SUMMARY OF HIGH EFFICIENCY TRUCK CASK SYSTEMS (GA-4 AND GA-9)

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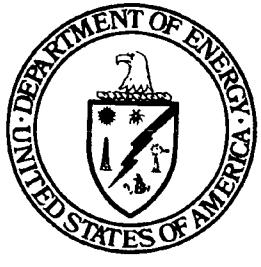
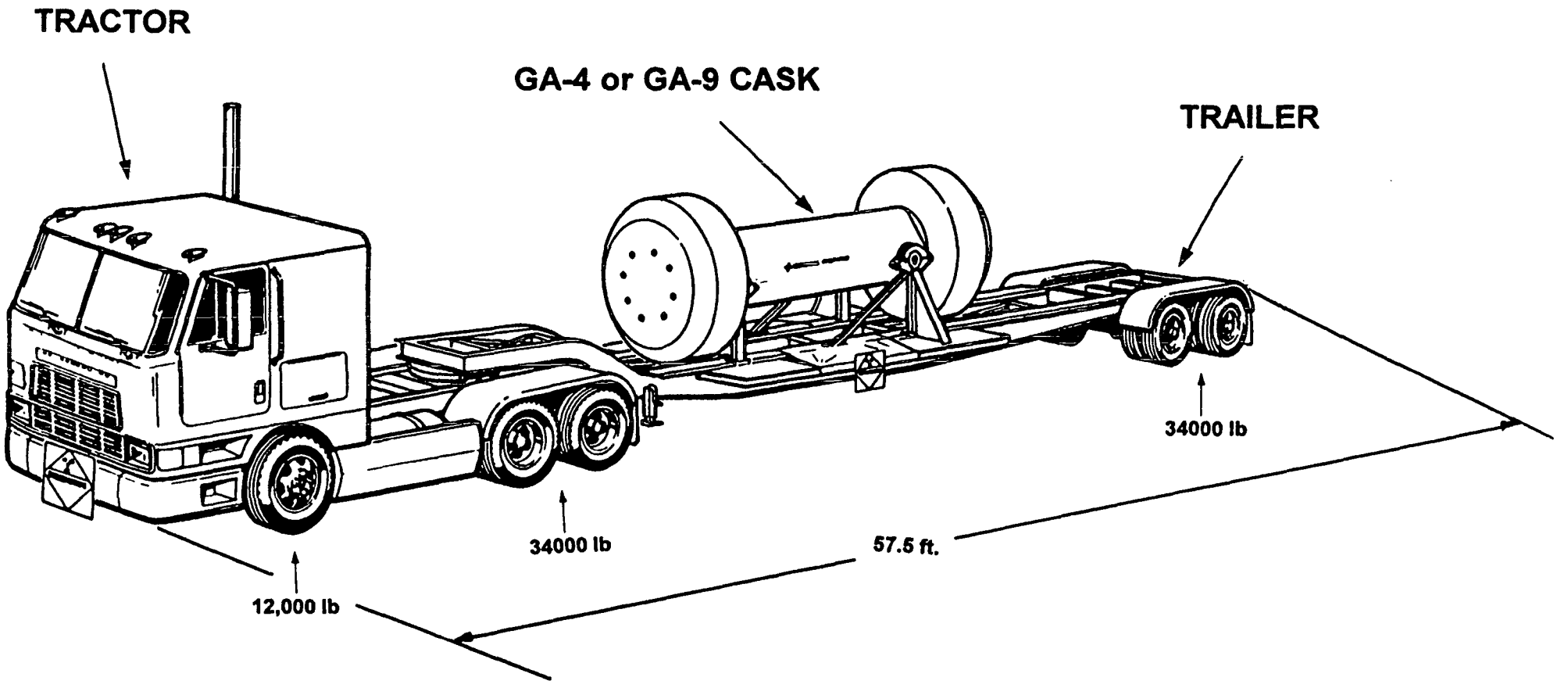


