

WCS CISF NRC Pre- Application Meeting

Safety Analysis Report (SAR)

June 16, 2015



Presentation Overview



- ▶ **Introductions**
- ▶ **General Licensing Approach**
- ▶ **Approach to CISF Specific Issues**
- ▶ **Overview of SAR Structure**
- ▶ **Summary and Closing Comments**



GENERAL LICENSING APPROACH

Use of Previously Certified Systems



- ▶ **Use existing licensed canisters**
 - ◆ All high burnup fuel canned
 - ◆ Damaged/Failed fuel canned or confined with end caps
- ▶ **Use existing licensed storage overpacks**
- ▶ **Use approved Aging Management Programs (AMP)**
- ▶ **Use existing licensed transportation casks**
 - ◆ not part of this application
- ▶ **Additional systems to be added as license amendments, as appropriate**

Initial License Application



► Priority on currently licensed systems for shutdown sites:

◆ NAC International

- **Maine Yankee**
- **Connecticut Yankee**
- **Yankee Rowe**
- **La Crosse**
- **Zion**
- Kewaunee*

◆ AREVA NUHOMS®

- **Rancho Seco**
- SONGS Unit 1
- Millstone Unit 1
- Oyster Creek* (S/D scheduled 2019)

Indicates a “stranded” (ISFSI only) site as identified in the 2012 Final Report of the “Blue Ribbon Commission on America’s Nuclear Future” (BRC)

**Initial License Application will cover ~80% of SNF and GTCC at BRC “Stranded” Sites
Additional Systems and Sites will be added in Future Amendments, as appropriate**

Storage Systems at the WCS CISF



Cask System	NRC Docket No.	Canister	Overpack	Shutdown Site
NUHOMS® MP187 Cask System	72-11 (SNM-2510)	FO-DSC	HSM (Model 80)	Rancho Seco
		FC-DSC		
		FF-DSC		
Advanced Standardized NUHOMS® System	72-1029	NUHOMS® 24PT1	AHSM	SONGS Unit 1
Standardized NUHOMS® System	72-1004	NUHOMS® 61BT	HSM Model 102	Millstone Unit 1 Oyster Creek
		NUHOMS® 61BTH Type 1		
NAC-MPC	72-1025	Yankee Class	VCC	Yankee Rowe
		Connecticut Yankee	VCC	Connecticut Yankee
		LACBWR	VCC	La Crosse
NAC-UMS®	72-1015	Classes 1 thru 5	VCC	Maine Yankee
MAGNASTOR®	72-1031	TSC1 thru TSC4	CC1 thru CC4	Zion Kewaunee

NUHOMS® Systems in WCS Application



▶ Certificate of Compliance (CoC) 1004 Standardized NUHOMS® System

- ◆ Canisters: 61BT and 61BTH Dry Shielded Canisters (DSCs) loaded with SNF having a burnup of less than 45 GWd/MTU
- ◆ Storage Overpack: Horizontal Storage Module (HSM) Model 102

▶ CoC 1029 Standardized Advanced NUHOMS® System

- ◆ Canister: 24PT1 DSC
- ◆ Storage Overpack: AHSM

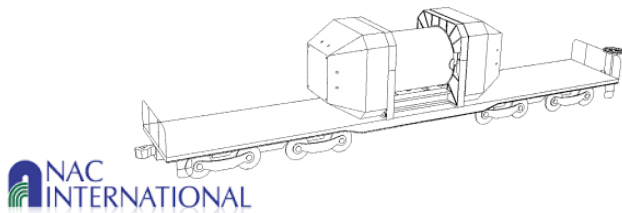
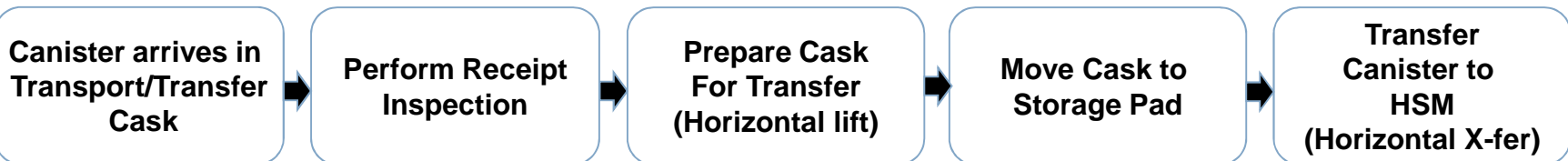
▶ SNM-2510 Standardized NUHOMS® System

