

**Marvin Resnikoff, RWMA<sup>1</sup>**  
**Transport Issues**  
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## **NRC Transport Regulations**

Under NRC regulations, 10 CFR Part 71.0(d), transport of licensed material is also subject to Department of Transportation (DOT) regulations referenced in Part 71.5, specifically to 49 CFR parts 170 through 189. But some casks, such as Holtec's HI-STAR 190 XL cask, do not yet have an approved rail carriage under DOT regulations, to carry the extra weight. Despite the fact that some casks are not yet approved by DOT to be transported by rail, we have an NRC licensing panel approving the CIS storage facility in New Mexico whose proposed facility therefore cannot be reached by rail for some casks from reactor sites. And we have NRC staff approving the HI-STAR 190 XL cask, without the means of transporting it, contrary to NRC regulations.

## **Weight**

In order to reduce the cost of dry storage, the nuclear industry has moved to larger casks with greater capacity. The first Holtec cask, the HI-STAR 60 (loaded weight 82 tons) held 12 PWR fuel assemblies. The HI-STAR 100 (loaded weight 140 tons) held 24 PWR fuel assemblies. The latest Holtec edition, the HI-STAR 190 XL (loaded weight 208 tons) contains 37 PWR fuel assemblies. As the capacity of Holtec casks increases, the weight of the casks increases as well. This additional weight has placed a burden on the rail infrastructure. The general nationwide rail system has an axle limit of approximately 36 tons, or 143 tons for a 4-axle rail car, which is a problem since the HI-STAR 190 XL itself, without the carriage and cask restraints, weighs 208 tons. Other heavy casks, such as the Areva MP-197, face a similar predicament. While the loaded weight of the CASTOR V/21 cask (138 tons) plus carriage may exceed 143 tons, it is much lighter than the HI-STAR 190 XL. Larger CASTOR casks are also in use in Europe.

Rail cars that exceed 143 tons are in service on US rails, but must have more than 4 axles. GE diesel engines, such as the AC6000CW, weigh between 212 and 216 tons. The Navy M-290 transport cask weighs 260 tons, on a 3-car, 12-axle carriage. At 36 tons per axle, 12 axles can support 432 tons. DOE originally proposed an 8 axle car for the HI-STAR 190 XL, but design calculations showed wheel hunting, which produces side to side wobbling and potential derailment under high speed. The new car, being designed by Atlas, is similar to the 12-axle M-290 rail car. See photo below. Naval fuel has a 93% U-235 enrichment and can be irradiated in a submarine or aircraft carrier for up to 33 years. The radioactive inventory and weight are secret, but the cask must satisfy external rad standards and NRC hypothetical accident conditions. One-quarter and full scale models have been physically tested.

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<sup>1</sup> [radwaste@rwma.com](mailto:radwaste@rwma.com), ph 802-732-8008

The rail car plus escort car for the HI-STAR 190 XL cask has been designed to meet AAR standards S-2403, but not yet built and tested at the Transportation Testing Center. This is a several year process. In the meantime, fuel must be stored at reactor sites for the foreseeable future. The weak link in rail transportation of heavy loads is the bridges. Heavy loads must be spaced and the routes must be chosen to avoid low capacity bridges. Some reactor sites not near rail lines, such as Indian Point, must use heavy-haul trailers or barges to access rail lines. An additional rail issue is the increasing number of rail fires due to the increasing number of rail tanker cars.

Since CASTOR V/21 casks are lighter, transportation may be less complicated. According to GNS, 1,500 CASTOR® type casks have already been loaded and stored at sites all over the world. Hundreds of shipments of CASTOR casks have taken place, mostly shipments of high-level waste from France to Germany, with major resistance by anti-nuke groups. Unlike Holtec casks, CASTOR casks are nodular cast iron and do not require welds of metal sheets.

The safety issues, bridge capacity, increased number of rail fires, and train speed of 12-axle cars, have not been properly analyzed by the regulators (DOT, DOE and the NRC), in the EIS for Yucca Mountain and CIS, and have been completely ignored by the CIS hearing panel.



**12-axle M-290 rail car for naval fuel**