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Drop Analysis of Department of Energy Standard Canister with Fort Saint Vrain SNF

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Drop Analysis of a Department of Energy Standard Canister Containing Fort Saint Vrain SNF

Abstract:
DOE manages over 300 types of SNF, most of which are located at the INL site. Management of this large variety of SNF for storage, transportation, and disposal poses a challenge to DOE. The Idaho Cleanup Project is collaborating with INL on the Road-Ready Capability Demonstration Project, which aims to develop and demonstrate designs, technologies, processes, and the regulatory framework needed for packaging DOE-managed SNF at the INL site for road-ready dry storage. “Road-ready dry storage” is a SNF management concept in which SNF is packaged into dry and sealed canisters that are then placed in onsite storage in anticipation of later transportation. The forward-looking goal of the Demonstration is to establish the foundation for a large-scale road-ready dry storage program at the INL site.

The Demonstration will first package Fort Saint Vrain SNF currently stored at INL into several DOE Standard Canisters, which will in turn be loaded into another containment similar to commercial dual-purpose canisters. This dual-purpose canister will then be compatible with a transportation or storage system, such as a storage cask for interim storage or transportation package for off-site transport. The DOE Standard Canister is a class of standardized canisters designed to contain the large variety of DOE-managed SNF during interim storage, transportation, and/or disposal at a geological repository.

One critical aspect of road-ready dry storage is the ability to license the DOE Standard Canister and its associated transportation package in accordance with 10 CFR 71. Depending on the SNF type and transportation strategy, DOE Standard Canisters may be required to maintain structural integrity under normal conditions of transport as well as hypothetical accident scenarios (i.e., drop events). The DOE Standard Canisters have been tested and analyzed under various SNF loading configurations and accident drop events in support of the Idaho Spent Fuel Facility and other DOE programs; however, no analysis has yet been completed in support of the recently initiated Demonstration.

This analysis will consider the Ø0.5 m × 5.1 m DOE Standard Canister under the drop scenarios considered in previous INL tests and analyses, including the 9-m drop at 80 degrees off vertical. However, it will also consider the more recent Fort Saint Vrain loading configurations proposed for the

Demonstration. This analysis will be performed using the strain-based acceptance criteria established in ASME Boiler and Pressure Vessel Code, Section III, Division 3. It will also be compared to previous analyses and will serve as the foundation for further formal calculations used to support licensing of the road-ready dry storage system at INL.