- ◆ Canisters: FO-, FC-, and FF-DSCs
- ◆ Storage Overpack: HSM

Application Contents Related to NUHOMS®



- ▶ No changes to the existing licensed HSMs and Transfer Casks proposed
- ▶ SAR appendices for CoC 1004, CoC 1029, and SNM-2510
- ▶ SAR to follow NUREG-1567



NUHOMS® Transport Systems Already Licensed



- ▶ **Transportation Casks are not a part of the WCS licensing action**
- ▶ **CoC 9255 NUHOMS® MP187 transportation cask**
 - ◆ Authorized contents include the 24PT1 DSC (SONGS Unit 1)
 - ◆ Authorized contents include the FO-, FC-, and FF-DSCs (Rancho Seco)
- ▶ **CoC 9302 NUHOMS® MP197HB transportation cask**
 - ◆ Authorized contents include nearly all NUHOMS® DSCs, including the 61BT and 61BTH DSCs (Millstone Unit 1, Oyster Creek and other sites that use these canisters)

Qualify Transport Casks for Transfer Operations



- ▶ **Plan to use NUHOMS® transportation casks as transfer casks for NUHOMS® canisters**
 - ◆ MP187 transport cask licensed for transfer under SNM-2510
- ▶ **SAR to include qualification of MP197HB transport cask for use as a transfer cask for 61BT and 61BTH canisters**
 - ◆ Qualified for Region II tornados (Reg Guide 1.76)
 - ◆ Qualified for 80” drop
 - ◆ Qualified for Seismic (CoC 1004)

NAC Systems in WCS Application



▶ CoC 1025 NAC-MPC System

◆ Canisters:

- Yankee-MPC
- CY-MPC
- MPC-LACBWR

◆ Storage Overpack: Vertical Concrete Cask (VCC)

▶ CoC 1015 NAC-UMS® System

◆ Canisters: Classes 1 thru 5

◆ Storage Overpack: VCC

▶ CoC 1031 MAGNASTOR® System

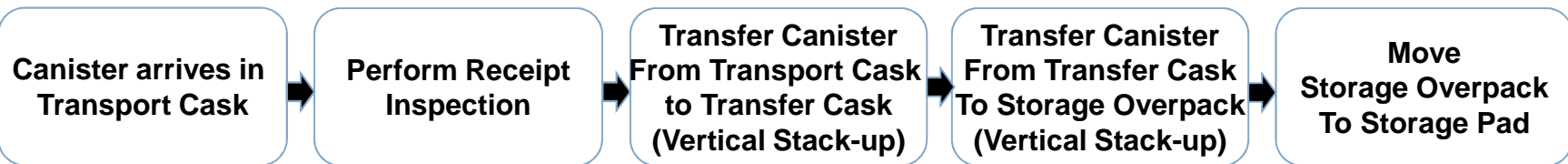
◆ Canisters: TSC1 through TSC4

◆ Storage Overpack: Concrete Cask CC1 thru CC4

Application Contents Related to NAC Systems



- ▶ No changes to the existing licensed VCCs and Transfer Casks proposed
- ▶ SAR appendices for CoC 1015, CoC 1025, and CoC 1031
- ▶ SAR to follow NUREG-1567



Overview of Existing NAC Transport Systems



- ▶ **Transportation Casks are not a part of the WCS licensing action**
- ▶ **CoC 9235 NAC-STC transportation cask**
 - ◆ Yankee-Rowe, Connecticut-Yankee, LACBWR
- ▶ **CoC 9270 NAC-UMS[®] UTC transportation cask**
 - ◆ Maine-Yankee
- ▶ **CoC 9356 NAC MAGNATRAN[®] transportation cask**
 - ◆ Zion
 - ◆ Kewaunee

Application to also include GTCC Waste

- ▶ **Greater Than Class C (GTCC) waste**
 - ◆ Segmented steel reactor components, including debris from cutting process
 - ◆ Irradiated equipment (jet pumps, etc.)
- ▶ **Use of existing GTCC canisters, overpacks and loading operations**
- ▶ **Technical Basis for the GTCC canisters will be included in the SAR**
- ▶ **GTCC Canisters are currently certified for transport under 10 CFR Part 71**
- ▶ **Sites with GTCC waste in dry storage include:**
 - ◆ Maine Yankee (4)
 - ◆ Connecticut Yankee (3)
 - ◆ Yankee Rowe (1)
 - ◆ Zion (4)
 - ◆ Rancho Seco (1)
 - ◆ SONGS Unit 1 (3)
 - ◆ Millstone Unit 1 (2)



