

January 7, 2003

The Honorable Richard A. Meserve  
Chairman  
U. S. Nuclear Regulatory Commission  
Washington, D.C. 20555-0001

SUBJECT: TRANSPORTATION WORKING GROUP MEETING

Dear Chairman Meserve:

During its 138<sup>th</sup> meeting on November 19-20, 2002, the Advisory Committee on Nuclear Waste (ACNW) conducted a Transportation Working Group Meeting. The meeting convened experts in spent nuclear fuel transportation package design, analysis, and testing methods to evaluate the current evidence regarding the mechanical and thermal capabilities of transportation packages. In addition, the experts reviewed the history of domestic and worldwide spent fuel and high-level radioactive waste transportation experience. Topics included the number and types of shipments made, problems encountered, and the consequences of these problems.

## **DISCUSSION**

The risks associated with the transportation of spent nuclear fuel and other high-level radioactive waste are of significant public concern. The Committee decided that a focused meeting of the Transportation Working Group would be the most efficient and encompassing way to gather information on various risks associated with such shipments.

The Transportation Working Group Meeting, which took place over 1½ days, was attended by a variety of stakeholders (see the attached agenda and attendance list). Several stakeholders took advantage of the time that was set aside during the meeting for members of the public to address the Working Group

The meeting had two objectives: (1) to assess the available test data and analysis methods for package performance to determine if additional tests or enhanced analytical methods are necessary to ensure safety of transportation packages; and (2) to review the actual experience with the transportation of spent nuclear fuel and high-level radioactive waste.<sup>1</sup>

The meeting included presentations by experts in spent nuclear fuel transportation package design, testing, and analysis, as well as individuals with experience in shipping spent nuclear

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<sup>1</sup>The security of transportation and its protection from terrorism is a separate issue and was not addressed during the meeting.

fuel and high-level radioactive waste.<sup>2</sup> The Transportation Working Group will document the proceedings from the meeting in a NUREG-series report.

### **Analysis and Testing**

The spent fuel transportation tests performed at Sandia National Laboratories (Sandia) in 1977 and “Operation Smash Hit” performed in the United Kingdom in 1984 provided compelling demonstrations of the structural integrity of spent fuel transportation packages. Those tests involved rail and truck accidents using full-scale packages. The packages sustained only minor damage. The packages tested by Sandia were of no more robust design than the packages used today. We concluded that similar tests, performed using a current package design, would adequately demonstrate transportation safety.

Information presented at the meeting demonstrated that transportation of packages that meet regulatory requirements does not pose a threat to public health and safety. While there was some disagreement about methods of testing and analysis, the presenters unanimously agreed that spent nuclear fuel and high-level radioactive waste are being transported safely.

We concluded that several tests using scale models of casks would be preferable to a single full-scale test for purposes of code validation. Such tests may be needed if unique designs are submitted for licensing.

We also concluded that current analysis techniques are adequate to provide reasonable assurance that transportation packages meet the current regulations. Notwithstanding, future analyses may be enhanced using simulation modeling techniques developed for nuclear weapons research.

### **Transportation Experience**

Over the past 50 years substantial experience has been gained in the transportation of spent nuclear fuel and high-level radioactive waste. In the United States, government agencies and industry have safely made thousands of shipments. None of these shipments has resulted in the release of the radioactive contents. Similarly, thousands more shipments have been made safely throughout the world.

Both domestic and worldwide statistics are available on spent nuclear fuel and high-level radioactive waste shipments. These statistics include information on consequences associated with transportation accidents and incidents. However, there currently is no comprehensive database that can be used to compare shipments and quantify trends. We concluded that information contained in such a database would be useful in performing risk-informed analyses and should be available to all stakeholders.

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<sup>2</sup>Sandia National Laboratories, Lawrence Livermore National Laboratory, Holtec International, NAC International, Transnuclear, Inc., the Association of American Railroads and the NRC’s Spent Fuel Project Office participated in the discussions of package design, testing, and analysis. The Department of Transportation, the Department of Energy, Progress Energy, and Cogema participated in the discussions of transportation experience.

