

U.S. DEPARTMENT OF  
**ENERGY**

Office of  
**NUCLEAR ENERGY**

# DOE-NE De-Inventory Reports

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# Disclaimer

- This is a technical presentation that does not take into account contractual limitations or obligations under the Standard Contract for Disposal of Spent Nuclear Fuel and/or High-Level Radioactive Waste (Standard Contract) (10 CFR Part 961).
- To the extent discussions or recommendations in this presentation conflict with the provisions of the Standard Contract, the Standard Contract governs the obligations of the parties, and this presentation in no manner supersedes, overrides, or amends the Standard Contract.
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# **Nuclear Power Plant Infrastructure Evaluations for Removal of Spent Nuclear Fuel**

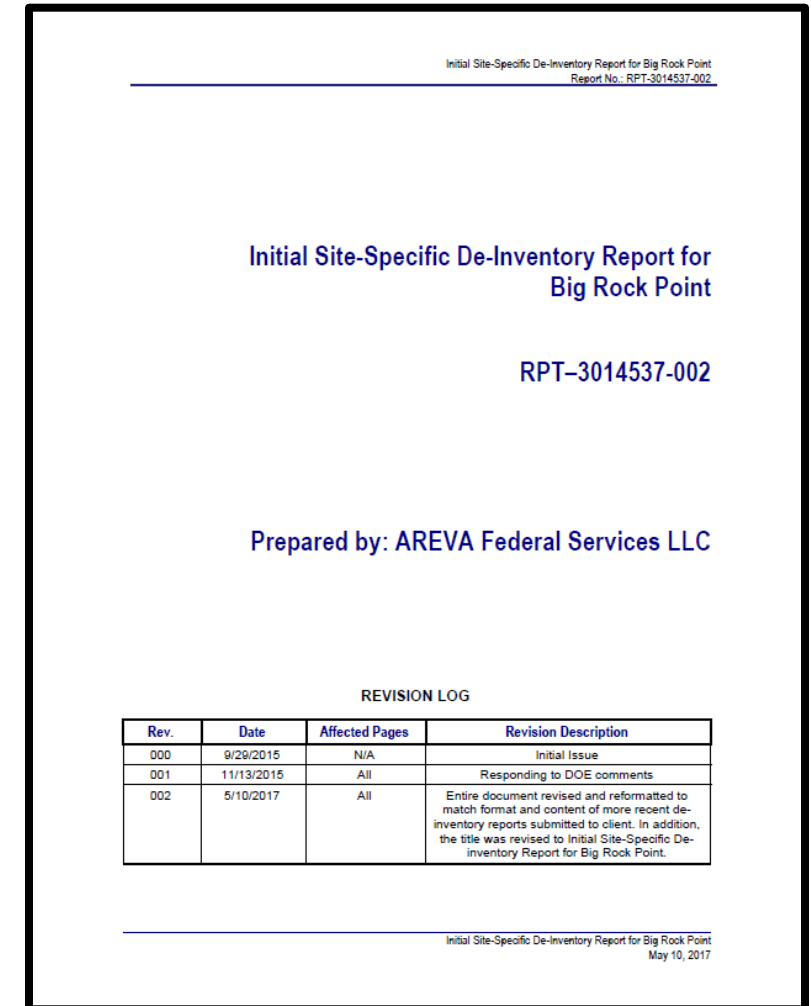
- **Infrastructure evaluations support the planning needed to remove spent nuclear fuel (SNF) from nuclear power plant sites**
- **Site infrastructure evaluations also provide data used in DOE systems modeling tools**
- **22 sites have been evaluated**
- **Emphasis in the past was on shutdown sites**
  - 20 shutdown sites have been evaluated
- **Operating nuclear power plant sites are also being evaluated**
  - Dresden and Morris evaluated in May 2022

# Initial Site-Specific De-Inventory Reports

- **Reports are a deeper dive into the activities needed to remove SNF from specific sites**
  - Team led by Orano is producing the reports
  - Reports build off of NPP site evaluations
- **Eleven reports have been completed and released**
  - Big Rock Point, Connecticut Yankee, Humboldt Bay, Kewaunee, Maine Yankee, Trojan, Crystal River, La Crosse, Rancho Seco, Yankee Rowe, Zion
- **Two reports are currently being prepared by Orano**
  - Vermont Yankee and San Onofre

