DOE's High Burnup Research Cask Project Updates

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March 26, 2026

U.S. DEPARTMENT of ENERGY | Office of Nuclear Energy

Spent Fuel and High-Level Waste Disposition

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Photo courtesy of Dominion Energy

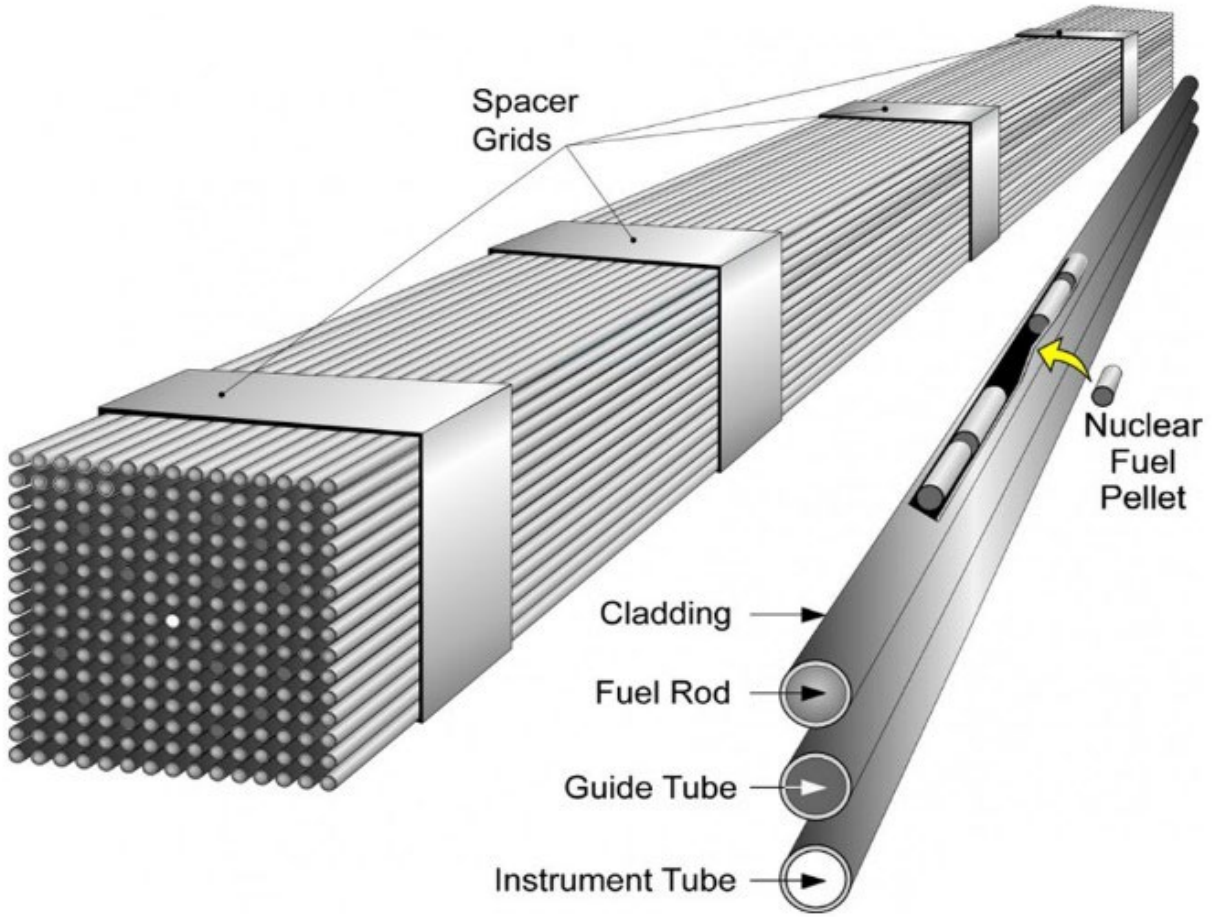
What is DOE's High Burnup Research Cask (HBURC) Project?

