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NRC Preparations for Potential Large-Scale Commercial Shipments of Spent Nuclear Fuel

Haile Lindsay
Thermal Engineer, Division of Fuel Management
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission

NRC Public Meeting
February 2, 2022

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Ground Rules for Today's Meeting

- Please keep yourself on mute throughout the duration of the meeting until the Q&A session. Limit comments in the Chat unless the comments pertain to meeting logistics.
- When we begin the Q&A session, please raise your hand to be recognized and from there, feel free to speak. For those who are on the phone, hit *5 to raise your hand and *6 to unmute.
- Please understand that there will be no regulatory decisions made at this meeting.
- Please keep your comments within scope of the public meeting (2 – 3-minute max).

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Updated Meeting Agenda

Time	Topic	Speaker
1:00 PM	Welcome and Opening Remarks	NRC
1:20 PM	Readiness Review Assessment Report and NRC Responsibilities	NRC
1:40 PM	DOT Responsibilities	DOT
2:00 PM	DHS Responsibilities	DHS
2:20 PM	Q/A	All
3:00 PM	Adjourn	All

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NRC Preparations for Potential Large-Scale Commercial Shipments of Spent Nuclear Fuel

Geoff Miller
Acting Deputy Director, Division of Fuel Management
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission

NRC Public Meeting
February 2, 2022

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Overview

- The NRC has completed a Regulatory Readiness Review for commercial transportation of spent nuclear fuel
- The review focused on NRC's regulatory framework and coordination with other agencies
- Today's presentations will discuss the results of the review along with the overall framework for regulatory oversight

Key Results of the Review

- The NRC has a well-established and strong regulatory framework for the safe and secure transportation of spent nuclear fuel
- The NRC's regulatory framework for transportation is well integrated with the overall Federal structure
- The overall framework is prepared to provide oversight for potential commercial shipments of spent nuclear fuel

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NRC Preparations for Potential Large-Scale Commercial Shipments of Spent Nuclear Fuel

James Rubenstone
Chief, Material Control and Accounting Branch
Division of Fuel Management
Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission

NRC Public Meeting
February 2, 2022

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Topics

- NRC Regulatory Readiness Review: Scope and Results
- Oversight Roadmap: Agency Roles and Responsibilities
- NRC's Roles and Responsibilities

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Review Scope

- Regulatory framework for safety and security
- Nineteen assessment areas, including:
  - Applicable regulations, guidance, and procedures
  - Respective roles of Federal, State, and Tribal agencies,
  - Interagency agreements and cooperation
  - Prior experience with SNF transportation
  - Prior evaluations and risk assessments
  - Information needs
  - Inspection and other oversight

Key Results

- The NRC has a well-established and strong regulatory framework for the safe and secure transportation of spent nuclear fuel
- The NRC's regulatory framework for transportation is well integrated with the overall Federal structure
- No major changes needed to NRC regulations or guidance
- Enhance inspection procedures for greater efficiency
- Expand public engagement and communications

Recommended Enhancements

- Pre-shipment and receipt inspections
  - Update and consolidate applicable procedures for greater efficiency
  - Ensure that inspectors are trained and qualified on the new procedures
- Public outreach
  - Provide more outreach and public interaction on spent fuel transportation safety and security

Other Review Outcomes

- *Identified* information needs to support NRC's oversight of the transportation campaign
- *Identified* areas that could potentially require a future policy action by the Commission
- *Developed* a high-level roadmap for regulatory oversight during the different stages of a transportation campaign

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Oversight Roadmap: Agency Roles and Responsibilities

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NRC's Regulatory Responsibilities

- Establishing and maintaining the regulations for transportation and storage packages and transportation security regulations
- Certification of transportation packages
- Oversight of shipments being prepared and received
- Review and approval of security plans and routes for shipments
- Coordination with other Federal agencies, other partners, stakeholders, and the public

Oversight Roadmap

Shipping Site

In Transit

Receiving Site

Event Response

Oversight Roadmap

Shipping Site

Package Certification
Site Operations
Pre-shipping Inspections

In Transit

Receiving Site

Receipt Inspections
Site Operations

Event Response

NRC Roles

Oversight Roadmap

Shipping Site

In Transit

Receiving Site

DOT Roles

PHMSA
FRA
FMCSA

Event Response

PHMSA = Pipeline and Hazardous Materials Safety Administration
FRA = Federal Railroad Administration
FMCSA = Federal Motor Carrier Safety Administration

