Vermont Yankee RWC Transportation Campaign Lessons Learned & Applicability to Future Transport of UNF

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2022 NTSF Northeast HLRW Transportation Task Force Meeting June 7, 2022



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Experience Gained for Future UNF transports



Lessons Learned and Wrap Up



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Introduction

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- What is the connection?





VY RadWaste Canister (RWC) Shipments

Connections

RWCs were loaded with irradiated metal reactor vessel components – no fissile material; no UNF

However, requirements of 10 CFR 37 *Physical Protection of Category 1 and Category 2 Quantities of Radioactive Material* applied

- List of isotopes and quantity thresholds for Category 1 and Category 2 quantities of radioactive material
 - Primarily ⁶⁰Co, for these shipments

Physical protection program elements

Heavy Type B transport package

	Category 1 Threshold		Category 2 Threshold	
RADIOACTIVE MATERIAL	TBq*	Ci	TBq	Ci
Americium-241	60	1,620	0.6	16.2
Americium-241/Beryllium	60	1,620	0.6	16.2
Californium-252	20	540	0.2	5.40
Cobalt-60	<mark>30</mark>	<mark>810</mark>	0.3	8.10
Curium-244	50	1,350	0.5	13.5
Cesium-137	100	2,700	1	27.0
Gadolinium-153	1,000	27,000	10	270
Iridium-192	80	2,160	0.8	21.6
Plutonium-238	60	1,620	0.6	16.2
Plutonium-239/Beryllium	60	1,620	0.6	16.2
Promethium-147	40,000	1,080,000	400	10,800
Radium-226	40	1,080	0.4	10.8
Selenium-75	200	5,400	2	54.0
Strontium-90	1,000	27,000	10	270
Thulium-170	20,000	540,000	200	5,400
Ytterbium-169	300	8,100	3	81.0



Transport Summary

- What was transported and how?







Stakeholders

Consignor/licensee – Northstar

Consignee – Waste Control Specialists

Federal Railroad Administration (FRA)

American Nuclear Insurers (ANI)

States

- 1. Vermont
- 2. Massachusetts
- 3. New York
- 4. Pennsylvania
- 5. Ohio
- 6. Indiana
- 7. Illinois
- 8. Missouri
- 9. Arkansas
- 10. Texas
- 11. New Mexico

Tribal nations

1. Seneca Nation





Waste Description

- Segmented reactor vessel components
- Control rod blades



- Jet pump segments

Placed in rad waste containers (RWC)
(3) category 1 quantity of radioactive material
(4) category 2 quantity of radioactive material





Transport Configuration

Configuration

- RWC inside the MP197HB® Type B transportation package
- The MP197HB® secured to the transport skid
- The transport skid secured to the railcar
 - Kasgro 8 axle rail car

Note: DOE prescribes use of AAR S-2043 compliant railcars in the train consist for UNF shipments

Merchandise (regular) train

Not a special or dedicated train

Note: UNF transport will use dedicated train and armed escort

 1st rail shipment of Category 1 radioactive material in many years



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Route



Transit Durations in Northeast

C toto	Average Duration in State	
State	(n:m:s)	Comments
Vermont	0:26:20	
Massachusetts	33:45:22	- Palmer (Avg. 3:02:17) - W. Springfield (Avg. 19:33:00)
New York	44:13:15	Selkirk (Avg. 30:25:26)
Pennsylvania	1:05:34	





Disposal at WCS

Receipt and offload



Insertion of RWC into MCC



To Burial Location





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Experience Gained for Future UNF Transports

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- Packaging & Physical Protection





1 - Deployment of MP197HB®

Prove the concept

Retract RWC into the MP197HB and prepare for shipment (leak test, assemble)



Transport via rail to disposal site



Identical process for shipping used nuclear fuel in Dry Shielded Canisters (DSC) from NUHOMS® dry storage modules to CISF

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Insert the RWC into the MCC and dispose (bury)







Physical Protection Program Requirements

10 CFR Part 73

- Transport physical security plan
- NRC approved route
- Preplanning with States along the route
- Advance notifications
- Movement control center
- Security Escorts
- Contingency and response procedures
- Communication protocols
- Training
- Access authorization and control of safeguards information

