DOE HIGH BURNUP RESEARCH CASK PROJECT

To Support Safe Long-Term Storage of Used Nuclear Fuel

Used Nuclear Fuel in the U.S.

The U.S. has been using nuclear power to generate electricity since 1958. Nuclear power production creates used nuclear fuel[1] (UNF) that must be safely and securely stored and eventually disposed. The U.S. has about 95,000 metric tons of UNF today and in the future will have up to approximately 180,000 metric tons when current reactors reach their end of life. UNF is stored at close to 75 sites in more than 30 States, placed in pools of water or in steel and concrete containers known as dry storage systems. To date, approximately 4,300 dry storage systems have been loaded in the U.S. with the final projected number of loaded dry storage systems expected to be more than 10,000.

Research on High Burnup UNF

Storage of commercial UNF is regulated by the U.S. Nuclear Regulatory Commission (NRC), which grants licenses to storage facilities. High burnup UNF is produced when nuclear fuel stays in reactors for a longer period of time to extract more energy from the fuel before being moved to storage. The initial license period for high burnup UNF in dry storage is 40 years. In 2013, the U.S. Department of Energy (DOE) started a research project in collaboration with the Electric Power Research Institute (EPRI) to understand whether higher burnup nuclear fuels behave similarly or not to lower burnup fuels once they are removed from the reactor and placed in dry storage systems.

For this research project, high burnup UNF was placed in a storage container, known as a “cask,” at the North Anna Power Station in Virginia. The cask was modified with a special lid that allows thermocouple instruments to measure temperatures inside the cask. The data collected will be shared with U.S. nuclear power plants and the NRC and could support continued dry storage of high burnup UNF for longer than 40 years. Today, 53 U.S. nuclear power plants rely on data from the High Burnup Research Cask (HBURC) Project for their NRC licensed onsite UNF storage facilities. There is also an NRC requirement that the cask needs to be opened and the fuel examined to demonstrate there is no change in the fuel.

[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).

Transporting DOE's High Burnup Research Cask

For the next stage of the research project, DOE will open the HBURC and examine the UNF rods inside. This can only be done safely at a specialized science facility like those available at DOE's national laboratories. DOE is currently developing plans and environmental information to support a proposal to relocate the HBURC from the nuclear power plant where it is currently stored to DOE's Idaho National Laboratory. The cask will travel by train on DOE's Atlas railcar, a 12-axle railcar specially designed to safely transport UNF. The train will include armed guards in a specially designed security railcar and real-time safety monitoring on each railcar.

Center for Used Fuel Research

The HBURC will become part of the planned Center for Used Fuel Research. The future U.S. inventory of UNF could have up to approximately 94 million individual fuel rods consisting of different material types, fuel enrichments, and burnups. By leveraging U.S. and international research and operational experience, DOE hopes to gain access to a wider range of data and technical expertise to inform decisions related to Federal UNF management.

What's Next?

DOE will work closely with other Federal agencies, Tribal and State governments, as well as the origin and destination facilities to ensure that all parties are well prepared for shipment of the HBURC to occur in 2027.

DOE's shipment preparations will include many activities, such as:

- Ensuring that all Federal regulations for the shipment are met
- Contracting for transportation services – rail carriers will determine the rail transport route
- Coordinating technical assistance, public information, and emergency response training needs with Tribal and State governments along the transport route
- Developing plans and protocols for shipment operations, security, and notifications to Tribes and States
- Planning for information-sharing engagements with communities at the origin and destination sites and along the transport route

DOE has established a resource portal to share additional information and updates on the HBURC project at **https://curie.pnnl.gov/HBURC-Transport**, including an option to sign up for email updates.