Nuclear Waste Technical Review Board
Denver, Colorado
July 13, 1994

General Atomics (GA) Legal Weight Truck (LWT) Cask System



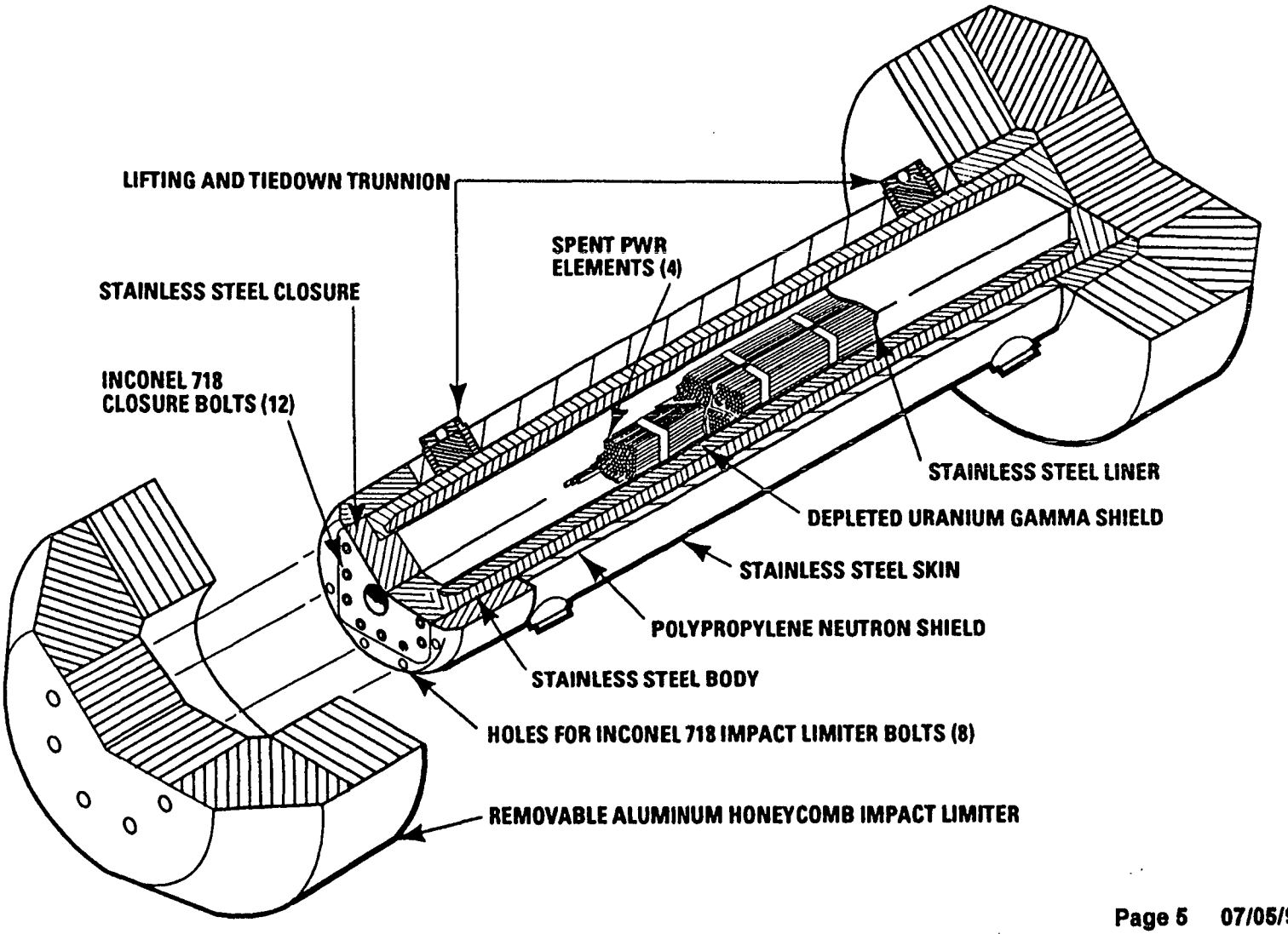
Benefit and Importance of GA-4 and GA-9 LWT Cask Systems to CRWMS Program

- Carrying capacity compared to existing legal weight truck casks increased
  - From 1 to 4 PWR assemblies
  - From 2 to 9 BWR assemblies
- Reduction in number of LWT shipments, miles travelled, and potential for accidents
- Reduction in routine radiation exposure to Public