# Content of Initial Site-Specific De-Inventory Reports

- The reports have a consistent structure
  - Executive Summary
  - Introduction
  - Pertinent Origin Site information
  - Transportation Route Analysis
  - Participating Entities
  - Multi-Attribute Utility Analysis
    - Metrics related to transportation routes, modes, transload locations
  - Concept of Operations
  - Budget and Spending Plan
  - Safety and Security Plans and Procedures
  - Emergency Response and Preparedness
  - Recommended Next Steps



# Pertinent Site Information

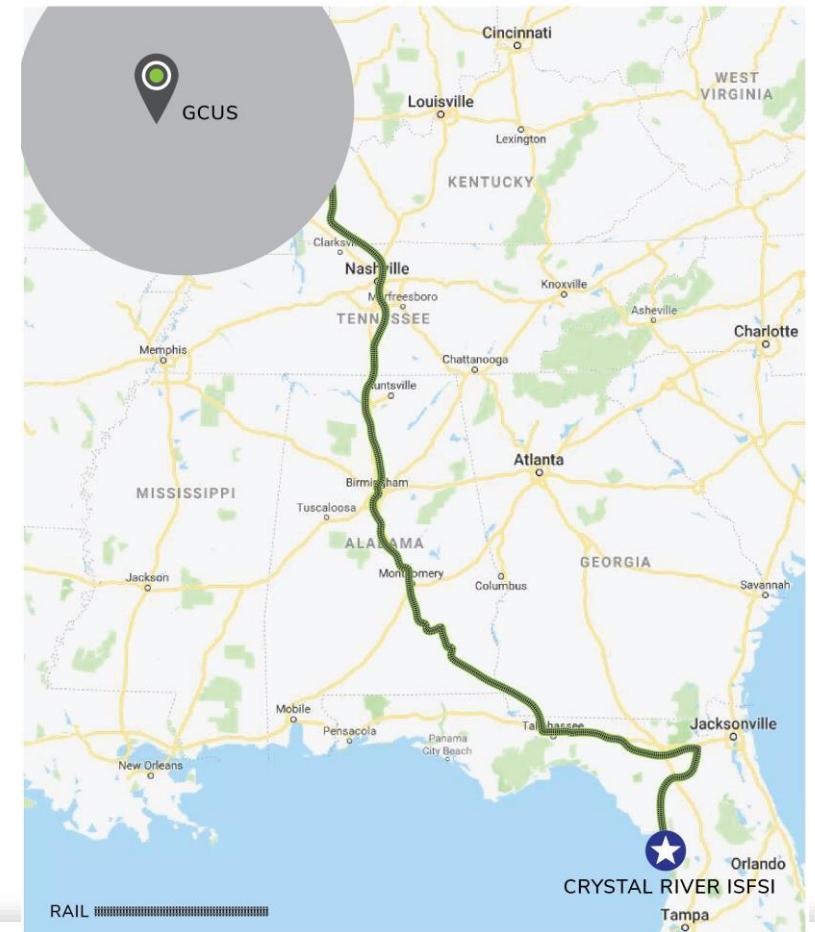
- The Pertinent Site Information section of a de-inventory report contains
  - **Description of the site/characteristics**
  - **Characteristics of the SNF and Greater Than Class C (GTCC) waste to be shipped**
  - **Description of the canisters/overpacks to be shipped**
- This information includes the overall site layout, site infrastructure, near-site transportation infrastructure, details on the dry storage systems deployed at a site, and transport equipment at a site
- SNF and GTCC waste data includes detailed information on specific assembly types, discharge dates, burnups, decay heats, often at the canister level
- Canister and overpack (transportation cask) data will typically identify any issues associated with transporting the SNF or GTCC waste that could require transportation Certificate of Compliance modifications; contain data on transportation cask weights and dimensions; and provide the sequence of operations for receiving, loading, and shipping a transportation cask