- Research project started in 2013 as a collaboration between DOE and the Electric Power Research Institute (EPRI)
- High burnup used nuclear fuel (UNF)[1] stays in reactors longer to produce electricity
- Monitoring characteristics of high burnup UNF in one dry cask at the North Anna Power Station near Mineral, Virginia
- Project will provide data to support safe storage of UNF for DOE's future Federal staging facilities (FSFs) for UNF, and for a majority of currently operating U.S. nuclear power plants

[1]The term "used nuclear fuel" is intended to be synonymous with the term "spent nuclear fuel" as used and defined in the Nuclear Waste Policy Act of 1982, as amended, and the Standard Contract for the Disposal of Spent Nuclear Fuel and/or High-Level Radioactive Waste (10 CFR Part 961).

UNF Characteristics

- 32 pressurized water reactor high burnup UNF assemblies
- UNF assemblies in the cask have four different cladding types
  - Zircaloy-4, low-tin Zircaloy-4, Zirlo®, M5®
- At the time of shipment, the UNF will have been in dry storage, collecting data for about 10 years



Cask Characteristics

- The cask is a TN-32B model cask certified by the U.S. Nuclear Regulatory Commission (NRC) for storage and transportation of UNF.
- Made of steel and provides containment and shielding to protect the public.
- Specialized lid allows temperature measurements with thermocouples.
- TN-32B and hardware for shipment (its “shipping weight”) is 361,855 pounds (181 tons).

Shipment Destination: Waiver from the State of Idaho

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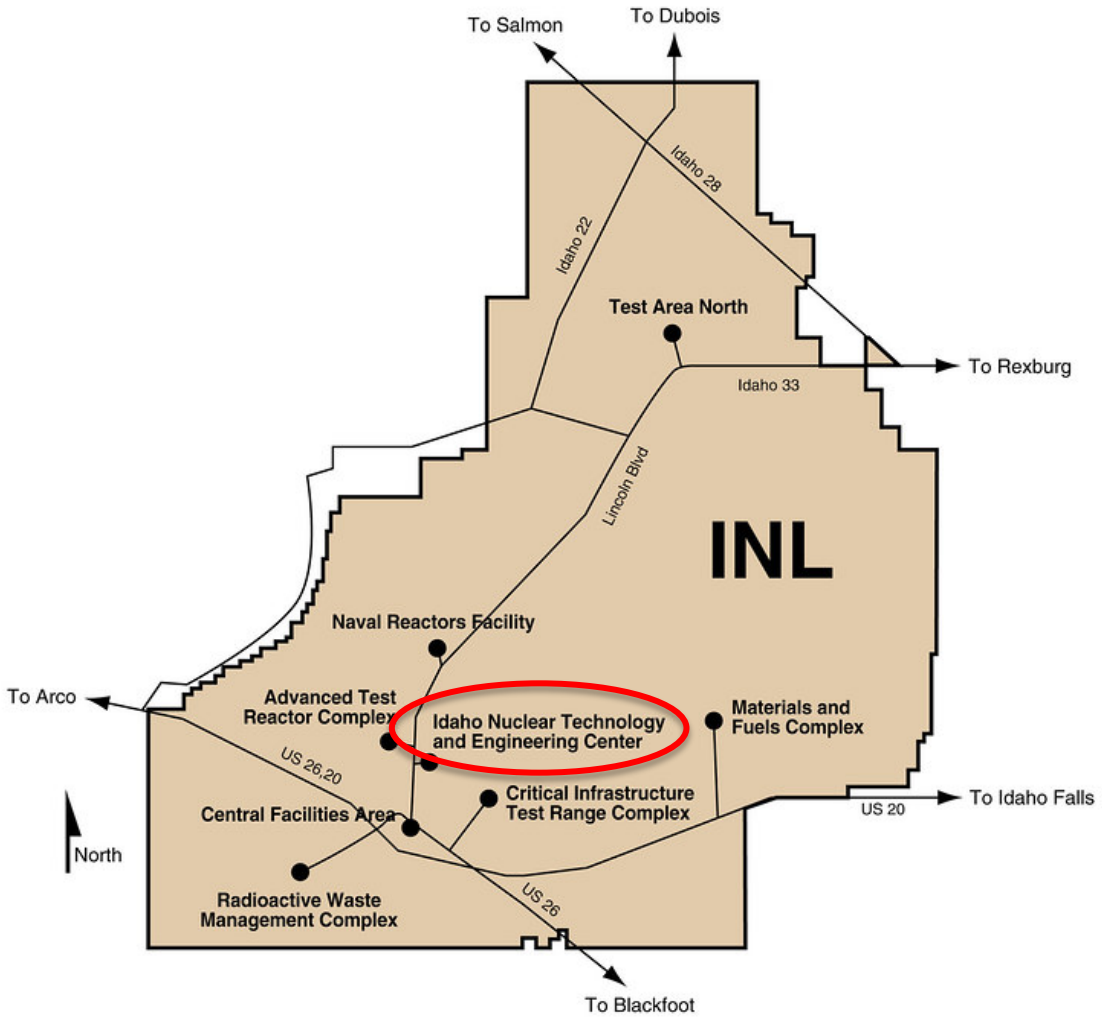
Idaho and Trump Administration sign agreement to support U.S. nuclear energy future

