

Dry Cask Storage License Renewal Industry Guidance for Operations-Based Aging Management (NEI 14-03)

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Used Nuclear Fuel in Storage in the U.S.

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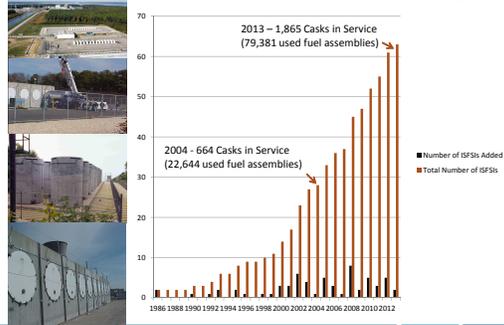
- **Used fuel inventory**
 - Approximately 72,000 MTU
 - Increases 2 - 2.4k MTU annually
- **ISFSI* storage**
 - 79,381 assemblies
 - 22,200 MTU
 - 1,865 casks/modules loaded
 - 63 Operating ISFSIs
 - * 1 pool ISFSI, 1 modular vault
- **Projections for 2020**
 - Estimating 88,000 MTU total
 - Estimating 31,000 MTU at ISFSI
 - 3,000 casks/modules loaded
 - At 76 ISFSIs
 - * All plant sites + Morris & INEL
 - Fuel from 119 reactors
- **ISFSI Storage will have long-term use**
 - DOE projects consolidated storage 2021-2025, repository 2048



*ISFSI = Independent Spent Fuel Storage Installation



Historical Growth of U.S. Dry Cask Storage



2013 - 1,865 Casks in Service
(79,381 used fuel assemblies)

2004 - 664 Casks in Service
(22,644 used fuel assemblies)

■ Number of ISFSIs Added
■ Total Number of ISFSIs



The amount of uncertainty that exists in used fuel management today in the U.S.



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ISFSI License Renewal – Current Situation

- Three specific ISFSI licenses have been renewed
- NRC is currently reviewing renewal applications for two specific licenses and one CoC (used by general licensees)
- 12 applications expected over next 6 years
- Staff review guidance for renewal applications in NUREG-1927 issued in 2011 needs augmentation:
 - to reflect the current state of knowledge
 - Provide forward-looking , confirmatory approach
- Industry proposes to develop additional guidance and seek NRC endorsement



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Industry pro-active efforts re: ISFSI aging

High Burn-up Fuel (HBF)

- All HBF in dry storage loaded within last 10 years
- Substantial scientific analysis supports HBF storage
- HBF Demonstration Project underway to collect confirmatory data
 - Data collection to begin 2017

Chloride Induced Stress Corrosion Cracking

- Regulatory Issue Resolution Protocol governs path forward
- Canister inspections conducted at 3 coastal sites
 - Early results are encouraging
- Susceptibility Criteria planned to inform all sites
- FMEA also being developed

Industry Guidance will assure that the results of these and other programs are consistently applied in ISFSI aging management programs



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Vision of Industry Guidance (NEI 14-03)

- Safety-focused
- Operations-based
- Built upon existing programs (OE, CAP)
- Risk-informed qualitatively via FMEA
- Forward-looking
- Proactive
- Responsive to condition-based monitoring



Status of NEI Effort

- Issue team established
 - NEI project manager
 - Four CoC holders
 - General and specific licensees
 - Shutdown site licensees
 - EPRI
 - Independent advisor
- Project plan issued
- Guidance outline drafted



NEI 14-03 Guidance Scope

- Augments NUREG-1927 Section 3.0 "Aging Management Review"
- Recognizes NUREG-1927 Section 1.0 and 2.0 "General Information Review" and "Scoping Evaluation" are sufficient
- Addresses practical considerations from CoC holders pertaining to lead canister inspections (LCI)
- Addresses 40-year renewal periods
- Focuses on storage only; understands linkage to transportation



NEI 14-03 Guidance Foundation

- Current Part 72 regulations
- Current ISFSI/CoC licensing basis (CLB)
 - Regulations, orders
 - Specific license, as amended
 - Initial CoC and all approved CoC amendments
 - ISFSI or cask UFSAR, as modified by 72.48 and to reflect amendments
 - Specific revisions of guidance and standards committed to in CLB
 - RGs, NUREGs, ISGs, ASME, ACI, ANSI, ASTM, etc.