# Transportation Route Analysis

- The Transportation Route Analysis section of a de-inventory report contains descriptions of the heavy haul truck routes, rail routes, and barge routes that are applicable at a site
- Transport from the site to the geographic center of the U.S. (GCUS) is assumed for the purposes of analysis
- Potential transload locations are also identified

CRYSTAL RIVER DE-INVENTORY  
ROUTE 3



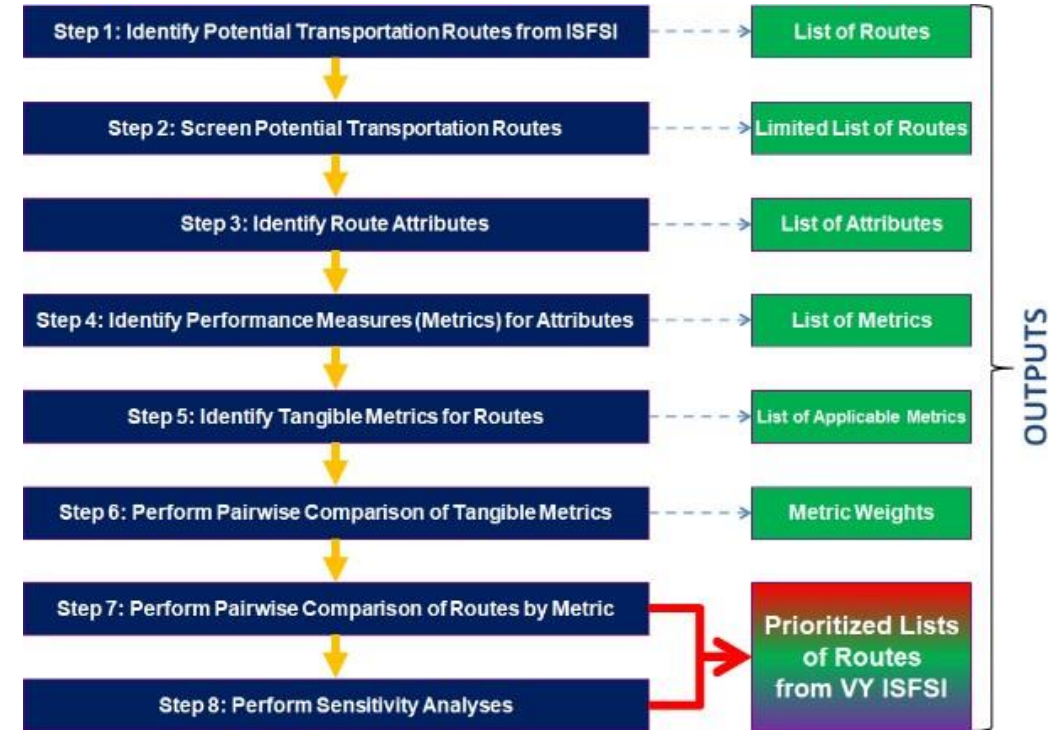
# Participating Entities

- This section of a de-inventory report identifies entities that would be involved in transporting SNF and GTCC waste from a site
- Typical entities include Federal Agencies (e.g., U.S. Department of Transportation and U.S. Nuclear Regulatory Commission), local law enforcement agencies (LLEAs), and the U.S. Coast Guard
- Typical entities also include utility/site employees, subcontractors (crane suppliers, riggers, etc.), transportation cask suppliers, security personnel, communications personnel, and transportation emergency responders
- State officials also include, e.g., the Governor's Designee for Advance Notification of SNF Shipments, and State Department of Transportation and Emergency Management
- Railroad transportation contacts, barge operators, and heavy haul service providers also included



# Multi-Attribute Utility Analysis (MUA)

- Often, there are several transportation modes and there may be several transportation routes available at a site
- Routes and modes can have both positive and negative aspects
  - Shorter length or fewer crane lifts might be desirable, higher costs might be undesirable
- The MUA provides a structured way to compare these modes and routes by identifying route attributes and associated metrics, performing a pairwise comparison of the metrics, and performing a pairwise comparison of the routes using the metrics
  - The pairwise comparison of the metrics provides a relative ranking of the metrics
  - The pairwise comparison of the routes provides a relative ranking of the routes
- Sensitivity analyses are also performed