Tuesday April 29, 2025

(IDAHO FALLS, Idaho) — The State of Idaho and the U.S. Department of Energy have agreed to a targeted waiver of the 1995 Settlement Agreement. The agreement established milestones to remove legacy waste at the Idaho National Laboratory site while allowing nuclear energy research and development at the lab.

The waiver will enable critical research on a high burnup nuclear fuel cask from a commercial nuclear power plant. This research will provide data to support licensing for the extended storage of spent fuel at 54 nuclear power plants in 28 states.

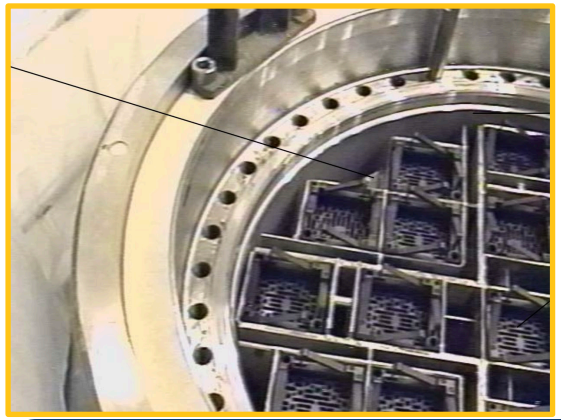
> *"The collaborative effort between the State of Idaho, the U.S. Department of Energy, and the Idaho National Laboratory showcases our commitment to advancing nuclear energy research while upholding the goals of the 1995 Settlement Agreement. We are proud to support innovation in nuclear energy that will support national security and energy independence into the future,"* **Governor Brad Little** said.

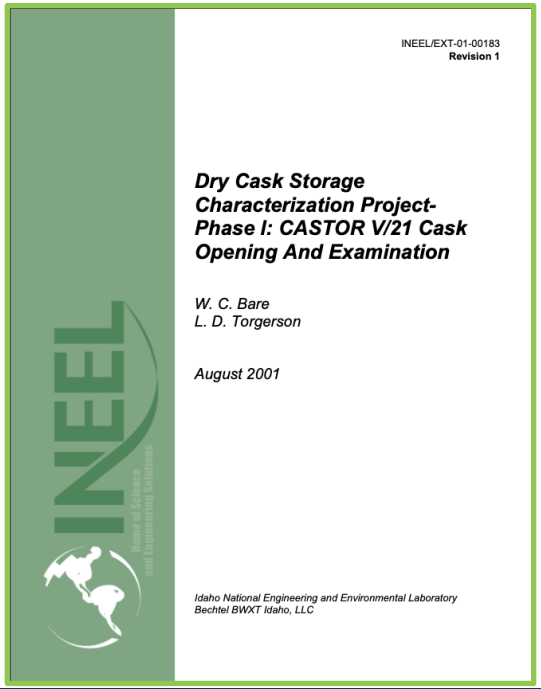


Next Research Stage: Idaho National Lab

Goal: Enhance understanding of high burnup UNF in dry storage.

How: HBURC will be opened and UNF will be examined.