Oversight Roadmap

Shipping Site

DHS Roles

In Transit

Security Planning

Receiving Site

FEMA

Event Response

FEMA = Federal Emergency Management Agency

Oversight Roadmap

Shipping Site

In Transit

Receiving Site

Local Roles

States
Tribes

Event Response

Oversight Roadmap

Shipping Site

In Transit

Receiving Site

DOE Roles

Outreach

R&D

Event Response

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Key Messages

- The NRC has a well-established and strong regulatory framework for the safe and secure transportation of spent nuclear fuel
- The NRC's regulatory framework for transportation is well integrated with the overall Federal structure
- Transportation of spent nuclear fuel has already occurred in the U.S. with no safety or security issues
- The NRC has confidence that spent nuclear fuel can continue to be transported safely and securely

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For Further Reading

- *Regulatory Readiness Review Report* is available in the NRC Agencywide Documents Access and Management System (ADAMS), No. ML21298A164
- *Summary of the review results* as reported to the NRC Commission (SECY-21-0101) in ADAMS, No. ML21300A344
- *Recent NRC transportation risk analysis*: NUREG-2125, "Spent Fuel Transportation Risk Assessment," issued January 2014, in ADAMS No. ML13249A329

(More reading in the Review Report)

Roles and Responsibilities of the U.S. Department of Transportation in the Safe Transportation of Spent Nuclear Fuel

Rick Boyle, Chief
Radioactive Materials Transport
Office of Sciences and Engineering

February 2, 2022

"To protect people and the environment by advancing the safe transportation of energy and other hazardous materials that are essential to our daily lives."

Department of Transportation
(www.dot.gov)

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CHIEF OF STAFF

DEPUTY CHIEF OF STAFF

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MARITIME ADMINISTRATION

FEDERAL MOTOR CARRIER SAFETY ADMINISTRATION

PIPELINE AND HAZARDOUS MATERIALS SAFETY ADMINISTRATION

PHMSA Organization
(www.phmsa.dot.gov)

- Administrator
  Deputy Administrator
  - Office of Chief Counsel
  - Office of Governmental, International, & Public Affairs
  - Office of Civil Rights
  - Executive Director & Chief Safety Officer
    - Office of Planning & Analytics
    - Office of Pipeline Safety
    - Office of Hazmat Safety
    - Office of Administration
    - Office of the Chief Financial Officer

PHMSA Mission

- **Administer a national program designed to protect life, property, and the environment from risks inherent in the transportation of hazardous materials, including SNF, in intrastate and interstate commerce.**

- **Identify and evaluate safety risks; develop and enforce standards for transporting hazardous materials; educate shippers and carriers; investigate transport and packaging incidents and failures; conducts research; and awards grants to improve emergency response to incidents.**

- **Issue Federal hazardous materials transportation safety laws.**

Federal Regulations

- **Title 49 of the Code of Federal Regulations (HMR) establish commodity-specific standards for the classification, packaging, marking, labeling, and documentation of hazardous materials shipments by rail, highway, vessel, and air.**
  - **https://www.ecfr.gov/cgi-bin/ECFR?page=browse**
  - **Title 49, Sections 100-199**

- **HMR prescribe standards for the loading and unloading of transport conveyances; training of transportation employees; and security of hazardous materials in transportation.**

- **HMR recognizes the shared safety and enforcement responsibility with the Federal Railroad Administration (FRA), the Federal Motor Carrier Safety Administration (FMCSA), the United States Coast Guard, the Federal Aviation Administration and state law enforcement officials.**

What About Other Federal Agencies?

- **Responsibility for Class 7 (Radioactive Materials) transport is shared between PHMSA and the Nuclear Regulatory Commission (NRC)**
  - **Department of Energy is not a regulator. Subject to HMR**
  - **Department of Defense is not a regulator. Subject to HMR**

- **1979 Memorandum of Understanding between DOT and NRC**
  - **NRC: Type B packages; Fissile Materials**
  - **DOT: Everything else (Type A; LSA/SCO; Excepted materials; Non-fissile material classifications; Radiation and contamination thresholds; Hazard communication**
  - **Shared: Security; Routing; Enforcement; Loading and unloading**

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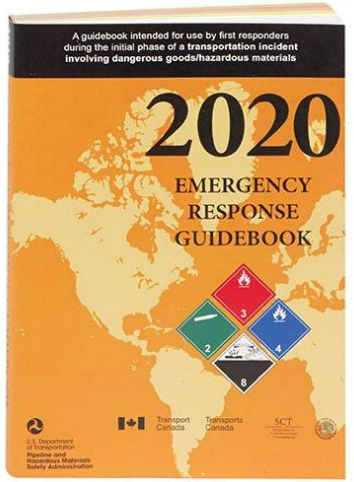
What About Other Countries?

