

# Spent Fuel Transport Studies



Robert Lewis  
Spent Fuel Project Office  
Office of Nuclear Material Safety and Safeguards

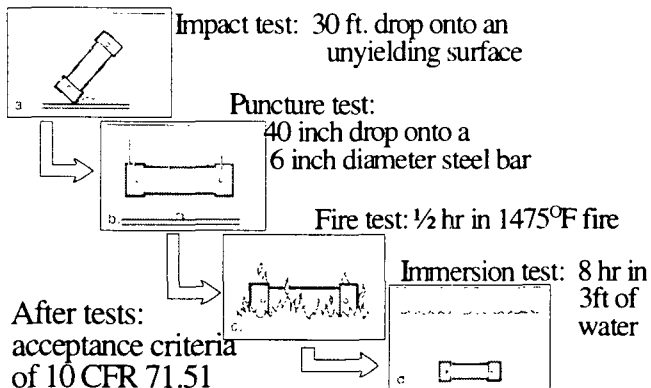
1

## Outline of Talk

- NRC role in Spent Fuel Transportation
  - Certify casks
  - Quality assurance program reviews
  - Evaluate physical protection
- Cask performance standards
- Transportation studies and risk assessments
- Package Performance Study
  - What it is, goals, status, issues

2

## NRC Cask Performance Standards



3

## Transportation Safety Studies

### Ongoing Effort to Ensure Shipment Safety

- 1977 - FES on Transportation by Air and Other Modes (NUREG-0170)
- 1987 - Shipping Container Response to Severe Accidents (NUREG/CR-4829)
- 2000 - Reexamination of Spent Fuel Shipment Risk Estimates (NUREG/CR-6672)
- ~2003 - Package Performance Study (Severe Accidents)

4

## **NUREG-0170 (1977)**

---

Final Environmental Statement on the Transportation of  
Radioactive Material by Air and Other Modes

- Assessed public and transport worker impacts
- All licensed shipments, all modes, incident-free transport and accidents, using RADTRAN 1
- Used as basis for NRC and DOT regulations
- Spent Fuel (1 of 25 types of materials studied)
  - Reprocessing economy (90 day cooled fuel)
  - Simple accident release (using engineering judgement)
  - Estimated a 1985 total of ~2000 shipments/year
  - Total population doses (p-rem): 565 (truck); 298 (rail)

5

## **Modal Study (1987)**

---

NUREG/CR-4829 (LLNL): Shipping Container Response  
To Severe Highway and Railway Accident Conditions

- Spent fuel package accident response by analysis
- Impact and thermal forces
- Finite element analysis of cask wall stresses
- Goal: relate Part 71 tests to forces in accidents
- Also considered 'real life' transport accidents
- Risks estimated to be ~1/3 those in NUREG-0170

6

## **Reexamination of Spent Nuclear Fuel Risk Estimates (March 2000)**

---

NUREG/CR-6672, Sandia National Laboratories

- Assess risks for shipment campaign to storage facilities and repository
- Model current cask designs (including closure system), modern fuel properties
- RADTRAN 5 incident-free & accident dose risk
- Result: risk < Modal Study < NUREG-0170
- Plain-English compliment to technical report in development

7

## **Package Performance Study**

---

- Build upon 1987 modal study and 2000 reexamination study
- Spent fuel only, truck and rail packages
- Assess severe accident scenarios, cask performance, and fuel responses
- Consider the need for, goals of, and benefits of physical testing (partial-scale or full-scale)
- Use enhanced public participatory approach

8

## **Package Performance Study**

---

### Considerations

- Increased modeling and testing capabilities can provide risk insights
- Dual-purpose cask technologies, designs known
- Potential for large shipping campaign
- Age of data used in previous efforts
- Consistency with NRC performance goals and Commission direction

9

## **NRC Performance Goals**

---

Performance goals being integrated into Agency activities

- Maintain safety
- Increase public confidence
- Reduce unnecessary regulatory burden
- Make NRC activities and decisions more effective, efficient and realistic

10

## **Package Performance Study**

---

### **Public Involvement**

- Website (<http://ttd.sandia.gov/nrc/modal.htm>)
- Workshops & seminars
  - ▶ 1999: Bethesda, MD; Henderson, NV; Pahrump, NV
  - ▶ 8/15-16/00: Las Vegas, NV & Pahrump, NV
  - ▶ 9/13/00: Rockville, MD
- Maintaining list of interested parties and members of the public

11

## **Package Performance Study**

---

### **Where We Are Today**

- Contract with Sandia National Laboratories
- Scoping study
  - ▶ Collect public views
  - ▶ Literature search/review
  - ▶ Options & recommendations for follow-on research
- Issues & Resolution Options Report
  - ▶ Results of scoping study
  - ▶ Published June 2000

12

## **Package Performance Study**

---

### **Major Issues**

- Verify cask modeling through analysis and fire and impact tests
- Evaluate fuel assembly/rod/pellet response through tests and analysis
- Reconstruct event trees using modern data
- Full-scale or Scale-model testing

13