Existing UNF Data supporting dry storage obtained from tests at INL* in 1999 and 2000

Why INL? World-class researchers and facilities enable safe handling and post irradiation examination of UNF.

Expected Outcome: Provides data to validate models, ensure safety, and inform future decisions of long-term storage of high burnup UNF.

53 Nuclear Power Plants are relying on the collection of data to support licensing of extended storage.

* INL was previously known as Idaho National Engineering and Environmental Laboratory (INEEL)

Where the HBURC Would be Stored at INL – CPP-2707

Center for Used Fuel Research (CUFR)

- The CUFR will operate out of Idaho National Laboratory based on a hub-and-spoke model
  - Hub = physical and intellectual location
  - Spokes = principal partners, associates, and other participants
- Accountable to the Deputy Assistant Secretary for Spent Nuclear Fuel and High-Level Waste Disposition
- U.S. Industry/Electric Power Research Institute
- Universities through DOE's Nuclear Energy University Program awards
- Small Companies through DOE's Small Business Innovation Research awards
- International programs

Transporting the HBURC

How?

- The size and weight of the cask – more than 180 tons – means that freight rail is the best mode to transport the cask from Virginia to INL
- DOE has designed, tested, and obtained approval for specialty railcars (Atlas) for transporting UNF by rail
- Armed escorts will travel on the train in a rail escort vehicle (REV)

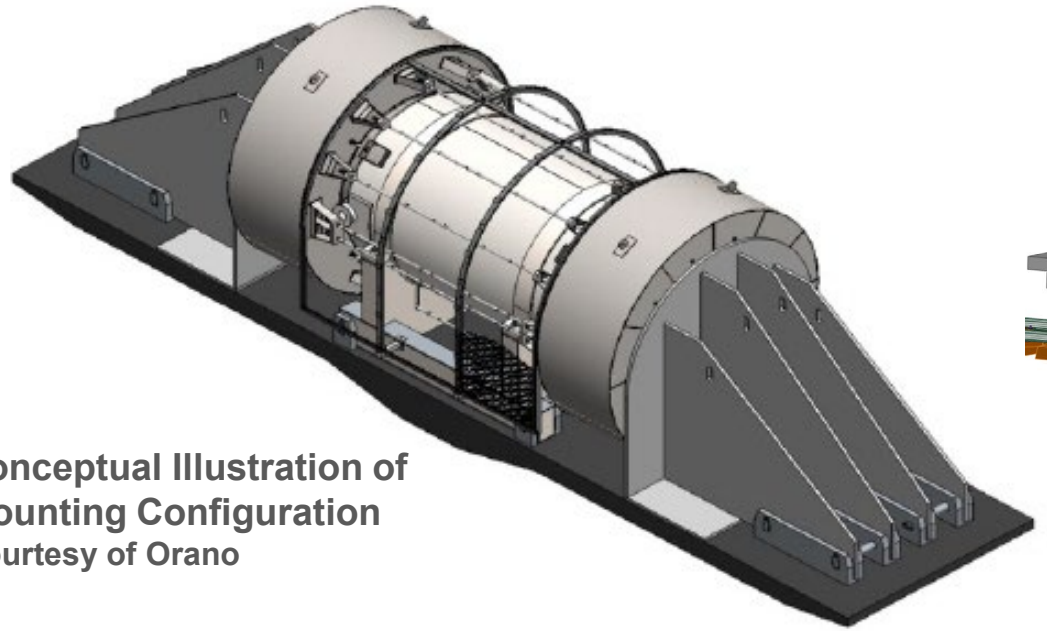
When?