- **PHMSA represents the United States on the IAEA Transport Safety Standards Committee (NRC is on delegation)**
  - **Regulations For the Safe Transport of Radioactive Materials, SSR-6 (Rev 1)**
- **DOT/NRC Harmonization Rulemakings**
- **Package designs for Import/Export/Transit Shipments are certified by PHMSA**
- **Package designs for domestic Shipments are NRC**

Emergency Response Support

- **Local fire departments and local law enforcement agencies**
  - **Hazard Communication required by HMR**
  - **Emergency Response Guidebook**
- **NRC Physical Protection Requirements**
- **State Radiation Control Authorities**
- **DOE response teams**



Questions?

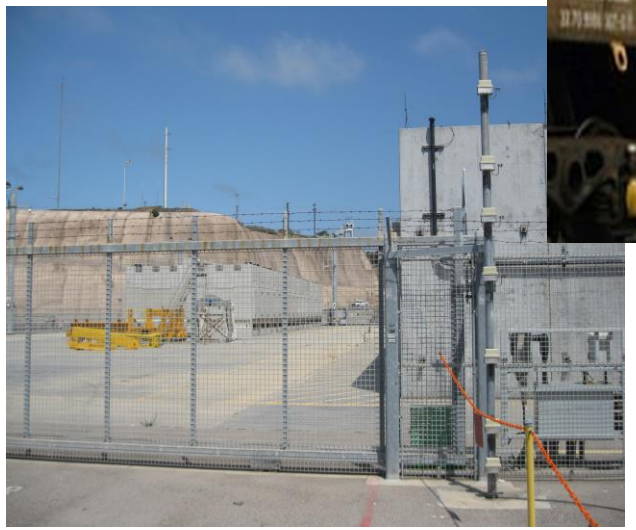
Rick Boyle

Rick.boyle@dot.gov

202-366-2993

F E D E R A L R A I L R O A D A D M I N I S T R A T I O N

The Federal Railroad Administrations Role in the Transportation of Spent Nuclear Fuel



RAIL
Moving America Forward

Office of Safety
Hazardous Materials Division

U.S. Department of Transportation
Federal Railroad Administration

FRA Regulatory Authority

- FRA only regulates the safety of rail transportation of the radioactive materials (RAM).
- FRA regulations were developed to set minimum standards for the safety of rail transportation vehicles, track structures, certification of train crews, etc.
- FRA adheres to the Nuclear Regulatory Commission (NRC) and Department of Energy (DOE) for their applicable regulations of High-Level Radioactive Waste (HLRW) and Spent Nuclear Fuel (SNF) packaging and security requirements that go above the DOT requirements.

FRA/State/Tribal/DOE/NRC

- FRA attends annual meetings and participates in conference calls and webinars with its transportation partners on rail-related issues.
- FRA works closely with the DOE and NRC as a subject matter expert on rail compliance issues.
- FRA also works with the NRC and Department of Homeland Security (DHS) on a Spent Nuclear Fuel Transportation Security Working Group to ensure uniformity for private sector SNF/HLRW transportation movements and alignment with governing principles and policies affecting infrastructure security.
- FRA is a member of DOE's "Preliminary Evaluation of Removing Used Fuel from Shutdown Sites" team reviewing rail/road/water near-site transportation of SNF and HLRW.

FRA's Role in the Movement of Spent Nuclear Fuel (SNF)

- FRA takes a very active role in the four phases of transportation; Package Preparation, Pre-inspection, En-Route Inspection, and Post Inspection.
- Each of the four phases involve planning with as much lead time as possible.
- Communication with all parties involved in the shipping of any SNF/HLRW is a key to success. This includes sharing transportation ideas with other federal, state, and local agencies as well as tribal groups.
- FRA created the Safety Compliance Oversight Plan in 1998, or SCOP, that reviews and covers all the FRA operating disciplines and their respective roles in the movement of SNF.
- The new document, the SCCOP or ***(Safety Coordination and Compliance Oversight Plan for Rail Transportation of High-Level Radioactive Waste and Spent-Nuclear Fuel***) discusses other safety and outreach programs available when shipping by rail. (EX: Operation Lifesaver). Parts of the new revised SCCOP will be discussed in this Power Point.

