

**Information Sheet: Shipping Cask Seal Performance Testing, Felix E. Gonzalez (NRC/RES/DRA)**

**Background**

The Nuclear Regulatory Commission (NRC) needs data to determine the performance of seals of spent fuel transportation packages during beyond-design-basis fires, similar to the Baltimore Tunnel Fire that happened in 2001. The performance of the package seals is important for determining the potential release of radioactive material from a package during a beyond-design-basis accident because the seals, in general, have lower temperature limits than other package components and the seals are the containment barrier between the environment and the cask contents.

NUREG/CR-6886, "Spent Fuel Transportation Package Response to the Baltimore Tunnel Fire Scenario," describes in detail an evaluation of the potential release of radioactive materials from three different spent fuel transportation packages. This evaluation used estimates of temperatures resulting from the Baltimore Tunnel Fire as boundary conditions for finite element models to determine the temperature of various components of the packages, including the seals. For two of the packages evaluated, the model-estimated temperatures of the seals exceeded their continuous-use rated service temperature, meaning the release of radioactive material could not be ruled out with available information. However, for both of those packages, the analysis determined by a bounding calculation that the maximum expected release was well below the regulatory safety requirements for a spent fuel packages release during hypothetical accident conditions in 10CFR Part 71.

In 2008, NIST performed the "Possible Methods for Determination of the Performance of a Transportation Cask in a Beyond-Design-Basis Fire" study which determined different testing approaches to evaluate package seal performance for containing Chalk River Unidentified Deposit (CRUD) released from the surface of fuel assemblies being transported. Testing of package seals to determine their performance in beyond-design-basis fire scenarios can provide physical data needed to understand the likelihood of a release of radioactive materials.

**Approach**

The Office of Nuclear Regulatory Research (RES) contracted the National Institute of Standards and Technology to conduct small-scale thermal testing to obtain experimental data of the performance of seals of shipping and transportation casks during beyond-design basis fires.

The experimental testing consists of testing a fabricated small-scale cask (fabricated to the same standards as spent fuel shipping casks) and nuclear grade seals from a selected manufacturer in an electrical oven at extra-regulatory temperatures (above 800°C). The temperature will be measured at different points in the test sample during testing and internal pressure of the vessel will be monitored to determine of leaks from the test sample.



**Figure 1. Pictures of Shipping Casks [Pictures from NUREG/BR-0292 and [www.ne.doe.gov](http://www.ne.doe.gov)]:** Pictures of Truck Shipping Casks (top left and bottom right), picture of a computer simulation response of a cask to a fire environment (top right), and diagram of a cask in a fully engulfing fire (bottom left)

**For More Information**

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