NEI 14-03 Guidance Goals

- Assure aging management activities are safety-function focused and prioritized based on risk and timing of degradation mechanisms
- Provide for appropriate use of future operational experience, research, inspections, and condition monitoring
- Provide a predictable regulatory environment
 - Avoid piecemeal submittals and renewals
 - Minimize multiple rounds of RAIs
 - Balance specificity and flexibility
 - Achieve alignment with NRC through endorsement



NEI 14-03 Guidance Approach

- Addresses known and potential age-related degradation mechanisms via established practices
- Uses operating experience, research, monitoring, inspection results, corrective action programs, and effectiveness reviews
- Establishes “toll gate” milestones during renewed operating period to systematically evaluate;
 - Susceptibility criteria (e.g., canister CISCC)
 - Plant-specific, other plants, R&D (e.g., demo), inspections
 - Impact, if any, on storage safety functions
- Actions developed in accordance with existing licensee QA corrective action program
 - Based on risk-informed assessment



Toll Gates



“Toll gates” are periodic safety assessment points within the renewed operating period that licensees must successfully navigate to continue operation to the next toll gate, and ultimately to the end of the renewed operating period. Licensees would be committed to complying with toll gate requirements by the aging management review requirements approved as part of the license or CoC renewal. Compliance with toll gate requirements during the renewal period is an extra layer of assessment beyond the normal continuous assessment of operating experience, research, monitoring, and inspections on DCS component performance that is part of normal ISFSI operations for licensees during the initial license period as well as the renewal period.



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Operations Based Aging Management

Operations Based Aging Management should include the following attributes for the known and unknown degradation mechanisms and time frames:

- Recognition
- Evaluation
- Monitoring
- Analysis and Assessment
- Mitigation/Repair
- Feedback



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Monitoring and Inspections

- Techniques, acceptance criteria, and remediation actions need to be tied to maintaining a storage safety function and reasonable to accomplish
- Monitoring and inspection protocols for aging management need to be specific and appropriate for the component or variable being monitored
- Use existing industry codes and standards
- NEI 14-03 will address conduct and practicality of canister inspections (revision to NUREG-1927, Appendix E)
 - Canister inspections will be included in aging management activities in the renewed CoC
 - Canister inspections (and other monitoring and inspections) may occur at a location/environment that bounds other sites



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Fuel and Canister Internals

- Cask fuel and internals (F&I) are not subject to known age-related degradation mechanisms
 - Inert environment
 - No fatigue cycles
 - Theoretical age-related degradation mechanisms may exist but are not confirmed nor characterized re: time horizons
- F&I are subject to regulatory requirements over the renewal period
 - Prevent gross cladding rupture
 - Maintain retrievability of individual fuel assemblies
 - Maintain fuel geometry and basket structural/criticality functions
- F&I are not part of traditional aging management programs (AMPs) because they are inaccessible for in-situ inspection
- The NEI 14-03 operations-based aging management guidance will address this issue by describing forward looking programs to confirm safe storage through the renewed operating period



Implementation

- Part 72 general licenses have two regulated entities
 - CoC holder: Develops generic renewal requirements
 - Licensee: Implements at the ISFSI considering site-specific conditions
- CoC renewal aging management implementation must be flexible enough to permit site-specific and generic changes to be efficiently and effectively managed
- 10 CFR 72.48 is an appropriate model to make necessary changes to TLAAs, AMPs, based on OE, research, monitoring, inspection, and toll gate assessments
- NEI 14-03 will address generic and site specific roles and responsibilities



Reporting

Operations-based aging management activities should include thresholds or criteria for new information and monitoring or inspection results pertaining to age-related degradation to be reported to the NRC at the time they occur.



NEI 14-03 Development Milestone Schedule

TASK	DATE
Submit Guidance Outline to NRC	2/10/14
Presentation at Regulatory Information Conference	3/12/14
Draft NEI Guidance Report	4/28/14
Presentation of Guidance Status at NEI Used Fuel Management Conference	5/8/14
Project Team Review and Comment	5/30/14
Project Team Comment Resolution and Report Revision	6/23/14
DSTF Steering Group Review and Comment	7/31/14
DSTF Steering Group Comment Resolution and Report Revision	8/29/14
Final NEI Editorial Proof	9/12/14
Submit to NRC for Endorsement	9/19/14
NRC Endorsement	11/30/14