# MUA (continued)

- Attributes are associated with cost, environmental impact, institutional considerations, permitting, resource requirements, safety, schedule, security vulnerability, and waste generation
- There are over 30 metrics evaluated. Some specific metrics include
  - On-site rental equipment costs
  - Infrastructure improvement costs
  - Transport costs
  - Route characteristics (e.g., terrain, grade, tunnels, etc.)
  - Number of Tribal lands crossed
  - Number of permits
  - Availability of specialty equipment (e.g., transfer cask)
  - Population along the route
  - Number of crane lifts
  - Transit duration
  - Ease of access to transload location
  - Number of police stations along route
  - Amount of radioactive and non-radioactive produced

# Concept of Operations

- The Concept of Operations section describes what activities are required to remove SNF and GTCC waste from a site
- Typically the activities are divided into groups:
  - Mobilization
  - Operational readiness
  - Site operations
  - Transport operations
  - Demobilization
- The section will also include information on resource requirements and staffing, lists of ancillary equipment, sequence of operations/schedule, ALARA planning, and quality assurance requirements

\*ALARA = as low as reasonably achievable

# Budget and Spending Plan

- The Budget and Spending Plan section of the report contains the overall cost and schedule estimate for removing SNF and GTCC waste from a site
- The following items are not included in the costs
  - Costs of transportation casks, impact limiters, transportation cask ancillary equipment, rail rolling stock
- The following items are included in the costs
  - Fees and permits, campaign operation management, equipment for loading operations, in-transit security, on-site operations
- Transportation cask shipping costs are included but only to where a short line meets the Class I railroad
  - For estimating the overall schedule, transport to the GCUS is assumed
- Additional costs to support de-inventory activities are also discussed – transportation costs from Class I railroad to GCUS, emergency response center operational costs, railcar maintenance costs, cask maintenance costs

# Security Plan and Procedures

- The Security Plan and Procedures section discusses strategies and procedures to ensure the safety and the security of the material, employees, and the public during loading, transloading activities, and movement associated with the transportation of the SNF and GTCC waste from a site to the GCUS
- Provisions for heavy haul truck, railroad, and barge security is discussed
- Section also discusses the development of various security and communication plans and protocols

# Emergency Response Plan and Preparedness

- The Emergency Response Plan and Preparedness section provides general guidance for an emergency response plan and contains site-specific considerations to be considered in the development of a plan

# Recommended Next Steps

- The Recommended Next Steps section provides recommendations to support the future de-inventorying of a site
- These recommendations typically are concentrated in the areas of issues associated with the SNF inventory and the need for transportation CoC modifications, onsite infrastructure and equipment needs, and near-site transportation infrastructure
- Because each site is unique, the recommended next steps will be site-specific
  - Removing SNF from some sites is likely to be more logistically simple than from other sites
  - For example, a site that requires a heavy haul truck to rail transload will be different than a site with direct rail access which will be different than a site where barge transport is used
  - If a site has SNF stored in non-transportable canisters, then the challenges are likely to be more significant than a site where no or minor transportation CoC modifications are required



# Vermont Yankee Initial Site-Specific De-Inventory Report

- **Report status**

- Orano submitted draft report to DOE in July 2023
- Report is under DOE review and revision
- Public release of the report anticipated later this year

- **Preliminary results**

- MUA identified 5 possible routes from the Vermont Yankee site to the GCUS
  - Three routes involved direct rail shipments from Vermont Yankee to the GCUS
  - Two routes involved heavy haul truck shipments from Vermont Yankee to nearby heavy haul truck to rail transload locations followed by rail transport to the GCUS
- Rail from Vermont Yankee to Palmer, MA and then to the GCUS preferred
- Cost and schedule still being worked

# Questions?

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SFWD Working Document: External Release or  
Reference Requires DOE-NE Approval