10 CFR Part 37

- Transport physical security plan
- Preplanning with States along the route
- Advance notifications
- Movement control center
- Control of protected information
- Response procedures

Preplanning



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Category 1 and UNF:

- Include all States that the shipment will cross
- Confirm contact information for the Governor's designee and any other notify parties
- Identify specific State requirements such as escorts or permits

UNF - differences:

- Required to be completed no later than 14 days prior to shipment entry into the State
- Coordination of security escorts (private or provided by the State)
- Agreement on the route
- Emergency response coordination

MUST BE DOCUMENTED



Prior to the start of the campaign, we coordinated with all 11 States and one Tribal Nation (10 CFR 71.97). Subsequently, we followed up prior to each Category 1 shipment. The interactions were positive and productive, especially to better understand their expectations and any individual State requirements.



Advance notifications



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Category 1:

- NRC 7 days prior to commencement if by mail, 4 days if other
- States 4 days prior to entry into the State
- Tribal Nations (only HRCQ; 10 CFR 71.97)
- Revisions are required for significant schedule changes or cancellations

UNF differences:

- NRC
 - received 10 days prior to commencement of the shipment,
 - 2 hours prior to commencement
 - Receipt at destination
- States and Tribal Nations 10 days by mail, 7 days if other prior to used fuel shipments crossing the territory
- Schedule changes of more than 6 hours are reported by phone

The experience was helpful in assuring that we were providing timely notifications with sufficient information to the NRC and the correct contacts in each State.



Nuclear logistics

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Movement Control Center (MCC)

Category 1:

- MCCs required to provide 24/7 coverage for tracking the shipments and in emergencies, communicate immediately with the local law enforcement agencies.
- Road shipments of Category 1 materials have more requirements than the Category 1 rail shipments such as continuous, active monitoring and communication protocols

UNF differences:

- MCCs supporting used fuel shipments will primarily communicate with the escorts (armed or unarmed) that will accompany the vehicle or train.
- Communication between the escorts and MCC shall be at random intervals not to exceed 2 hours.

We activated our MCC for each of the Category 1 rail shipments. We were able to continuously track the progress, make revised notifications if needed, and were prepared to respond to emergencies. We used GPS units mounted on the transport skid to track the trains in between the railroad waypoints.

Lessons Learned and Wrap Up







Experiences

Resolved issues that provide good lessons learned

Issue: Hazard communication on 1st shipment

- Package was placarded per 49 CFR 172.514(c)(3) rather than labeled (Yellow-II)
 - Intent: Yellow-II shipments do not require placards, the placards would be better for hazard communication
- FRA inspector expected a Yellow-II label matching the paperwork and questioned TN and the licensee.
 - The reality is that it's not clear how the exception would be communicated on paperwork

Resolution:

• Labels were used for the remaining shipments

Issue: Data loss in electronic BOL system

 eBOL generated in the NECR system, information was not consistently being transferred to CSX and UP.

Resolution:

- Worked with IT support with all three railroads
 - Sensitivities with minor inconsistencies in information
 - Field 'rules' (numbers only vs. text)





Experiences

Resolved issues than provide good lessons learned

Issue: Railroad routing changes - 1

- Unplanned changes made by railroads based on schedule and operations optimization
 - Affected routes in Missouri, Arkansas and Texas

Resolution:

 Contacted governor's designees in Missouri, Arkansas and Texas to provide the new alternate routes

Issue: Railroad routing change – 2

 Railcar was scheduled to be part of a train that would pass through States that we had not preplanned with

Resolution:

 Immediately alerted the railroad hazardous material department and had the car removed from that train consist

Our MCC staff identified this problem in time to avoid this issue





Wrap Up

No delays due to transportation events or incidents

FRA was very open and helpful in ensuring that shipments were prepared and executed in accordance with regulatory requirements

WCS performed unloading without difficulty

Coordination and pre-planning activities with States and Tribal Nations were very important and productive

New processes developed to interact with railroads

The planning and implementation of used fuel shipments is more complex; however, the category 1 waste shipments from VY did provide us with valuable experience that can be applied to our used fuel transport program in the future.





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