FRA's History, Profile and Current Progress of the SCCOP

The FRA's SCOP *(now the SCCOP)* was originally written in June 1998 for limited shipments of High-Level Radioactive Waste (HLRW) and SNF and included the oversight of Foreign Research Reactor Fuel coming into the Port of Charleston, SC, and the removal of High-Level Radioactive Waste and Spent Nuclear Fuel from the Three Mile Island Nuclear Power Plant.

Current Progress of the SCCOP

- The current *draft* SCCOP addresses many of the same operating disciplines as the original SCOP document created in 1998, but it does address the new regulations developed since the creation of the original SCOP in 1998
- The new *draft* SCCOP is designed for the both FRA federal and state certified rail inspectors to be used as a coordination document for their inspections in preparation for a SNF rail move.
- It will also address FRA's new FRA management structure and responsibility for specific railroads.

We have done this before by rail!

- On July 17, 2003, DOE completed the West Valley Shipment by rail. The movement of more than 2,300 miles was completed safely, securely, and without incident more than 17 hours ahead of schedule.

Quick History on West Valley Rail Shipments

During the West Valley shipment, DOE worked closely with the states, tribes, railroad carriers, and other federal agencies in planning and preparing for the shipment.

Quick history on West Valley Rail Shipments

Shipping planning, information briefings,

training courses and communication were coordinated with the following;

- Council of State Governments–Midwest,
- Council of State Governments-Eastern Regional Conference,
- Western Governor's Association, and
- The Shoshone-Bannock Tribes.

**Additional planning activities were coordinated with security points-of-contact for the states, tribes, carriers, and various other federal agencies.*

Radioactive Materials Shippers are inspected the same as other HM shippers

- Hazardous Materials PHMSA Registration
- Training (per 49 CFR Subpart H)
- Facility generated shipping papers for compliance (per 49 CFR Subpart C)
- SOPs (Standard Operating Practices) pertaining to loading rail cars
- Review of OEMs (Origional Equipment Manufacturers) use of equipment such as rail car liner, rail car lids, etc.
- Review of any incidents or abnormal occurrences pertaining to rail shipments.

FRA's Four Inspection Phases of Rail Transportation

- Package Preparation
- Pre-transportation
- En Route transportation
- Post- transportation

Pre Transportation - Early Planning and Coordination

- Even before routes are decided, FRA participates in the DOE joint site evaluation of the transportation needs for removing used fuel from a site and conducting an overview with other joint agencies that may involve several modes of transportation.
- This is a great model for both private and DOE shipments!

Pre-Transportation Functions- Early Planning with Small Railroads on Infrastructure on the Proposed Route

- FRA is taking a proactive approach as proposed/discussed routes involve regional and short-line railroads.
- More than 30 of these power plants will be served by Regional or Short Line carriers.
- These small railroads typically use Excepted and/or Class 1 track safety standards, which has a 10-mph maximum speed. FRA recommends that track infrastructure be at least FRA Class 2 track for a higher track maintenance standard. FRA routinely discussed infrastructure grants for track upgrades.

Pre-Transportation Checks

- All operating disciplines affected (*Track, Motive Power & Equipment, Signal and Tran Control-where applicable, and Operating Practices*)
- Communication is everything
- Rail documents review of Electronic Data Interchange (EDI) for seamless transfer of information between carriers
- Route inspection (track quality), and planned and coordinated security plan reviews will be conducted for routes & alternate routes
- Transfer of crew change locations between carriers
- Equipment inspections for locomotives, cars
- Train crew qualifications, and dispatch employees training will be reviewed before shipments in preparation

Shipping Documents on Rail

- We commonly understand terms like hazardous materials shipping documents, bills of lading, NRC 540 & 541 forms, and they are all important, and typically good documents, but railroads use waybills for their own purposes as internal movement documents.
- Waybills are created from the forms listed above by a system called electronic data interchange, or EDI.
- All rail carriers operate their systems under an EDI format for a seamless transfer of information and recordkeeping.

