



Renewing Dry Spent Fuel Storage Certificates of Compliance and Specific Licenses

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Outline

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 - Requirements and guidance for spent fuel storage renewals
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- Aging Management Programs
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- Example HBU AMP
- Current Status

Background

Regulatory Framework for Spent Fuel Storage

- Two part regulatory framework for spent fuel storage in 10 CFR Part 72
- Specific license for storage of spent fuel in an independent spent fuel storage installation (ISFSI)
- General license for storage of spent fuel in NRC-approved storage systems
 - General license authority provided to Part 50 and 52 license holders through 10 CFR Part 72, Subpart K
 - Approved designs are provided a Certificate of Compliance (CoC), and are available for use by general licensees
 - General license term is tied to the term of the CoC that is in use at the ISFSI; general licenses are not renewed

Background

Storage Renewal Requirements – Specific Licenses & CoCs

- Renewal of specific licenses and CoCs for storage of spent fuel, for a period not to exceed 40 years
- Time-limited aging analyses (TLAAs)
- Description of the Aging Management Program (AMP)
- Design bases information as documented in the most recently updated final safety analysis report
- Maintain intended functions in the period of extended operation

Background

Current Spent Fuel Storage Renewal Guidance

- Guidance located in NUREG-1927, Rev. 0, “Standard Review Plan for Renewal of Spent Fuel Dry Cask Storage System Licenses and Certificate of Compliances”
 - Provides NRC guidance for renewal of ISFSI licenses and CoCs for storage cask designs
 - Issued in March 2011 to accompany the 10 CFR Part 72 final rulemaking for “License and Certificate of Compliance Terms”

AMRs and AMPs

- Aging management review (AMR)
 - Assessment conducted by the licensee or CoC holder
 - Addresses aging mechanisms and effects that could adversely affect the ability of dry storage systems in performing their intended functions during the period of extended operation



- Aging management program (AMP)
 - Program conducted by the licensee or CoC user
 - Addresses aging effects that may include prevention, mitigation, condition monitoring, and performance monitoring.



10 Elements of an AMP

- (1) Scope of Program
- (2) Preventive Actions
- (3) Parameters Monitored/Inspected
- (4) Detection of Aging Effects
- (5) Monitoring and Trending



10 Elements of an AMP

- (6) Acceptance Criteria
- (7) Corrective Actions
- (8) Confirmation Process
- (9) Administrative Controls
- (10) Operating Experience.



Example SSC AMP

- Chloride-induced stress corrosion cracking (SCC) complex process with multiple dependencies
 - Residual Stress
 - Operating Environment
- Based on consensus codes/standards and NUREGs (USNRC guidance)



Example SCC AMP

- Element 1 (Scope of Program)
 - Welded stainless steel dry storage canisters
 - In-service inspection for localized corrosion and SCC
- Element 3 (Parameters Monitored/Inspected)
 - Canister surfaces, welds, and weld heat affected zones for discontinuities and imperfections
 - Appearance/location of atmospheric deposits on canister surfaces
 - Size and location of localized corrosion (e.g., pitting and crevice corrosion) and stress corrosion cracks

Example Reinforced Concrete Structures AMP

- Elements 1 and 2 (Scope of Program and Preventative Actions)
 - Visual inspection (condition monitoring)
 - Groundwater chemistry program (mitigation)
 - Mitigate below-grade (underground) effects
 - Corrosion of embedded steel
 - Chemical attack (chloride, sulfate induced degradation)

Example Reinforced Concrete Structures AMP

- Elements 1 and 2 (Scope of Program and Preventative Actions)
 - Periodic radiation surveys (performance monitoring)
 - Continuance of daily inspections of air inlet/outlet vents
 - Preventive actions not required for structures designed and fabricated in accordance to ACI 318 or ACI 349

High Burnup Fuel Performance AMP

- Fuel assemblies with discharge burnup > 45 GWd/MTU
- AMR not expected to identify aging mechanisms or effects that could lead to loss of intended function
 - Retrievability (primary)
 - Criticality, shielding, confinement (secondary)
- As long as the HBU fuel assemblies are stored in a dry inert environment and temperature limits are maintained



High Burnup Fuel Performance AMP

- Element 3 (Parameters Monitored or Inspected)
 - Maximum cladding temperature
 - Inspection for the presence of fission gas in the cover gas
 - Inspection for presence of water vapor in the cover gas
 - Inspection for hydrogen to determine that any radiolysis of residual or bound water does not produce a flammable condition
 - Profilometry at the completion of the storage period to determine creep deformation
 - Gas puncturing at completion of storage to determine cladding stress for creep calculations
 - Cladding metallography at the completion of storage to determine condition of cladding hydrides

Current Status

- NRC staff is revising its guidance for renewal reviews for dry storage systems and ISFSIs
 - Based on completed and ongoing renewal reviews
 - Incorporating industry input.
- The draft revised guidance will be published for public comment in 2015



Acronyms

ACI: American Concrete Institute

HBU: High Burnup Fuel

AMP: Aging Management Program

ISFSI: Independent Spent Fuel
Storage Installation

AMR: Aging Management Review

TLAA: Time-Limited Aging Analysis

CFR: Code of Federal Regulations

SCC: Stress Corrosion Cracking

CoC: Certificate of Compliance

GwD/MTU: gigawatt-days per metric
ton of uranium