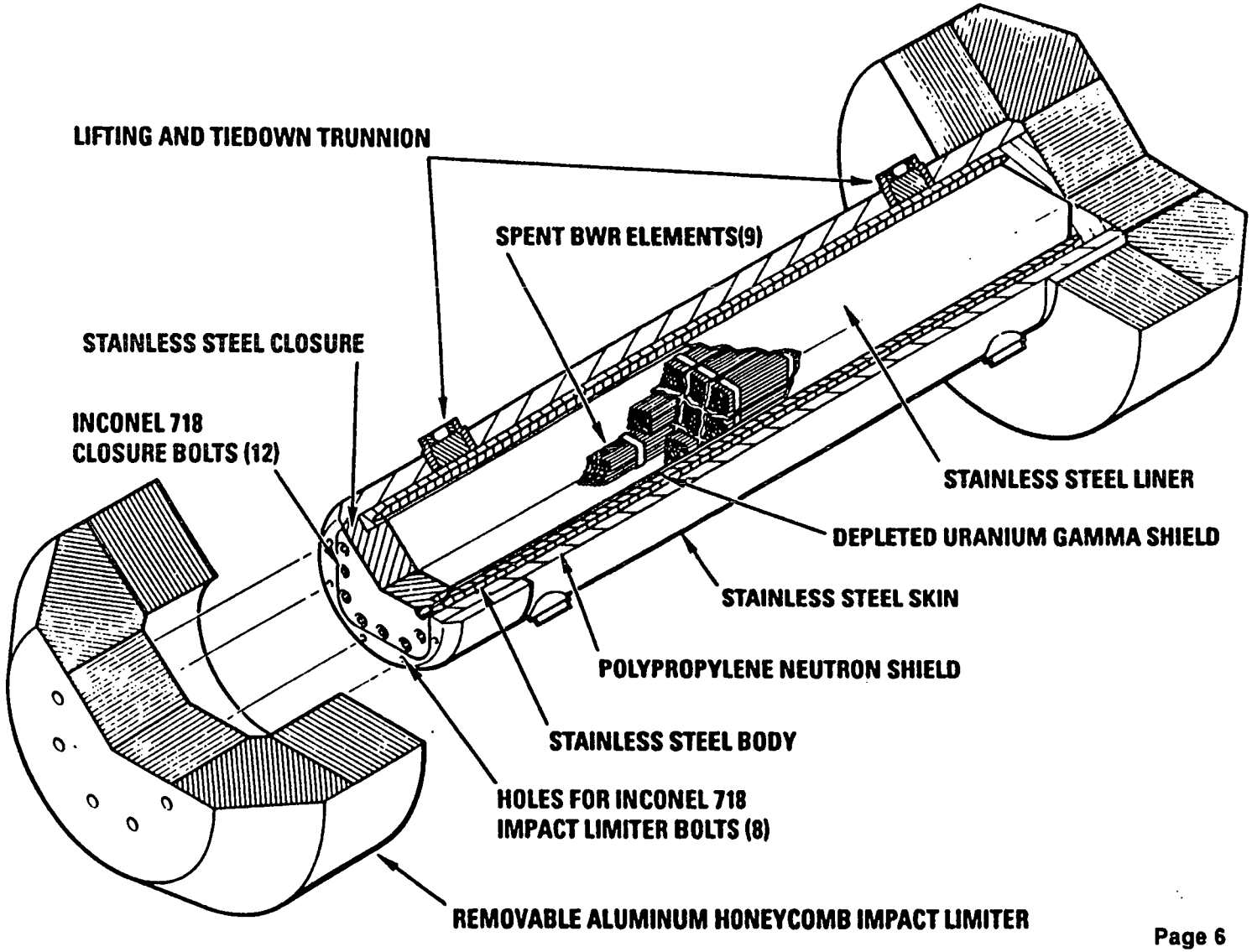
This presentation will present a brief summary of