- Spring 2027 – "Dry-run" rail shipments with an empty TN-32B cask from Virginia to INL and back to test procedures and inform emergency responders (provide opportunities to view train consist)
- Fall 2027 – UNF shipment

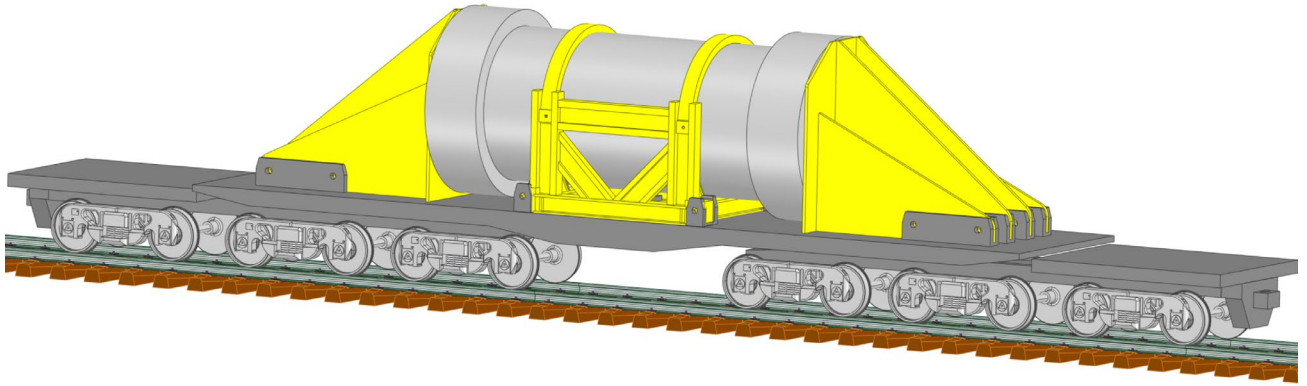
DOE's Atlas railcar

Rail Escort Vehicle

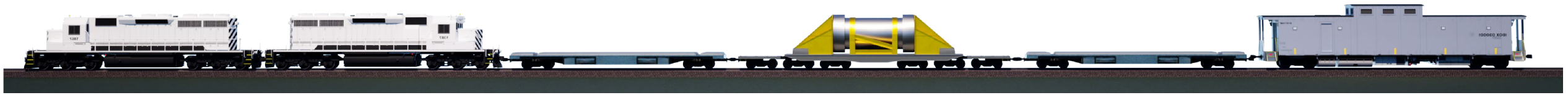
Shipment Basics: What Will the Train Look Like?



Conceptual Illustration of Mounting Configuration
Courtesy of Orano



Conceptual Illustration of a Cask on Atlas Railcar



Locomotives | Buffer Car | Atlas Railcar | Buffer Car | Rail Escort Vehicle

Conceptual Illustration of Atlas Rail Consist

Likely Rail Route for the U.S. Department of Energy's High Burnup Research Cask Used Nuclear Fuel Shipment

