

RIC 2006

SESSION W4GH

Spent Fuel Management

Transportation of Spent Fuel and High-Level Waste

Kevin D. Crowley

Director, Nuclear and Radiation Studies Board

The National Academies

March 8, 2006

THE NATIONAL ACADEMIES

Advisers to the Nation on Science, Engineering, and Medicine

“Going the Distance?” Study

- Initiated by the National Academies
- Original study task:
 - Assess risks of spent nuclear fuel (SNF) & high-level radioactive waste (HLW) transport in the U.S.
 - Identify key technical and societal concerns for SNF/HLW transport, now and in the future
 - Recommend steps to address these concerns
- Expanded study task:
 - Assess the manner in which DOE selects routes for shipment of research reactor SNF between its facilities and recommend improvements
- Pre-publication report released in Feb. 2006

Study Committee

- Neal Lane, Rice University, Chair
- Tom Deen, National Research Council (retired), Vice Chair
- Julian Agyeman, Tufts University
- Lisa Bendixen, ICF Consulting
- Dennis Bley, Buttonwood Consulting
- Hank Jenkins-Smith, Texas A&M University
- Mel Kanninen, MFK Consulting
- Ernest Moniz, MIT
- John Poston, Texas A&M University
- Lacy Suiter, FEMA (retired)
- Joseph Sussman, MIT
- Elizabeth Ten Eyck, ETE Consulting
- Seth Tuler, Clark University
- Detlof von Winterfeldt, University of S. California
- Thomas Warne, Tom Warne and Associates
- Clive Young, UK Department of Transport

Bottom-Line Messages

- The committee could identify no fundamental technical barriers to the safe transport of spent fuel and high-level waste in the United States
- However, there are a number of social and institutional challenges to the successful initial implementation of large-quantity shipping programs

Bottom-Line Messages (2)

- Malevolent acts against SNF/HLW shipments are a major technical and societal concern
- The committee was unable to perform an in-depth examination because of information constraints
- An independent examination of transportation security should be carried out prior to the commencement of large-quantity shipments to a federal repository or to interim storage

Selected Results on Package Performance

- Current international standards and U.S. regulations are adequate to ensure package containment effectiveness over a wide range of transport conditions
- BUT there may be a very small number of extreme accident conditions involving very-long-duration fires that could compromise containment effectiveness
- The USNRC should undertake additional analyses of very-long-duration fire scenarios that bound expected real-world accident conditions ... and implement operational controls and restrictions as necessary to reduce the chances that such conditions might be encountered in service

Selected Results on Package Testing

- The committee strongly endorses full-scale testing for determining how packages will perform under both regulatory and credible extra-regulatory conditions
- Full-scale testing should continue to be used as part of integrated testing programs to validate package performance
- Full-scale testing of packages to deliberately cause their destruction should not be required

Selected Results on Transport Risk

- The radiological health and safety risks associated with the transport of SNF/HLW are well understood and generally low ... with the possible exception of risks from releases in extreme accidents involving very-long duration fires
- The likelihood of such extreme accidents appears to be very small, however, and their occurrence and consequences can be further reduced through relatively simple operational controls and restrictions