Rail Shipping Documents

- EDIs are required to contain the same information as all other shipping documents mentioned in the previous slide, but the EDI system allows the railroads to store, maintain and transmit the information electronically from one carrier to another and through a rail phone app supply information to emergency responders if needed and still comply with the regulations.

FRA's Inspection of EDIs and Shipper/Offeror Training

- FRA still has the duty to look for consistency in the transition of the shipping documents for required information, and still inspects shipper facilities for these forms.

- In short, we look at the documents from the shipper of record and/offerors involved (depending on the number of contractors). The HM description drives the marking and placarding requirements.

Pre-Check - Day of Departure

- FRA will be in place for cask (SNF) preparation, inspections for markings, placarding, documents inspection – consistent between documents and markings.
- Crew documents correct.
- Car mechanical inspection for both the locomotives and rail cars
- Train and car train air brake inspections for continuity (*or brakes throughout the train and effective on each car in the train*), are completed and documented.
- We will be in communication with initial carrier for interchange and plans for crew change points, refueling locations and potential inspection locations.

En Route Inspections

Mandatory Train Stop Points – Two Types Required by Regulation

1. *Air tests, under the regulations for long haul trains have to be completed every 1500 miles per 49 CFR 232.213 (with some conditions), and;*
2. *Crew change points/refueling locations (train crews have a maximum time on duty of 12 hours).*

Arrangements for states and tribes to inspect the cask will have to be coordinated with the carriers.

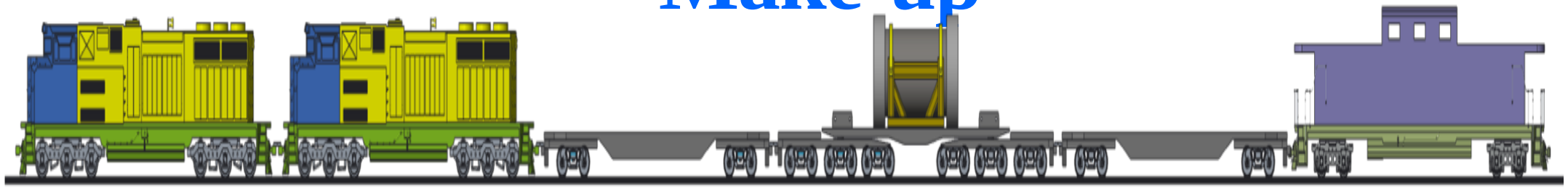
Differences duties between NRC and DOT/FRA on route

- NRC approves a route. DOT does not approve a route but requires each carrier to complete the following:
  - A safety and security risk analysis and route analysis using the 27 factors outlines in 172.820

Differences between NRC and DOT/FRA on Route - (Safe Havens)

- Safe havens are not required or involved in rail transportation.
- FRA addresses safe havens in the SCOP but only as they apply to track quality, not location or requirement.
- Any secure location for the train to potentially stop or sit overnight must be coordinated with the carrier/s involved.

The Complete Spent Fuel Train Make-up



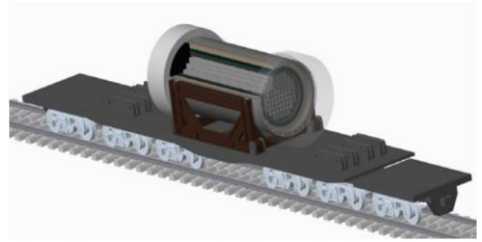
- Two locomotives
- Buffer railcar
- One or more Atlas railcar(s)
- Buffer railcar
- Rail escort vehicle

Any SNF/HLRW trains make-up must follow the NRC regulations for armed guards per the NRC regulations in 10 CFR, Part 73.

The New Industry Standard Rail Car for SNF and HLRW Movements By Rail

DOE's "S-2043 Atlas" Rail Car

The Atlas Car Design



Although the Atlas design is referred to as DOE's car, the AAR S-2043 car has been adopted by the Association of American Railroads (AAR) as the only car railroads will accept in interchange carrying SNF.

- So even a private shipper must obtain a car with the S-2043 design and operational requirements.
- Just to be clear, the S-2043 is not required by Federal regulation but is an industry standard!
- The S-2043 Standard Cask Car, Buffer cars and the Escort Cars are still in testing phases with the AAR.

