

DOCKET

11-IEP-1J

DATE _____

RECD. Aug 02 2011



Safety and Security of Commercial Spent Nuclear Fuel Storage

Kevin D. Crowley, Director
Nuclear and Radiation Studies Board

THE NATIONAL ACADEMIES

Advisers to the Nation on Science, Engineering, and Medicine

Who We Are

■ The National Academies

National Academy of Sciences (NAS)

National Academy of Engineering (NAE)

Institute of Medicine (IOM)

National Research Council (NRC)

Nuclear and Radiation Studies Board

■ Private, nonprofit, Congressionally chartered to provide scientific and technological advice to the nation

Study Background

- Request prompted by a 2003 Science and Global Security article which predicted potentially dire consequences from an accident or attack on spent fuel pools at commercial nuclear power plants
- Study requested by U.S. Congress (2004 Energy and Water Development Conference Report)
- Study was sponsored by the Nuclear Regulatory Commission and Department of Homeland Security
- Two reports were requested:
 - Classified report: Issued to congressional committees and sponsoring agencies on July 15, 2004
 - Public report: Issued on April 6, 2005

Congressional Study Charge

- (1) Potential safety and security risks of spent nuclear fuel presently stored in cooling pools, including the density of such storage
- (2) Safety and security advantages, if any, of dry cask storage versus wet pool storage at reactor sites
- (3) Potential safety and security advantages, if any, of dry cask storage using various single-, dual-, and multi-purpose cask designs
- (4) The risks of terrorist attacks on these materials and the risk these materials might be used to construct a radiological dispersal device

Committee Roster

- **Louis J. Lanzerotti, Chair**
Bell Labs/Lucent Technologies
New Jersey Institute of Technology
- **Carl A. Alexander**
Battelle National Laboratories
- **Robert M. Bernero**
U.S. Nuclear Regulatory Commission
(retired)
- **M. Quinn Brewster**
University of Illinois
- **Gregory R. Choppin**
Florida State University
- **Nancy J. Cooke**
Arizona State University
- **Gordon Johnson**
Network Computing Services, Inc.
- **Robert P. Kennedy**
RPK Structural Mechanics Consulting
- **Kenneth K. Kuo**
The Pennsylvania State University
- **Richard T. Lahey, Jr.**
Rensselaer Polytechnic Institute
- **Kathleen R. Meyer**
Keystone Scientific, Inc.
- **Frederick J. Moody**
GE Nuclear Energy (retired)
- **Timothy R. Neal**
Los Alamos National Laboratory
- **Loring A. Wyllie, Jr.**
Degenkolb Engineers
- **Peter D. Zimmerman**
King's College of London



Public Report: Summary for Congress

- Spent fuel pools are necessary at all operating nuclear power plants to store recently discharged fuel
- The committee judges that successful terrorist attacks on spent fuel pools, though difficult, are possible
- If an attack leads to a propagating zirconium cladding fire, it could result in the release of large amounts of radioactive material

Summary for Congress (2)

- Additional analyses are needed to understand more fully the vulnerabilities and consequences of events that could lead to propagating zirconium cladding fires
- It appears to be feasible to reduce the likelihood of a zirconium cladding fire by rearranging spent fuel assemblies in the pool and making provision for water spray systems that would be able to cool the fuel, even if the pool or overlying building were severely damaged

Summary for Congress (3)

- Dry cask storage has inherent security advantages over spent fuel pool storage, but it can only be used to store older spent fuel
- There are no large security differences among different storage-cask designs
- It would be difficult for terrorists to steal enough spent fuel from storage facilities for use in significant radiological dispersal devices (dirty bombs)

Phase 2 Security Study?

- Committee was unable to obtain complete information on security changes made at spent fuel storage facilities after September 11
- Final report recommended that an independent review be undertaken
- Nuclear Regulatory Commission Chairman Nils Diaz requested that committee develop an addendum to its report to address this task
- A proposal for this follow-on work is pending with the Commission