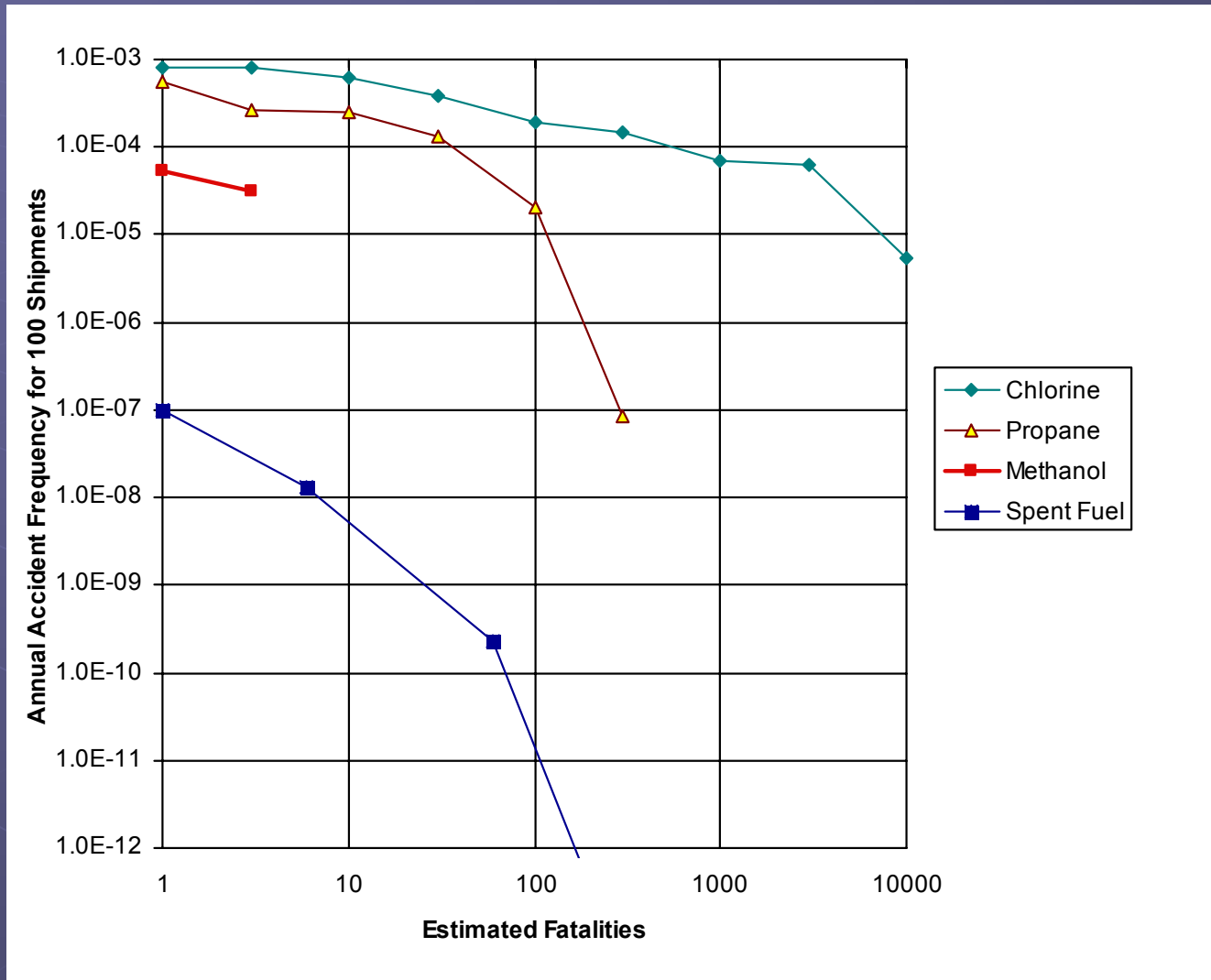
Transport Risk (2)

- Social risks for SNF/HLW transportation pose important challenges to transportation implementers
- Transportation planners can take early and proactive steps to establish formal mechanisms for gathering advice about social risks and their management
- DOE should create a risk advisory group to obtain advice on risk characterization, communication, and mitigation

Selected Results on Comparative Risk

- The report provides quantitative comparisons of radiological risks for normal and accident conditions of transport
- Normal transportation
 - Risk ladder comparing estimated YM exposures to other common exposure types
- Accidents
 - Complementary cumulative distribution functions for accidents involving spent fuel and other hazardous materials

Accident Conditions of Transport



Selected Results on Research Reactor SNF Routing

- DOE's procedures for selecting routes within the United States for shipments of foreign research reactor SNF appear on the whole to be adequate and reasonable
- DOT routing regulations are a satisfactory means of ensuring safe transportation provided that shippers actively and systematically consult with states and tribes along potential routes and states follow route designation procedures prescribed by DOT

Selected Results on Improving SNF/HLW Transportation

- The committee strongly endorses DOE's decisions to ship SNF/HLW to a federal repository by mostly rail using dedicated trains
- The committee recommends that DOE fully implement these decisions before commencing large-quantity shipments to the repository and also examine the feasibility of further reducing the need for cross-country truck shipments

Improving SNF/HLW Transportation

- DOE should negotiate with commercial spent fuel owners to ship older fuel first to a federal repository or federal interim storage
- Should these negotiations prove ineffective, Congress should consider legislative remedies
- DOE should initiate transport to the federal repository through a pilot program involving relatively short, logistically simple movements of older fuel from closed reactors

Improving SNF/HLW Transportation (2)

- The DOE secretary and the U.S. Congress should examine the following options for changing the organizational structure of DOE's program for transporting SNF/HLW to a federal repository to increase its chances for success:
 - Quasi-independent DOE office reporting to upper-level management
 - Quasi-government corporation
 - Fully private organization operated by the commercial nuclear industry
- This recommendation does not reflect on the high quality of many program staff

Report Information

- The pre-publication version of the report can be ordered online at www.nap.edu
- The report can be read online for free at <http://fermat.nap.edu/catalog/11538.html>
- The final (printed) version of the report is expected in June 2006