**RECOMMENDATIONS**

1. The full-scale test of a shipping package now being proposed by the NRC staff should be a public demonstration performed under credible accident conditions. An example of such a test would be crashing a transportation vehicle and package into a target (e.g., a concrete wall, a steel bridge, or another vehicle).
2. Advantage should be taken of the enhanced analytical capabilities that have been developed as part of the nuclear weapons program. Application of these computational tools to transportation package performance analysis would augment confirmatory testing and increase confidence in safety.
3. A centralized database for past and future spent fuel and high-level radioactive waste shipments should be developed. This database should record all data regarding the number and types of shipments, as well as the consequences associated with any accidents or incidents.

Sincerely,

**/RA/**

George M. Hornberger  
Chairman

**References:**

1. Sandia National Laboratories Report SAND77-0270, "Analysis, Scale Modeling, and Full Scale Tests of a Truck Spent-Nuclear-Fuel Shipping System in High Velocity Impacts Against a Rigid Barrier," April 1978.
2. Sandia National Laboratories Report SAND78-0458, "Analysis, Scale Modeling, and Full-Scale Test of a Railcar and Spent-Nuclear-Fuel Shipping Cask in a High-Velocity Impact Against a Rigid Barrier," February 1980.

**Attachments:**

1. ACNW Transportation Working Group Agenda for Meeting held 11/19-20/02
2. Attendance List for Meeting of Transportation Working Group on 11/19-20/02

ADVISORY COMMITTEE ON NUCLEAR WASTE  
TRANSPORTATION WORKING GROUP WORKSHOP  
NOVEMBER 19 & 20, 2002.  
TWO WHITE FLINT NORTH, AUDITORIUM, ROCKVILLE, MARYLAND

Contact: Tim Kobetz (301-415-8716, [tjk1@nrc.gov](mailto:tjk1@nrc.gov))

**-PROPOSED SCHEDULE-  
NOVEMBER 19, 2002**

Topics	Presenters	Time
I. <u>Opening Remarks</u>	G. Hornberger, Chairman, ACNW M. Levenson, ACNW	8:30-8:40 a.m. (10 min)
II. <u>Analysis and Testing</u>		
a. Overview of Research Program Objectives	E. William Brach, SFPO	8:40-9:00 a.m. (20 min) Presentation Time 9:00-9:20 a.m. (20 min) Discussion Time
b. Summary of Sandia National Laboratory Research	Doug Ammerman, Sandia	9:20-10:05 a.m. (45 min) Presentation Time 10:05-10:35 a.m. (30 min) Discussion Time
<b>BREAK</b>		10:35-10:50 a.m.
c. Summary of Lawrence Livermore Laboratory Research	Larry Fischer, LLNL	10:50-11:35 a.m. (45 min) Presentation Time 11:35 a.m.-12:05 p.m. (30 min) Discussion Time
d. Public Comments		12:05-12:30 (25 min)
<b>LUNCH</b>		<b>12:30-1:30 p.m.</b>
e. Vendor Analysis and Testing	Kris Singh, Holtec International Peter Shih, Transnuclear Michael Yaksh, NAC Intl.	1:30-1:50 p.m. (20 min) Presentation Time 1:50-2:10 p.m. (20 min) Presentation Time 2:10-2:30 p.m. (20 min) Presentation Time 2:30-3:15 p.m. (45 min) Discussion Time

BREAK		3:15-3:30 p.m.
f.	Analysis of Fires	Chris Bajwa, SFPO 3:30-3:50 p.m. (20 min) Presentation Time 3:50-4:10 p.m. (20 min) Discussion Time
g.	Comparison of Analysis and Testing to Actual Railway Experience	Robert Fronczak, AAR 4:10-4:30 p.m. (20 min) Presentation Time 4:30-4:50 p.m. (20 min) Discussion Time
h.	Public Comments	4:50-5:15 p.m. (25 min)
i.	Committee Discussions	Milt Levenson, ACNW 5:15-5:45 p.m. (30 min) Discussion Time

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NOVEMBER 19 & 20, 2002.  
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Contact: Tim Kobetz (301-415-8716, [tjk1@nrc.gov](mailto:tjk1@nrc.gov))

