



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

January 15, 1993

The Honorable George Miller, Chairman
Committee on Natural Resources
United States House of
Representatives
Washington, D.C. 20515

Dear Chairman Miller:

I am responding to your letter to Mr. Fred McGoldrick of the U.S. Department of State regarding the Executive Branch study required by Public Law 102-486. In your letter you identified a report, "Definition of Bounding Physical Tests Representative of Transport Accidents -- Air and Marine," prepared for the Nuclear Regulatory Commission in 1983 by the Illinois Institute of Technology's Research Institute (IITRI). You requested that this report be reviewed prior to completion of the Executive Branch study.

The IITRI report has been reviewed in preparation of the Executive Branch study. In 1979, the NRC was concerned with frequent public criticism that regulatory test requirements and performance standards for packages containing large quantities of radioactive material were not realistically linked to possible severe accident conditions. For example, survival of a 30-ft drop on an unyielding surface without incurring significant leakage did not appear to be a stringent collision standard. The NRC initiated a multiphase effort (the Modal Study) to evaluate the extent to which regulatory tests and performance standards bounded high severity transportation accidents, and to evaluate the residual risk from any accidents which may not be bounded. The initial phase of this effort resulted in two studies: (1) Severe Rail and Truck Accidents: Toward a Definition of Bounding Environments for Transportation Packages, by Ridihaigh, Eggers and Associates (REA); and (2) Definition of Bounding Physical Tests Representative of Transport Accidents - Air and Marine, by the Illinois Institute of Technology Research Institute (IITRI).

IITRI submitted their final report to the NRC in 1983. The IITRI report developed a series of physical tests, based on an analysis of marine and air accident data for 1970-1979. These included a crush test, penetration test, slash test and immersion test for extremely severe marine accident conditions, as well as a separate test sequence comprised of a fire test, hose stream test, and an immersion test. A separate deep submersion test was also proposed. The tests specified by the IITRI study appear to be more severe than the traditional tests recommended and adopted by IAEA member states. However, the study did not develop post-test acceptance criteria. While the tests seem more severe, the level of safety afforded by the suggested tests was not evaluated, and could not be determined without corresponding acceptance criteria.

In the area concerning shipboard fires, the IITRI study concluded that the current IAEA packaging requirement that packages withstand a 30-minute 1475° F fire would be more than adequate for below-deck fires. This conclusion is particularly germane to plutonium shipments, where the greatest risk is

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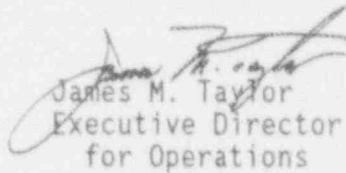
from respirable particles, such as those that may be produced in fires. The IITRI study based this conclusion on its analysis of a collision between a container ship (the Sea Witch) and an oil tanker which occurred in New York Harbor in 1973, an accident which is characterized by the Coast Guard (according to the IITRI report) as a "worst-case" accident.

About the time the IITRI report was submitted, a reconsideration of program strategy led to a redirection of the Modal Study. This redirection was based on program costs and timing, since at that time, large numbers of road and rail spent fuel shipments were being projected (e.g., shipments to a monitored retrievable storage facility), many of which were anticipated to be made in new package designs. As a result, neither the IITRI or the REA study was pursued beyond its initial effort to develop package qualification tests (e.g., no efforts were undertaken to establish post-accident acceptance criteria). Because of the redirection, neither the IITRI or REA reports were subjected to normal peer review. Instead, NRC redirected its effort towards determining the adequacy of protection provided by spent fuel packages (built to Type B standards) when subjected to historically severe highway and railway accident conditions. The resulting study (NUREG/CR-4829) showed that spent fuel packages, which are designed to the same international standards used for plutonium packages, would perform their safety functions under severe accident conditions.

In our consulting role in the Executive Branch study, the staff reviewed the IITRI report as well as Department of Energy and NRC risk studies previously performed. The staff concluded that due to the low probability of severe marine accidents (as acknowledged in the IITRI report) and the minimal risk posed by such accidents, the current IAEA package standards provide adequate public health and safety for plutonium shipments by sea.

We hope that this addresses your concerns. We expect that the Executive Branch study will be issued shortly.

Sincerely,


James M. Taylor
Executive Director
for Operations

Congress of the United States
Washington, DC 20515

December 14, 1992

The Honorable Fred McGoldrick
Acting Deputy Assistant Secretary
Nuclear Energy and Energy
Technology Affairs
Bureau of Oceans and International
Environmental and Scientific Affairs
United States Department of State
Washington, D.C. 20520

Dear Mr. McGoldrick:

Enclosed is a copy of a report, "Definition of Bounding Physical Tests Representative of Transport Accidents -- Air and Marine," that was recently brought to our attention. We believe the report is highly relevant to the Executive Branch study now being carried out in consultation with the Nuclear Regulatory Commission (NRC) pursuant to Public Law 102-486.

This report, prepared for the NRC in 1983, includes a detailed set of tests for determining whether casks used for transporting radioactive materials by sea could withstand extremely severe accidents. Unfortunately, although the report was completed under contract for NRC's Office of Nuclear Regulatory Research by a team at the Illinois Institute of Technology's Research Institute (IITRI), the tests proposed in the report have never been pursued. This report was part of the Modal Study, a project begun by NRC in 1978 to examine safety issues related to various modes of transportation of radioactive materials.

The IITRI team has identified both historical and hypothetical scenarios for severe air and marine transport accidents involving radioactive material containers and used this data to develop scenarios for "extremely severe credible accidents for each shipping mode." IITRI then developed tests for radioactive material casks that would simulate the stresses that actually occur in such severe accidents. It appears that the report satisfactorily defined a maximum credible accident scenario involving plutonium transport based upon a survey of maritime accidents and an assessment of the most severe conditions under which such accidents have occurred. The study further designed appropriate test procedures to replicate such conditions.

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