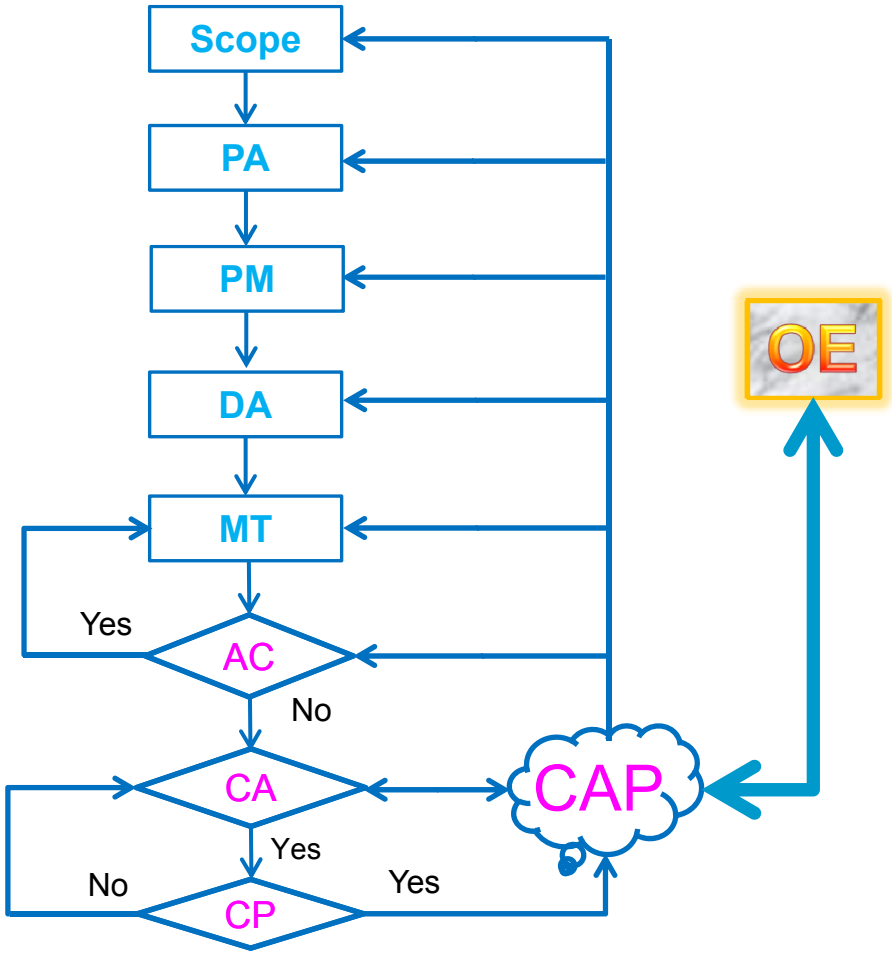
1. Scope of the Program
2. Preventive Actions (PA)
3. Parameters Monitored/Inspected (PM)
4. Detection of Aging Effects (DA)
5. Monitoring and Trending (MT)
6. Acceptance Criteria (AC)
7. Corrective Actions (CA)
8. Confirmation Process (CP)
9. Administrative Controls
10. Operating Experience (OE)



Acronyms

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- AMP – Aging Management Program
- CAP – Corrective Action Program
- CFR – Code of Federal Regulations
- ITS – Important to Safety
- OE – Operating Experience
- QA – Quality Assurance
- SSCs – Structures, Systems, and Components
- TLAA – Time-Limited Aging Analysis