

An Analysis of a Spent Fuel Transportation Cask  
Under Rail Tunnel Fire Conditions

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Hazards in the transportation industry from rail shipments can result in accidents involving fire. Fire is a concern in the transportation of radioactive material, specifically, that transportation accidents can cause ignition of flammable materials that could fully engulf a spent fuel transportation package, increasing the potential for release of radioactive material.

Recently, a fire occurred in a railroad tunnel outside of Baltimore Maryland, involving hazardous materials. According to reports, the fire burned for several days. Although it is very unlikely that a fire of such duration could occur during the shipment of spent nuclear fuel, several questions have been raised with regards to how a spent fuel casks would perform if exposed to a fire for several days.

Title 10 of the Code of Federal Regulations Part 71 section 73(c)(4), (10 CFR 71.73(c)(4)) delineates that transportation packages designed to ship radioactive material and that are subject to accident conditions must be designed to resist a consuming fire of a duration of 30 minutes in order to protect the contents of the package and prevent release of radioactive material to the environment.

The staff of the Spent Fuel Project Office (SFPO), in the Office of Nuclear Material Safety and Safeguards (NMSS) is responsible for evaluating the performance of spent fuel transportation casks under the fire accident conditions specified in the regulations. Evaluating the thermal performance of a transportation package design is essential to ensuring that a package can survive a fire accident and will not release radioactive material in excess of the release limits established by the NRC.

This paper will examine a spent fuel transportation cask under conditions similar to the severe fire that occurred in the Baltimore, Maryland railroad tunnel. The ANSYS finite element analysis program will be utilized for this analysis. The paper will describe the model that was utilized for the analysis and present preliminary results, as well as a discussion on the significance of the results.

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