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Roadway Accident Analyses for Spent Nuclear Fuel Transportation Packages

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Abstract

10 CFR Part 71 provides the regulatory requirements for the certification of transportation packages for spent nuclear fuel (SNF) and radioactive waste. SNF packages are expected to be designed to endure a fully engulfing fire, as prescribed in 10 CFR Part 71. In regulating transportation of high-level radioactive materials, the U.S. Nuclear Regulatory Commission (USNRC) ensures that packages designed to transport SNF meet the regulations prescribed in 10 CFR Part 71. The purpose of this study was to evaluate the types of accidents and accident parameters that could have an impact on SNF road transport. Historical road accidents involving hazardous material (HAZMAT) and long duration fires in the United States were analyzed using data from the Pipeline and Hazard Materials Safety Administration. This study focused on those in-transit HAZMAT accidents resulting in a fire that involved more than one vehicle. Such fires were analyzed to identify those that could have been severe enough to potentially affect an SNF package being transported on a roadway where the source of fuel for the fire would be from a vehicle not carrying the SNF package. From this study, the frequency of a severe fire occurring was estimated as roughly 4.90×10^{-5} accidents per million HAZMAT vehicle-km [7.89×10^{-5} accidents per million HAZMAT vehicle-mi]. This frequency represents 23 severe fire accidents occurring over the last 12 years (i.e., 1997 to 2008). None of the severe fire accidents involved the release of radioactive material. In general, severe fires are characterized by the release of flammable liquid (i.e., Class 3 HAZMAT), and in about 40 percent of the severe fires, more than 22,700 L [6,000 gal] of flammable liquid were released. Also, about half of the severe fires occurred on interstate highways with a median or divider and two of the severe fires occurred on interstate ramps. One of these accidents on a ramp was likely in an enclosed area and, as such, had the potential for a much hotter fire.

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