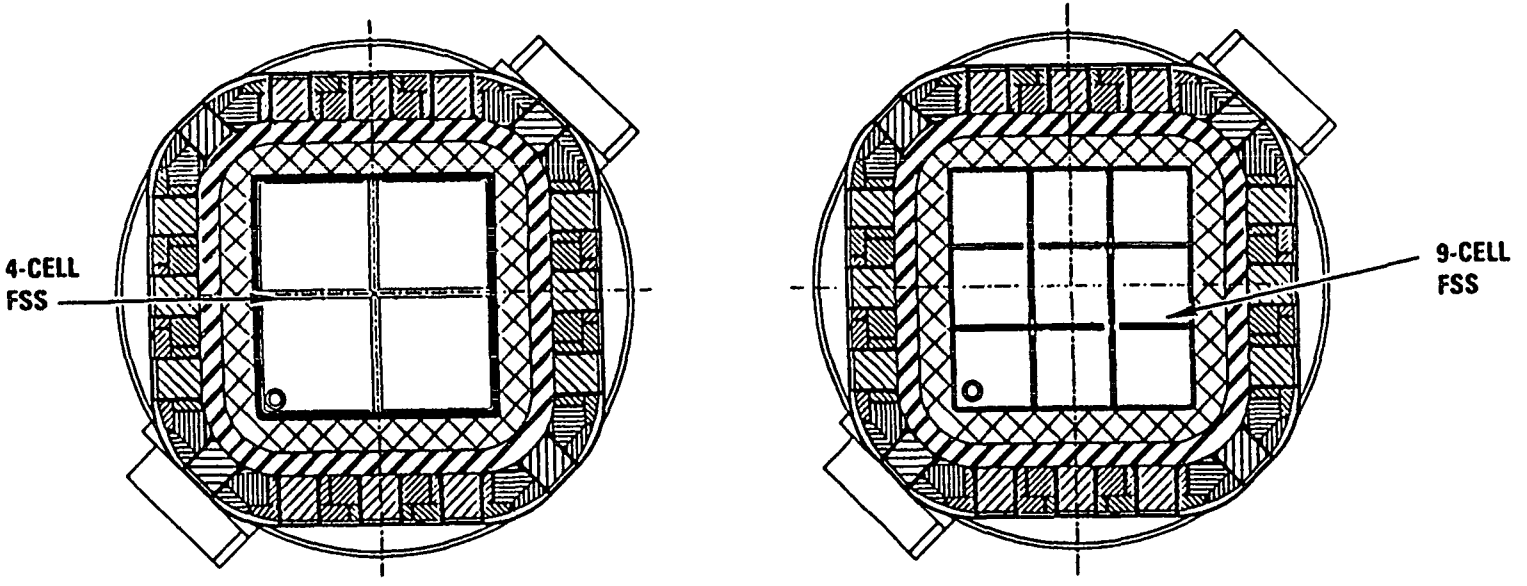
- Design of GA-4 and GA-9 casks and the design status
- Brief discussion of analysis efforts required in preparation for review by the Nuclear Regulatory Commission (NRC)
- Certification process and activities
- Testing performed and planned to confirm analysis results and cask performance

GA-4 Legal Weight Truck Cask

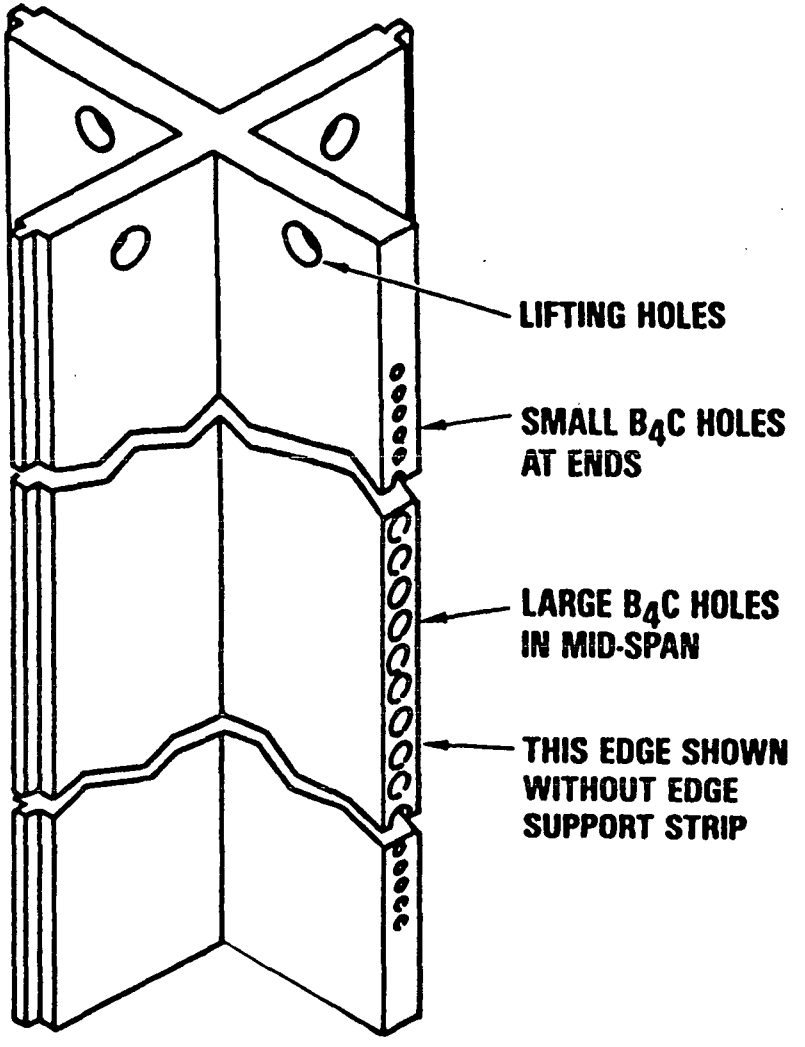


GA-9 Legal Weight Truck Cask





Cross Sections



Fuel Support Structure

Key Design Features

- 4 PWR or 9 BWR Spent Fuel Assemblies
- Stainless steel cruciform fuel support structure (FSS)
- Stainless steel liner
- Depleted Uranium (DU) gamma shield
- Stainless steel outer shell
- Polypropylene neutron shield