Post Inspection Review

- Lessons learned
- The S-2043 car inspection and the entire SNF train
- Cask overview and its securement in the car.
- Review any en-route stoppages, unnecessary delays
- Security concerns (*predictable and surprises*)
- Route issues- review of alternate routes as a possibility?

Thoughts?

Questions?

Jeffrey Moore
Federal Railroad Administration
Hazardous Materials Specialist- RAM
202-493-0635 (office)
215-327-6851(Cell)
jeffrey.moore@dot.gov

PRIVATE SECTOR TRANSPORTATION SECURITY OF SPENT NUCLEAR FUEL WORKING GROUP

CISA
CYBER+INFRASTRUCTURE

Ryan Bechtel
February 1, 2022

National Infrastructure Protection Plan

The NIPP was first developed by the Department of Homeland Security in 2006 with a mission to strengthen the security and resilience of the United States' critical infrastructure, by managing physical and cyber risks through the collaborative and integrated efforts of the critical infrastructure community.

NIPP Goals

- Assess and analyze threats to, vulnerabilities of, and consequences to critical infrastructure to inform risk management activities
- Secure critical infrastructure against human, physical, and cyber threats through sustainable efforts to reduce risk, while accounting for the costs and benefits of security investments
- Enhance critical infrastructure resilience by minimizing the adverse consequences of incidents through advance planning and mitigation efforts, and employing effective responses to save lives and ensure the rapid recovery of essential services
- Share actionable and relevant information across the critical infrastructure community to build awareness and enable risk-informed decision making
- Promote learning and adaptation during and after exercises and incidents

NIPP Partnership Model

- **Sector Coordinating Councils (SCC)** are self-organized, self-run, and self-governed private sector councils consisting of owners and operators and their representatives, which interact on a wide range of sector-specific strategies, policies, activities, and issues
- **Government Coordinating Councils (GCC)** consist of representatives from across various levels of government stakeholders
- **Sector Risk Management Agency (SRMA)** which leverages their knowledge and expertise to serve as a day-to-day Federal interface for the dynamic prioritization, collaboration, and coordination of sector-specific activities

NIPP Partnership Model

- The sector partnership approach is designed to be scalable and can include the full sector council or cross-sector councils, standing sub-councils, or temporary targeted working groups.
- The partnership approach is intended to promote a consistent process within sectors and the critical infrastructure community.
- This concept has proved successful and can be leveraged to build, form, or expand existing networks; identify proven practices; adapt to or adopt lessons learned; and leverage practices, processes, or plans as appropriate.

Spent Nuclear Fuel Working Group

- The Nuclear Government Coordinating Council established the Private Sector Transportation Security of Spent Nuclear Fuel Working Group (Spent Nuclear Fuel WG) in Spring 2020 to facilitate information sharing to a broader government audience.
- Membership Includes
  - Council of Radiation Control Program Directors
  - Department of Energy
  - Department of Homeland Security: Customs and Border Protection, Cybersecurity and Infrastructure Security Agency (CISA, chair), Transportation Security Administration, US Coast Guard
  - Department of Transportation: Federal Motor Carrier Safety Administration, Federal Railroad Administration, Pipeline Hazardous Materials Safety Administration
  - Nuclear Regulatory Commission (vice chair)
  - Tribal Radioactive Materials Transportation Committee (SME)

Spent Nuclear Fuel Working Group

The Working Group's objectives are to:

- Serve as a mechanism through which the Nuclear GCC will collaborate to address private sector SNF transportation security information sharing
- Inform and make recommendations to the Nuclear GCC on the private sector transportation of SNF
- Introduce, implement and identify methods and exercises to examine commercial SNF transportation effects on infrastructure security
- Identify the possible forthcoming challenge(s) and development(s) of evolving private sector SNF transportation

Spent Nuclear Fuel Working Group

Potential activities include:

- Information sharing on matters related to private sector transportation of SNF
- Joint exercises
- Identifying private sector SNF transportation needs, issues and unique concerns

Conclusions

- The SNF WG was created as a forum to enhance information sharing and coordination.
- The SNF WG will broaden the communication and understanding of safety goals, security requirements and work to establish solid working relationships across the SNF transportation community.

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For more information:
NuclearSector@cisa.dhs.gov

Ryan Bechtel
February 1, 2022

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