**-PROPOSED SCHEDULE-  
NOVEMBER 20, 2002**

Topics	Presenters	Time
I. <u>Opening Remarks</u>	M. Levenson, ACNW	12:30-12:35 p.m. (5 min)
II. <u>Transportation Safety in the U.S. and Worldwide</u>		
a. Summary of DOT Experience with Spent Nuclear Fuel Shipments	Rick Boyle, DOT Kevin Blackwell, DOT	12:35-12:55 p.m. (20 min) Presentation Time 12:55-1:15 p.m. (20 min) Presentation Time 1:15-1:45 p.m. (30 min) Discussion Time
b. Summary of DOE Shipping Experience <ul style="list-style-type: none"> <li>i. Waste Isolation Pilot Plant</li> <li>ii. Foreign Fuel</li> <li>iii. Navy Fuel</li> </ul>	Alton Harris, DOE Maureen Clapper, DOE Don Doherty, DOE	1:45-2:05 p.m. (20 min) Presentation Time 2:05-2:25 p.m. (20 min) Presentation Time 2:25-2:45 p.m. (20 min) Presentation Time 2:45-3:30 p.m. (45 min) Discussion Time
<b>BREAK</b>		
c. Summary of Utility Experience	Robert Kunita and Steven Edwards, Progress Energy	3:45-4:15 p.m. (30 min) Presentation Time 4:15-4:45 p.m. (30 min) Discussion Time
d. Summary of International Experience	Ian Hunter, Transnuclear/ Cogema	4:45-5:05 p.m. (20 min) Presentation Time 5:05-5:25 p.m. (20 min) Discussion Time
e. Public Comments		5:25-5:45 p.m. (20 min) Discussion Time
f. Committee Discussions	Milt Levenson, ACNW	5:45-6:30 p.m. (45 min) Discussion Time

**138<sup>TH</sup> ACNW MEETING  
NOVEMBER 19–21, 2002**

**WORKING GROUP MEETING ON TRANSPORTATION OF SPENT NUCLEAR FUEL**

**ACNW WORKING GROUP AND STAFF**

George Hornberger, ACNW Chairman  
Raymond Wymer, ACNW Vice-Chairman  
Milton Levenson, Working Group Chairman  
John Garrick, ACNW Member  
Mike Ryan, ACNW Member

Sher Bahadur  
Neil Coleman  
Michele Kelton  
Timothy Kobetz  
John Larkins  
Howard Larson  
Michael Lee  
Richard Major  
Richard Savio

**INVITED EXPERTS**

**NOVEMBER 19, 2002**

E. William Brach	Spent Fuel Project Office (NRC)
Doug Ammerman	Sandia National Laboratory
Larry Fischer	Lawrence Livermore National Laboratories
Kris Singh	Holtec International
Peter Shih	Transnuclear
Michael Yaksh	NAC International
Chris Bajwa	Spent Fuel Project Office (NRC)
Robert Fronczak,	Association of American Railroads

**NOVEMBER 20, 2002**

Rick Boyle	Department of Transportation
Kevin Blackwell	Department of Transportation
Alton Harris	Department of Energy
Maureen Clapper	Department of Energy
Don Doherty	Department of Energy
Robert Kunita	Progress Energy
Ian Hunter	Transnuclear/Cogema

## **ATTENDEES FROM THE NUCLEAR REGULATORY COMMISSION**

### **NOVEMBER 19, 2002**

Melanie Wong	NMSS/DWM
Rosetta Virgilio	OPA
Robert K. Johnson	NMSS/DWM
David Esh	NMSS/DWM
Chris Grossman	NMSS/DWM
Michael Waters	NMSS/SFPO
Beth Schlapper	NMSS/SFPO
Naiem Tanious	NMSS/MNS
Allen Hansen	NMSS/SFPO
Phyllis Sobel	OCM/RAM
Rob Lewis	NMSS/SFPO
Steven Baggett	SFPO
Mike Tokar	SFPO
Wayne Hodges	SFPO
Dan Dorman	RES
Charles Miller	SFPO
Rob Temps	SFPO
Bob Shewmaker	SFPO
Mahendra Shah	SFPO
Daniel Huang	SFPO
Andrew J. Murphy	RES/DET
David Pstrak	SFPO
Julia M. Barto	SFPO
Carl Wither	SFPO/NMSS
Heather Astwood	OCM/EXM
Philip Justus	NMSS/DWM
Chet Poslusky	NMSS/SFPO
Neil Jensen	OGC/RFC