Aging Management Approach



► Use approved Aging Management Programs

- ◆ Implementation start date based on canister age
- ◆ Incorporate CoC 1004 AMP into WCS SAR by reference for the NUHOMS® Systems
 - AREVA has submitted an Application for Renewal of CoC 1004
- ◆ AMP programs will be incorporated by reference for each NAC system into the WCS SAR via a later amendment, following NRC approval at the time the CoCs are renewed
 - NAC is developing AMPs for its systems
 - Submittal timeline for MPC and UMS® systems is 2018-2020
 - Submittal timeline for MAGNASTOR® Systems is 2027-2029

Site Dose Calculations



- ▶ **Occupational Exposures based on site specific operations**
 - ◆ Use near field dose rates for design basis fuel from transportation casks
 - ◆ Use near field dose rates for design basis fuel from original FSAR for each system
- ▶ **Off-Site Dose calculations based on projected Phase 1 CISF Pad**
 - ◆ Use design basis fuel from original FSAR for each system
 - ◆ Include inhalation contribution from applicable canisters
 - Updated analysis which includes all isotopes required in NUREG-1536
- ▶ **Similar approach for environmental report**

Confirmatory Calculations



- ▶ **Confirmatory Evaluations (documented in calculations)**
 - ◆ **72.212 type reconciliation to demonstrate that the WCS site conditions are bounded by prior NRC approvals**
 - ◆ **Site Conditions**
 - temperature
 - seismology
 - precipitation
 - flood
 - lightening
 - fire/explosion



APPROACH TO CISF SPECIFIC ISSUES

Part 72/Part 71/Part 72 Interface



► CISF Receipt Inspection/Evaluation

- ◆ Preparation for Transport and Transport of the canisters is not part of this licensing action
- ◆ Normal Part 71 and 49 CFR receipt inspections of the package will be performed at WCS site
- ◆ Records surveillance to verify “chain-of-custody” from canister fabrication through shipment to the WCS CISF
 - Verify canister was fabricated, loaded, placed into storage and maintained in storage (including any AMP), and shipped in accordance with applicable license and certificate requirements
- ◆ Physical receipt inspection of canister potentially necessary only if canister has experienced accident conditions during transport to WCS
- ◆ High-Burnup Fuel
 - For initial WCS CISF license application, all high-burnup fuel is canned

Contingency Plan for Damaged/Failed Canisters



► Consistent with Material License SNM-2510

- ◆ Place leaking or suspect canisters in a transportation cask
- ◆ Transportation cask for each system provides confinement barriers that isolate any materials leaking from a canister
- ◆ Develop recovery plan based on specific conditions
- ◆ Upon evaluation and licensing actions
 - Obtain appropriate licensing revisions or amendments
 - In situ repair
 - Off-site shipment for repair or repackaging



OVERVIEW OF SAR STRUCTURE

SAR Structure



- ▶ **SAR content based on guidance from**
 - ◆ **NUREG-1567, *Standard Review Plan for Spent Fuel Dry Storage Facilities***
 - ◆ **Regulatory Guide 3.48, Revision 1, *Standard Format And Content For The Safety Analysis Report For An Independent Spent Fuel Storage Installation Or Monitored Retrievable Storage Installation (Dry Storage)***
- ▶ **SAR Table of Contents follows DOE-CISF-FSAR (MOV.19970523.0004)**
- ▶ **Separate appendices for each NUHOMS® and NAC system for system specific evaluations**
- ▶ **Similar to Materials License SNM-2510 plan to incorporate canister and storage overpack designs by reference to existing SARs**

Chapter Titles



- 1. Introduction and General Description of Installation**
- 2. Site Characteristics**
- 3. Principal Design Criteria**
- 4. Operating Systems**
- 5. Operating Procedures**
- 6. Waste Confinement & Management**
- 7. Installation Design & Structural Evaluation**
- 8. Thermal Evaluation**
- 9. Radiation Protection**
- 10. Criticality Evaluation**
- 11. Confinement Evaluation**
- 12. Accident Analysis**
- 13. Conduct of Operations**
- 14. Operating Controls & Limits**
- 14A Technical Specification Bases**



SUMMARY & CLOSING COMMENTS

Summary



▶ General Approach to Licensing

- ◆ Maximum use of existing licensed storage and transfer systems
- ◆ Minimal calculations required to support application
- ◆ Use approved AMPs
- ◆ AMP continued or initiated during storage at the WCS CISF based on canister age
- ◆ High burnup fuel is canned

▶ Part 72/Part 71/Part 72 Interface

- ◆ Transportation not a part of this license application
- ◆ Physical receipt inspection potentially necessary only if canister has experienced accident conditions during transport to WCS

▶ SAR follows guidance from NUREG-1567 and RG 3.48 Rev 1



BACK-UP

TECHNICAL OVERVIEW OF NAC STORAGE

► Transportable Storage Canister (TSC)