Coordination with Tribal, State, and Federal Partners

CSG ERC

Western Interstate Energy Board

CSG MIDWEST

SOUTHERN STATES ENERGY BOARD
Transcending Boundaries

TRMTC

NAVAL REACTORS

FRA

PHMSA

CYBERSECURITY & INFRASTRUCTURE SECURITY AGENCY CISA

FEDERAL BUREAU OF INVESTIGATION COUNTERTERRORISM DIVISION WEAPONS OF MASS DESTRUCTION

DEPARTMENT OF ENERGY UNITED STATES OF AMERICA

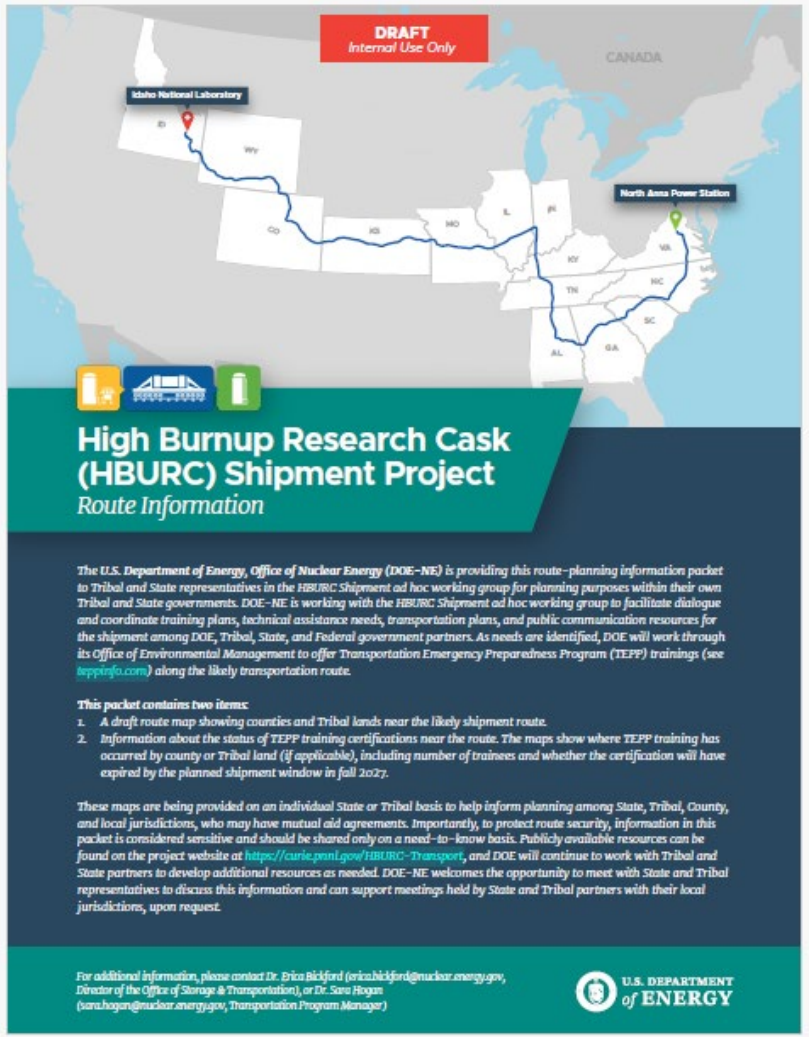
UNITED STATES NUCLEAR REGULATORY COMMISSION

HBURC Shipment Ad Hoc Working Group (AHWG)

- Established through National Transportation Stakeholders Forum in May 2025
- Open to Tribal and State entities at origin and destination sites and along likely route, and Federal partners
- AHWG Goals and Purpose
  - Facilitate dialogue
  - Coordinate training plans, technical assistance needs, and public communications resources
  - Build capacity and gather lessons learned in real time
  - Review lessons learned post-shipment to prepare for future shipments

HBURC Shipment Ad Hoc Working Group (AHWG)

- AHWG meets approximately monthly, either hybrid or virtually
- Shoshone-Bannock Tribes are represented; open to other Tribes along the route
- Each State along route from VA to ID is represented
- Primary communication mechanism now well established and working as envisioned
- Provided likely route maps to Tribes and States with jurisdiction-specific information



Transportation Emergency Preparedness Program (TEPP)

- TEPP training offered for HBURC shipment; coordinated with DOE's Office of Environmental Management.
- Mission is to “ensure that Federal, State, Tribal, and local responders have access to the plans, training, and technical assistance necessary to safely, efficiently, and effectively respond to transportation accidents involving DOE-owned radioactive materials.”
- Includes multiple tools to help communities understand their current response capacity and develop additional emergency response capabilities.
- Learn more at www.teppinfo.com

