INL has managed spent nuclear fuel, like the Peach Bottom fuel, for more than five decades.

Repository Design and Engineering Support

Delivering science-based engineering solutions related to nuclear materials production, use and disposition.

Engineering Challenges

Centralized underground repositories are studied around the world as a safe method for long-term storage and disposition of spent nuclear fuel and radioactive waste. These facilities must be designed, constructed, operated, and closed in a way that protects public and worker health and safety and preserves environmental quality for thousands of years. For more than 50 years, INL has developed and demonstrated innovative science and engineering solutions to manage spent nuclear fuel and radioactive waste. INL is supporting design of the Yucca Mountain repository by leveraging its infrastructure and experience to build full-scale models, design and operate remote systems for spent fuel handling, license NRC facilities, and provide expertise to support transportation of spent nuclear fuel. INL is also applying its analytical and modeling capabilities to support the Yucca Mountain Project License application

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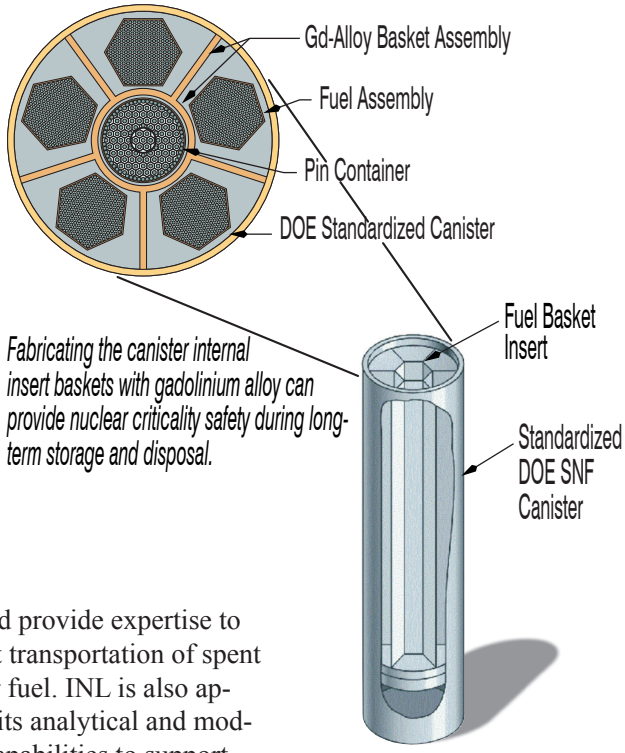
Fast Flux Test Reactor Fuel Canister



Fabricating the canister internal insert baskets with gadolinium alloy can provide nuclear criticality safety during long-term storage and disposal.

Science

Idaho National Laboratory

Continued from front

Engineering Design and Prototype Capabilities

The laboratory has developed several remotely operated prototypes to support engineering designs for radioactive waste calcining, spent nuclear fuel dissolution and storage, and advanced uranium extraction. The laboratory is influential in setting industry standards, and its remote system designs have been copied and used internationally. To support the Yucca Mountain Project, INL is developing a full-scale prototype of the waste package closure system. This complex system requires integration of existing and INL-designed components to perform remote welding and nondestructive examination of waste package closure welds.

INL's National Spent Nuclear Fuel Program collaborated with the Office of Civilian Radioactive Waste Management and the DOE laboratories to design standard canisters for handling, interim storage, transportation, and disposal of more than 250 types of DOE spent nuclear fuel in the repository. Benefits include an immediate reduction in canister development costs for each type of fuel and a significant life-cycle savings for the DOE complex.

NRC Experience

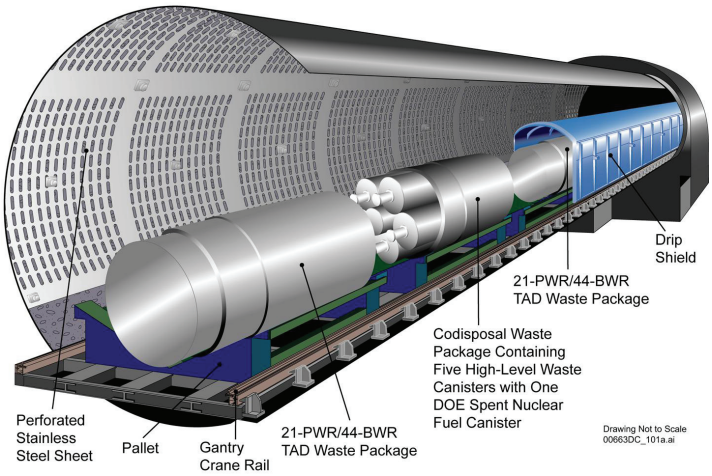
INL manages two NRC-licensed spent nuclear fuel facilities and has extensive experience in U.S. Nuclear Regulatory Commission (NRC) regulation development, and technical analysis and testing. INL is applying this expertise to review the license application for the Yucca Mountain repository.

Transportation

The INL has been involved in several major spent nuclear fuel shipping campaigns for clients across the country. INL's qualified staff performs transportation planning that includes cask licensing, shipping facility preparations, fuel loading, and all preparations for transport and receipt along the transportation route. INL is frequently consulted to aid DOE sites with transportation of spent nuclear fuel.

Analytical and Modeling Capabilities

- INL helped develop the Total System Performance Assessment model. The model estimates repository performance with estimates for radiation dose to people, groundwater contamination, and the probability of human intrusion.
- INL software engineers performed verification/validation of modeling codes to verify mountain science.
- INL's geoscientists reviewed water infiltration models to ensure repository integrity.
- INL conducted corrosion testing of the INL-developed nickel-chromium-molybdenum-gadolinium alloy for use as a neutron absorber in DOE canisters.
- INL developed models to show how DOE canisters survive drop accidents and verified predictions with actual drop tests.



For more information

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INL is a U.S. Department of Energy national laboratory operated by Battelle Energy Alliance