Key Design Features (Continued)

- Forged bottom head
- Bolted lid closure
- Aluminum honeycomb impact limiters
- Access ports for draining, drying and venting for in-plant operations

Major Design Changes to Address Review Groups' Comments

- BWR FSS length shortened for channels
- A second set of lifting trunnions
- GA-4 lid closure modified for Non-Fuel Assembly Hardware (NFAH)
- GA-9 lid closure modified and four cell FSS added for NFAH
- Impact limiter tapered
- Paint eliminated
- Welded FSS on GA-4

Table 1 Weights and Dimensions of the GA-4 and GA-9 Casks

	GA-4	GA-9
Weight (loaded)	53,600 lb.	52,900 lb.
Cask length		
without impact limiters	187.75 in.	198.30 in.
with impact limiters	233.95 in.	244.50 in.
Trunnion-to-trunnion width	48.3 in.	46.66 in.
Impact limiter diameter	90.00 in.	90.00 in.
Cavity depth	167.25 in.	178.00 in.
Cavity fuel cell cross section	8.755 in.	5.760 in.

High Capacity Achieved by

- Longer cooled fuel
- Two cask bodies (PWR/BWR)
- Non-circular cross section eliminates unused space
- Efficient gamma shield material (DU)
- High strength materials (XM-19) for cask body components
- Unique FSS; poison contained within structure
- Aluminum honeycomb filled impact limiters

Cask Analyses

- Casks are designed by analysis
- Five major areas or disciplines
- Analyses performed using sophisticated computer codes
- Finite element two and three dimensional models are used
- Analysts can perform highly-detailed analyses of the entire cask, individual components, or specific areas

Cask Analyses (Cont'd)

- Computer programs and models used are typical for cask analysis and are familiar to and accepted by NRC
- The applied loads result from the conditions defined by Title 10 Part 71 of the Code of Federal Regulations and in-plant operations
- Mechanical and thermal loads are in terms of
  - internal and external pressure
  - thermal gradients
  - acceleration and deceleration loads
  - lifting and tiedown loads
  - 30 ft drop
  - Puncture
  - Accident thermal environment (Fire)
- Radiological source terms of spent fuel

Cask Analyses (Continued)

- **The analyses produce results, e.g.**
  - **Stresses**
  - **Deformations**
  - **Temperatures**
  - **Radiation dose levels**
- **These results are compared to allowable limits**
- **The allowable limits are established by NRC regulatory guides, the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) codes for Nuclear Components, and the American National Standard Institute (ANSI) standards**

Cask Analyses (Continued)

- The allowable limits provide significant safety margins against failure
- Analysis methods, models and results, applied loads, and allowable limits are summarized in the Safety Analysis Report (SAR), which is submitted to NRC for review

Certification Process & Activities

- Cask supplier has NRC approved QA program
- NRC audits cask supplier periodically
- Several presentations to NRC during design and analysis phases
- Last meetings June 2 and July 13, 1993
- Issues raised are resolved prior to SAR submittal
- NRC performs thorough and exhaustive independent review

Certification Process (Cont'd)

- Reviews completed and SARs to be submitted in July 1994 and end of September 1994
- First round questions expected 6-9 months after submittal
- One-half scale model test results spring of 1995
- Test results incorporated into revision of SAR

Cask Testing

- **Component, Material, or Subsystem testing**
  - **During design phase**
- **Design Verification (Regulatory) testing**
  - **Part 71 Accident Scenarios**
- **Performance Verification testing**
  - **Cask Acceptance testing**
  - **Periodic Maintenance testing**

Cask Testing (Cont'd)

- **Component, Material, or Subsystem testing**
  - **Full scale mockup of a section of cask body**
  - **Full scale mockup of lid closure area**
  - **Fire tests of neutron shield materials**
  - **Several tests on aluminum honeycomb material tests**

Cask Testing (Cont'd)

- **Design Verification (Regulatory Testing)**
  - **Drop tests on 1/2 scale model**
  - **30 ft drops and puncture, 3 each**
    - **side**
    - **side slapdown**
    - **Center-of-Gravity (CG) over end corner**

Cask Testing (Cont'd)

- **Performance Verification Testing**
  - **After manufacturing prior to acceptance**
  - **Periodic Maintenance testing**