Stainless Steel canister shell provides confinement for the fuel

Fuel Basket supports fuel assemblies and provides necessary criticality and thermal design features

► Vertical Concrete Cask (VCC)

Right Circular Reinforced Concrete Structure

Provides Shielding, Structural Protection and Natural Convection Cooling

► Transfer Cask (TFR/MTC)

Supports the TSC during In-Pool Fuel Loading, TSC Drying, Backfill and Transfer to Storage or Transport

Provides shielding and physical protection for the TSC during transfer



TECHNICAL OVERVIEW OF NAC TRANSPORTATION

► NAC-STC Transport Overpack

Steel-Lead-Steel Body with Solid Neutron Shield

Dual Closure Lids

2 Units in Operation

Licensed for multiple contents

► NAC-UMS® Universal Transport Package

Steel-Lead-Steel with Solid Neutron Shield

► NAC MAGNATRAN®

Steel-Lead-Steel with Solid Neutron Shield Design



Technical Overview of NUHOMS® Storage

► Dry Shielded Canister (DSC)

- ◆ Shell is stainless steel that provide axial shielding and confinement for the fuel
- ◆ Basket provides fuel separation, conducts heat and support



► Horizontal Storage Module (HSM)

- ◆ Reinforced concrete, rectangular overpack
- ◆ Provides for shielding, structural protection, and natural circulation cooling



► Transfer Cask (TC)

- ◆ Contains the DSC as it is transferred to and from the HSM
- ◆ Provides for shielding and physical protection for DSC during transfer



NUHOMS® Licensing History



▶ CoC 1004 Standardized NUHOMS® System

- ◆ Initial CoC effective 1/23/1995
- ◆ Several DSCs including the 61BT and 61BTH
- ◆ Standardized TC and HSM

▶ CoC 1029 Standardized Advanced NUHOMS® System

- ◆ Initial CoC effective 2/5/2003
- ◆ 24PT1 DSC
- ◆ CoC 1004 TC and (advanced) AHSM

▶ SNM-2510 Standardized NUHOMS® System

- ◆ Initial CoC effective 6/30/2000
- ◆ FO-, FC-, and FF-DSCs (based on 24P DSC in CoC 1004)
- ◆ CoC 1004 HSM Model 80
- ◆ MP-187 Dual Purpose Cask (Transport and Transfer)

References



► NUHOMS® Systems

◆ Storage SARs

- “Rancho Seco Independent Spent Fuel Storage Installation Safety Analysis Report,” NRC Docket No. 72-11, Revision 4.
- AREVA TN, “Updated Final Safety Analysis Report for the Standardized NUHOMS® Horizontal Modular Storage System for Irradiated Nuclear Fuel,” NRC Docket No. 72-1004, AREVA TN Document No. NUH-003, Revision 14.
- AREVA TN, “Updated Final Safety Analysis Report for the Standardized Advanced NUHOMS® Horizontal Modular Storage System for Irradiated Nuclear Fuel,” NRC Docket No. 72-1029, AREVA TN Document No. ANUH-01.0150, Revision 6.

◆ Transportation SARs

- AREVA TN, “NUHOMS®-MP197 Transport Packaging Safety Analysis Report,” Revision 17, COC 9302 Revision 7, USNRC Docket Number 71-9302.
- AREVA TN, “Safety Analysis Report for the NUHOMS®-MP187 Multi-purpose Cask, Revision 1, USNRC Docket Number 71-9255.

References



► NAC International Systems

◆ Storage SARs

- NAC-MPC, “NAC Multi-Purpose Cask Safety Analysis Report,” Revision 10, USNRC Docket Number 72-1025.
- NAC-UMS®, “Universal Storage System Safety Analysis Report,” Revision 10, USNRC Docket Number 72-1015.
- MAGNASTOR®, “Modular Advanced Generation Nuclear All-purpose Storage Cask Safety Analysis Report,” Revision 6, USNRC Docket Number 72-1031.

◆ Transportation SAR (Background only)

- NAC-STC, “NAC Storage Transport Cask Safety Analysis Report,” Revision 17, CoC 9235 Revision 13, USNRC Docket Number 71-9235.
- NAC-UMS®, “Universal Multi-Purpose Cask System Safety Analysis Report,” Revision 2, CoC 9270 Revision 4, USNRC Docket Number 71-9270.
- MAGNATRAN®, “Modular Advanced Generation Nuclear All-purpose Transport Cask Safety Analysis Report,” Revision 0, CoC 9356 Revision 0, USNRC Docket Number 71-9356.
 - Note, this transport cask is currently under initial licensing review by the NRC.