U.S. Department of Energy Preparations to Transport a Rail-Sized Research Cask of Commercial Spent Nuclear Fuel

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INTRODUCTION

The US Department of Energy (DOE) is preparing to transport a rail-sized cask of commercial spent nuclear fuel (SNF) as part of an ongoing research project. Today, nuclear fuel is being kept in nuclear power reactors longer to produce more electricity. This fuel is known as "high burnup." DOE, in collaboration with the nuclear industry through the Electric Power Research Institute (EPRI), is studying how high burnup SNF behaves in long-term storage to verify that it can be stored safely for many years before being transported for eventual disposal. This research project is being conducted on one cask of SNF known as the "High Burnup Research Cask (HBURC)." In addition to gas sampling of the cask upon loading, the cask was fitted with a special lid to allow temperature measurements while the cask has been in storage. Additional gas samples will be taken pre- and post-shipment. For the next stage of the research project, DOE will open the HBURC and examine the SNF rods inside. This can only be done safely in a specialized science facility like those available at DOE's national laboratories. In 2027, DOE plans to ship the HBURC from its current location at the North Anna Power Station near Mineral, VA to the Idaho National Laboratory (INL) in southeastern ID. This summary presents information on DOE's current planning activities to prepare to ship the HBURC.

TRANSPORTATION PLANNING ACTIVITIES

The HBURC is a TN-32B bolted lid dual-purpose cask with current US Nuclear Regulatory Commission (NRC) certificates of compliance for storage and transportation (see Fig 1.). The cask was loaded with 32 pressurized water reactor high burnup SNF assemblies in 2017. The weight of the cask in transport configuration, which includes the SNF it contains, and the ancillary equipment required for transport, is 361,855 lbs (181 tons). Legal weight truck limits for highway transport in the US are about 40 tons. Therefore, rail is the best mode to transport a container of this size and weight cross-country.

DOE has designed, tested, and certified specialized railcars for transporting SNF and high-level radioactive waste in accordance with the Association of American Railroads' (AAR) standard S-2043, *Performance Specification for Trains Used to Carry High-Level Radioactive Material.* DOE's Atlas 12-axle cask-carrying railcar, buffer railcars, and rail escort vehicle received AAR certification in 2024 [1], and will be used to transport the HBURC in 2027.

Fig. 1. HBURC in storage at the North Anna Power Station (front right). Source: DOE.

Activities to prepare for shipment of the HBURC include:

- fabrication of ancillary transport equipment including impact limiters, cradle, end stops, and personnel barrier; coordination with utility personnel at the North Anna Power Station for the cask loading activities and pre-shipment gas-sample;
- coordination with State, Tribal, and Federal government entities with regulatory or public safety responsibilities at the shipment origin and destination and along the transportation route;
- offering emergency response training and technical assistance to States and Tribes along the transportation route;
- evaluating transportation infrastructure at the origin and destination to identify options and considerations for transporting the HBURC;
- contracting for logistics and transportation services, including rail carriers that will determine the final route for the shipment in

accordance with US Department of Transportation regulations;

- coordinating with personnel and facilities at INL to develop plans and procedures to unload the HBURC, take a gas sample, place it on a storage pad, and later open it to remove SNF rods for examination;
- identifying and implementing an armed escort capability to accompany the shipment and travel in the rail escort vehicle;
- ensuring all shipment activities are conducted in accordance with applicable DOE orders, such as Order 460.2B, *Departmental Materials Transportation Management* [2];
- conducting a dry-run of the shipment to test shipment procedures using an empty TN-32B cask to be provided by EPRI; and
- coordinating security planning within DOE and among applicable Federal agencies.

WHAT'S NEXT?

DOE has established roles and responsibilities for shipment planning for DOE entities and contractors focused on origin site activities; destination site activities; transportation operations; and intergovernmental coordination along the route. Each respective team has begun executing on their segment of the project.

For Tribal, State, and Federal government coordination, an ad hoc working group has been established under DOE's National Transportation Stakeholders Forum (NTSF) [3]. NTSF is the primary mechanism DOE uses to communicate with States and Tribes about DOE shipments of radioactive materials. Around 20-25 States and Federally recognized Tribes are currently expected to be within 50 miles of the potential transport routes (see Fig. 2). Potential rail transportation routes have been determined based on the dimensions of the HBURC on DOE's Atlas railcar. The final rail transportation route will be determined by the rail carriers once under contract for the shipment. DOE plans to use the ad hoc working group to facilitate dialogue and coordinate training plans, technical assistance needs, transportation plans, and public communication resources for the shipment among DOE and State and Tribal partners. In addition, DOE, through the Office of Environmental Management's Transportation Emergency Preparedness Program (TEPP) [4] is offering emergency response training to Tribes and States along the potential transportation routes for the HBURC shipment.

DOE is developing test plans for the examination of the SNF rods at INL once they are removed from the cask. The objective is to collect data on the condition of the high burnup SNF and confirm whether or not it meets regulatory requirements for storage and transportation. The HBURC research project is expected to conclude in the early 2030s.

Fig. 2. Potential rail transport routes for the HBURC shipment. Source: DOE.

PUBLIC INFORMATION ON THE HBURC SHIPMENT

Public information on the HBURC shipment can be found on a HBURC project page hosted on DOE's CURIE website [5], including informational fact sheets on the HBURC research project, DOE's railcars, and training through the TEPP program; presentations on HBURC transportation planning; and HBURC shipment project points of contact. There is also an option to sign-up for email updates on the HBURC shipment project. DOE will maintain this project page with project updates and information resources for those who want to follow along from now until the shipment is completed in 2027.

SUMMARY

DOE is conducting preparations to transport a research cask of commercial SNF by rail from Virginia to Idaho in 2027. Shipment of this cask, known as the HBURC, will support completion of a research project on the condition of high burnup SNF, including opening the cask and examining fuel rods at the Idaho National Laboratory. DOE is working with many Federal, Tribal, and State government partners on planning and coordination for the shipment, fabricating transportation equipment for the SNF cask, and developing operational and security plans in accordance with applicable DOE Orders and requirements.

REFERENCES

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