Photo credit: TEPP/DOE

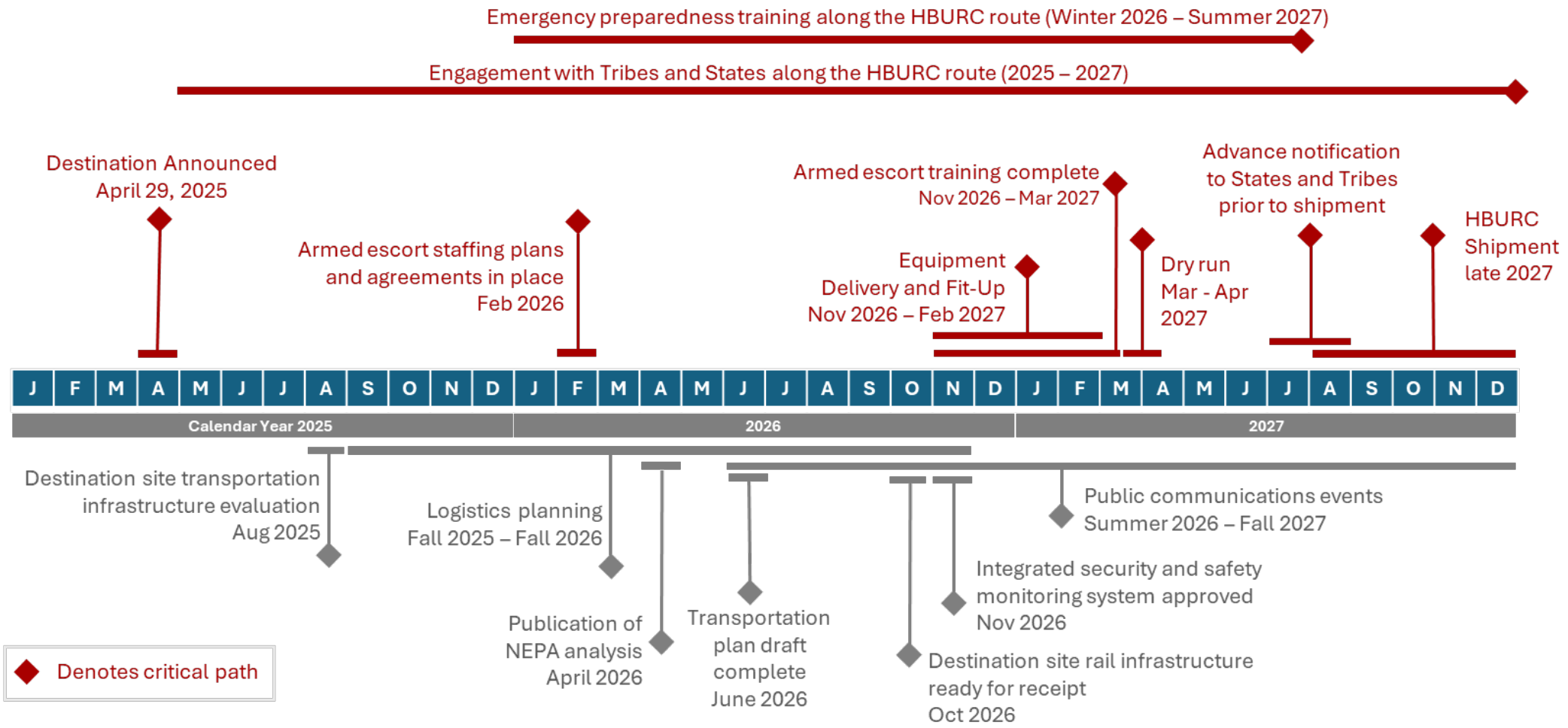
Status of Outreach to Tribes Along the Likely HBURC Route

- Formal Consultation between DOE and the Shoshone-Bannock Tribes began in September 2025 for activities covered under DOE's targeted waiver with Idaho
  - Includes HBURC shipment and research, as well as university UNF shipments
- DOE sent notification letters to 12 Federally-recognized Tribes along the likely HBURC rail transportation route; initial communication with Lumbee Tribe
  - Follow-up communication with 4 Tribes as of January 2026
  - Shoshone-Bannock Tribes requested formal Consultation
  - Chickahominy Tribe – Eastern Division communicated to DOE that the HBURC shipment project was outside their immediate ancestral territory and the Tribal office does not have the capacity to participate in the project. They asked DOE to update them if anything changes with the project.
  - Rappahannock Tribe – requested periodic information sharing on the project. An initial virtual discussion was held in November 2025.
  - Prairie Band Potawatomi Nation recently indicated interest in Consultation

HBURC Shipment Accomplishments

- Conducted infrastructure assessments at Origin: North Anna and Destination: Idaho National Laboratory (INL)
  - Rail infrastructure at both sites
  - Held local leaders' meetings at both sites
  - Met with Shoshone-Bannock Fort Hall Business Council
- Stood-up DOE/contractor teams to plan origin site loading preparations, shipment operations, destination site receipt
- DOE identified a one-time armed escort option for the shipment.
- Working with FBI and DOE-NNSA on CURRIE security-focused training tabletop in September 2026
- Stood-up Tribal, State, and Federal ad hoc working group
- DOE-EM supporting the HBURC shipment by making Transportation Emergency Preparedness Program (TEPP) training available along the likely route

