

Testing to Failure: Design of Full-Scale Fire and Impact Tests for Spent Fuel Shipping Casks

Bob Halstead

State of Nevada Agency for Nuclear Projects

Fred Dilger

Clark County Nevada Nuclear Waste Division

Presentation to

Waste Management '04

Tucson, AZ

March 2, 2004

Additional documentation available at
www.state.nv.us/nucwaste/trans.htm

Nevada Recommendations

Full-Scale Physical Testing of Casks

- Meaningful stakeholder role in development of testing protocols & selection of test facilities and personnel
- Full-scale physical testing (sequential drop, puncture, fire, and immersion) prior to NRC certification
- Additional testing (casks, components, models) and computer simulations to determine performance in extra-regulatory accidents and to determine failure thresholds
- Reevaluate Modal Study findings , and if appropriate, revise NRC cask performance standards
- Evaluate costs and benefits of destructive testing of a randomly-selected production model cask

Nevada Perspective on Controversy Over Baltimore Fire Studies

- Nevada publishes report on Baltimore Fire September 2001
- Nevada raises Baltimore Fire issues relative to NRC PPS full-scale testing proposal May 2002-Present
- NRC excludes Nevada consultants from technical meetings with NRC contractors (NIST) June-August, 2002
- NRC withholds draft reports and technical analyses requested by Nevada under FOIA August 2002-April 2003
- Baltimore Fire discussed at WM'03 Conference February 2003
- Baltimore Fire discussed at NRC PPS meetings March 2003
- NRC invites Nevada consultants to meet with NRC staff and contractors, provides requested data, and initiates open and ongoing dialogue April 2003-Present
- NRC Inspector General investigation May 2003-Present

Nevada Perspective on Baltimore Fire Study Issues to be Resolved

- NIST fire model & tunnel experiments
- Significance of water main break and oxygen supply
- Fire history reconstruction (duration, temperatures, cool down period)
- Hypothetical accident conditions (e.g., cask lid proximity to hottest region of fire)
- Selection of cask(s) to be evaluated and significance of welded internal canister
- Cask and fuel performance modeling
- Implications for extra-regulatory cask testing
- Need for independent peer review

Nevada Comments on NUREG-1768 NRC PPS Draft Test Protocols

- Good stakeholder participation process though March, 2003: public meetings, transcripts, website
- The draft testing protocols are wholly unacceptable
- NRC must reissue new draft for public comment
- NRC program costs >\$20 million but would not determine if two casks tested meet NRC accident performance standards
- NRC program costs >\$20 million but would not determine failure thresholds of the two casks tested
- NRC program results would not validate models
 - Impact test: expected cask deformations too small to be accurately measured
 - Fire test: unclear fire duration

Nevada Recommendations to NRC

Extra-regulatory Full-Scale Tests

- Test Casks to be used for Yucca Mountain Shipments (Truck-GA/4; Rail-TBD)
- Load Casks with one PWR assembly, plus dummy or surrogate assemblies and heaters (simulate 5 YR SNF)
- Rail Impact Test: Tower drop; Lid end, Center of gravity over corner impact; No impact limiter; Speed TBD, based on modeling failure (probably >75 mph)
- Truck Impact Test: Tower drop; Lid end or backbreaker, TBD; No impact limiter; Speed TBD, based on modeling failure (probably >75 mph)
- Fire Test: Engulfing fire, Minimum 3 hours @ 1800°F (1000°C) or 6 hours @ 1475°F (800°C)