National Academies Update

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Nuclear and Radiation Studies Board

THE NATIONAL ACADEMIES
Advisers to the Nation on Science, Engineering, and Medicine

Topics to be Discussed

- Two studies of potential interest:
  - Safety and Security of Commercial Spent Nuclear Fuel Storage
  - Transportation of Radioactive Waste
- Organizational changes

Spent Nuclear Fuel Storage Study

- Requested by U.S. Congress (2004 Energy and Water Development Conference Committee)
- Sponsored by 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

Statement of Task

(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; and

(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

Study Topics

- Spent fuel storage configurations and operations
- Assessments of spent fuel storage safety and security
- Actions completed, underway, or planned to assess and improve spent fuel storage safety and security
- Assessments of domestic terrorist means and methods for attacking spent fuel storage facilities
- Capabilities of power plant operators to mitigate the effects of accidents or terrorist attacks on spent fuel storage facilities
- Potential lessons-to-be-learned from Europe, especially Germany

Summary for Congress (1)

- 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.
- Additional analyses are needed to understand more fully the vulnerabilities and consequences of events that could lead to propagating zirconium cladding fires.

Summary for Congress (2)

- 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 damaged.
- 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.

Summary for Congress (3)

- It would be difficult for terrorists to steal enough spent fuel from storage facilities for use in a significant radiological dispersal device (dirty bombs).
- The statement of task does not direct the committee to recommend whether the transfer of spent fuel from pool to dry cask storage should be accelerated. The committee judges, however, that further engineering analysis and cost-benefit analyses would be needed before decisions on this and other mitigative measures are taken. The report contains detailed recommendations for improving the security of spent fuel storage regardless of how it is stored.

Transportation of Radioactive Waste

- Study was developed by the Board on Radioactive Waste Management & Transportation Research Board
- Study was motivated by U.S. plans to develop a repository at Yucca Mountain later this decade:
  - Thousands of spent nuclear fuel/high-level waste shipments likely over 24+ years of repository operation
  - September 11, 2001 attacks have raised new concerns about security
  - DOE's transportation program is immature—there is still time to have an impact
- Sponsors: DOE, DOT, EPRI, NAS, NCHRP, NRC

Questions to be Addressed

- What are the risks (accidents & terrorism) for spent nuclear fuel/high-level waste (SNF/HLW) transportation? How well do we know them? How do they compare with other societal risks?
- What are the principal technical and societal concerns for transporting SNF/HLW over the next two decades?
- What can/should be done to address them?
- Study has a U.S. focus

Committee Roster

- **Neal Lane, Chair**
  Rice University
- **Tom Deen, Vice Chair**
  PRC-Voorhees (retired),
- **Julian Agyeman**
  Tufts University
- **Lisa Bendixen**
  ICF Consulting
- **Dennis Bley**
  Buttonwillow 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**
  USC
- **Thomas Warne**
  Tom Warne and Associates
- **Clive Young**
  UK Department of Transport

Study Plan

- Planned as a 24 month study; was to have been completed in early 2005
- Committee held 6 information-gathering meetings in various parts of United States
- One meeting held in Europe to witness a cask drop test and learn about French and British transport programs
- Study will be extended into the summer of 2005 to undertake a 2003 congressionally mandated (and DOT-funded) study on spent fuel routing (next slide)
- Two additional open meetings will be held to complete the routing study: first meeting to be held on May 26-27; second meeting date TBD

Route Selection for Transportation of Research Reactor Spent Nuclear Fuel

The principal task of this study will be to assess the manner in which the Department of Energy and its contractors:

- Select potential highway and rail routes for the shipment of spent nuclear fuel from research nuclear reactors
- Select specific land routes for such shipments
- Conduct assessments, if any, of the risks associated with such shipments

Route Selection, continued

- The assessment should identify deficiencies, if any, in current procedures for selecting routes that have important potential health or safety consequences.
- In making recommendations to address these deficiencies, a clear distinction should be made between technical and policy considerations.
- Recommendations should be directed at competent regulating authorities or the United States Congress.

Nuclear and Radiation Studies Board

- Created through the merger of the Board on Radioactive Waste Management and Board on Radiation Effects Research on March 1, 2005
- Topical responsibilities:
  - Radioactive waste management & environmental cleanup
  - Radiation health effects (including BEIR and RERF)
  - Nuclear and radiological terrorism and security (new)
- Board membership to be announced soon

Want More Information?

- Visit our “current projects” web site at www.national-academies.org. Click on “current projects” and search under the project title or BRER, BRWM, or NRSB to see all projects in progress.
- For a list of reports visit www.national-academies.org/nrsb. Click on “publications.” Most reports can be read on line.
  - Spent fuel report: http://www.nap.edu/catalog/11263.html
- Call us at 202-334-3066 or send us an e-mail message (nrsb@nas.edu) to be placed on our electronic mailing lists.