HBURC Shipment Schedule



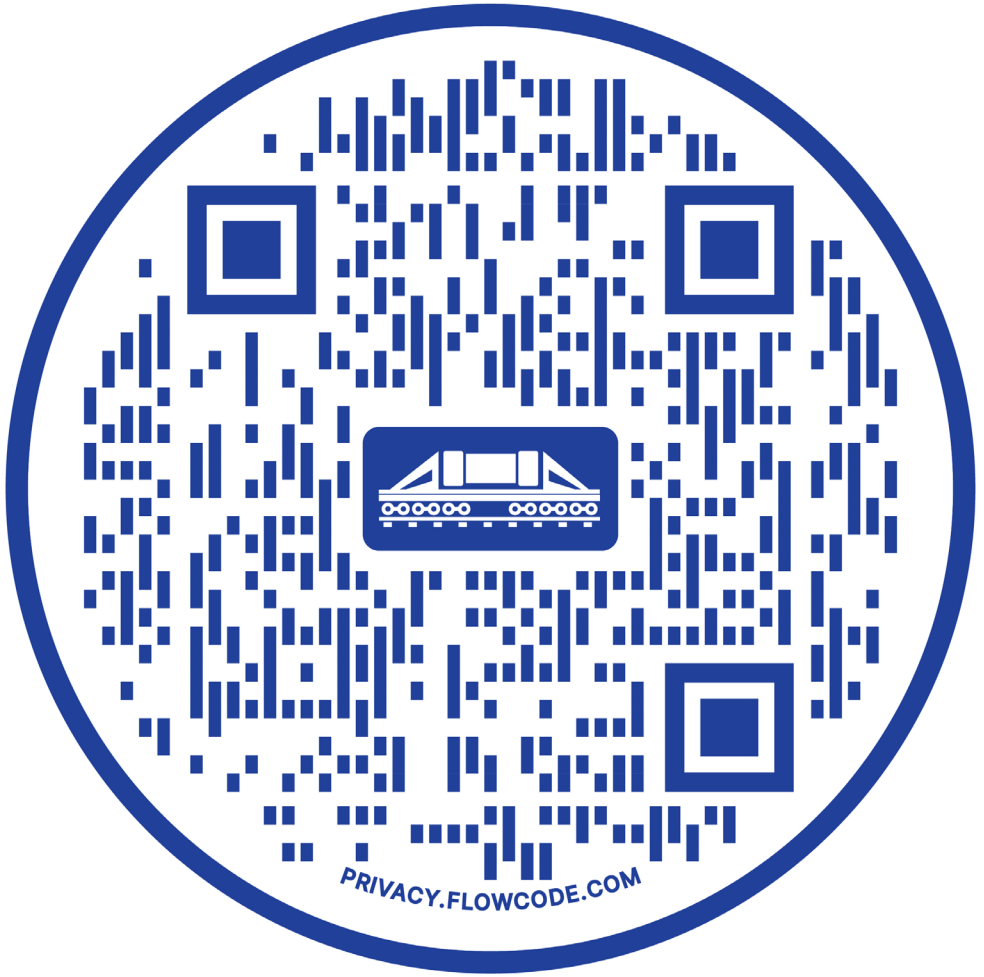
Summary

- DOE is conducting preparations to transport a research cask of commercial UNF - HBURC - by rail from Virginia to Idaho in 2027.
- HBURC is part of a research project on high burnup fuel in dry storage.
- Around 2029, cask will be opened at Idaho National Laboratory and the fuel examined as part of DOE's new Center for Used Fuel Research.
- DOE is coordinating with Tribal, State, and Federal partners on shipment planning and coordination.
- The HBURC shipment is a model for future large-scale transport of UNF and high level radioactive waste to Federal storage and disposal facilities, as well as potential reprocessing/recycling facilities.

Learn More About the HBURC Shipment Project

- Visit our webpage at: https://curie.pnnl.gov/HBURC-Transport

- Background information
- Updates on the project
- Contact information
- Sign-up link for email updates



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