### **NOVEMBER 20, 2002**

David Dancer	NMSS/DWM
Rob Lewis	NMSS/SFPO
Steven Baggett	NMSS/SFPO
David Pstrak	NMSS/SFPO
Melanie Wong	NMSS/DWM
Rob Temps	NMSS/SFPO
Chet Poslunsy	NMSS
Naiem Tanious	NMSS/IMNS
Andrew Murphy	RES/DET
Phyllis Sobel	OC/RAM
Mike Tokar	NMSS/SFPO
Rosetta Virgilio	OPA
Julia Barto	NMSS/SFPO
Heather Astwood	OCM/EXM
Dinnis Galvin	NMSS/DWM
Dennis Dambly	OGC



## **ATTENDEES FROM OTHER AGENCIES AND GENERAL PUBLIC**

**NOVEMBER 19, 2002**

Craig F. Smith	Lawrence Livermore National Laboratories
Larry Kennedy	Senator Henry Ried
Allan Jolen	Holtec
Brian Gutherman	Holtec
Nancy Thompson	Department of Energy
Mark Holt	CRS
Ed Davis	Self/Pegasus
Marvin Resuilkeff	Self
Brian O'Connell	National Association of Regulatory Utility Commission
Ray Clark	Environmental Protection Agency
Thomas Phan	General Accounting Office
Maureen Conly	McGraw-Hill/Platts
William Garfield	Bechtel - SAIC Co.
Kevin Kamps	NIRS
Jerome Roth	ENER Corp.
R. M. Bernero	NRC, Retired
E. V. Tiesenhausen	CCCP
Rick Boyleston	WSMS
Norman Henderson	Bechtel SAIC Company
Steven Kraft	Nuclear Energy Institute
Jim Pegues	City of Las Vegas
Ken Grumski	MHF Logistical Solutions INC.
Tom Michener	Pacific Northwest National Laboratory
William Lake	Department of Energy
James B. Wingfield	Tri State Motor Transit
Ellen W. Ott	Department of Energy
Jose S. Pena	Department of Transportation
Eileen Supro	Electric Power Research Institute
Carol Hanlon	Department of Energy
Lisa Gue	Public Citizen
Ed Benz	SAI/BSC
Carl Bella	Nuclear Waste Technical Review Board
D. J. Feheringer	Nuclear Waste Technical Review Board
Felix Killar	Nuclear Energy Institute
M. E. Wangler	Department of Energy
Michael Conroy	Department of Energy
Ralph Best	OAI
Daniel Bullen	Nuclear Waste Technical Review Board
Kevin Crowley	NAS
Alan Zimmer	General Atomics
David Bennett	USTC - TSMT
David B. Lee	USTC - U.S. Transport Council
John A. Vincent	Nuclear Energy Institute
Alan Hansen	TN
Andrea Jennetta	Fuel Cycle Week

**NOVEMBER 19, 2002 (cont.)**

Albert Macitiels	Electric Power Research Institute
David McCarville	Booz-Allen Hamilton
Willis Brorne	DURATEK
Eric Wieser	Nuclear Waste News
Karyn Severson	Nuclear Waste Technical Review Board
Tom Danner	NAC International

**NOVEMBER 20, 2002**

Alan Soler	Holtec International
Brian Gutherman	Holtec International
Albert Machiels	Electric Power Research Institute
Jose Pena	Department of Transportation
Jerome Roth	ENERCORP.
Tom Griffith	Department of Energy
Rick Boyleston	WSMS
James Channell	New Mexico/EEG
Ellen Ott	Department of Energy
David McCarville	Booz-Allen
Ralph Best	JAI
Robert Benero	Self
Rodger Comstal	EMH
Jim Pegues	City of Las Vegas
David Bennett	Tri State Motor Transit Co.
John Vincent	Nuclear Energy Institute
Felix Killar	Nuclear Energy Institute
Alan Zimmer	General Atomics
Eileen Surko	ERI
Steve Kraft	Nuclear Energy Institute
Michael Conroy	Department of Energy
Darla Thompson	National Academies
E. V. Tiesenhausen	CCCP
Brian O'Connell	NARUC
D. J. Fehringer	Nuclear Waste Technical Review Board
William Lake	Department of Energy
Jim Shaffer	
Bob White	General Accounting Office
Carol Hanlon	Department of Energy
Norm Henderson	BSC
Mark Holt	CRS
Lis Gue	Public Citizen
Ed Davis	Self
Ray Clark	Environmental Protection Agency
Ed Benz	BSC/JAI
Lake Barrett	Self
David Blee	U.S. Transport Council