HIGH LEVEL NUCLEAR WASTE SHIPMENTS RADIOACTIVE AND DEADLY

Louis Zeller May 30, 2002

The Blue Ridge Environmental Defense League was founded in 1984 in response to the federal plan to construct a high-level nuclear waste dump. In 1987 the Crystalline Repository Project which would have sited a dump in the eastern United States came to an effective end when Congress selected Yucca Mountain, Nevada as the site for the nation's high-level nuclear waste. However, nuclear waste shipments to Nevada would also place millions of people at risk from accidents, sabotage, and routine exposures.

Nuclear Waste Shipments Cannot Be Made Safe

> **"A person standing one yard away from an unshielded, 10 year old fuel assembly would receive a lethal dose of radiation (500 rem) in less than three minutes and would incur significant damage in within seconds." ***
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> **"The surface dose rate of spent fuel is so great (10,000 rem/hour or more) that shipping containers with enough shielding to completely contain all emissions are too heavy to transport economically. Consequently, NRC regulations allow a certain amount of neutron and gamma radiation to be emitted from shipping casks during routine operations and transport."***
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> ***Information from: A Report By The Nevada Agency for Nuclear Projects**
> **http://www.state.nv.us/nucwaste/news2001/nn11313.pdf**

Public Radiation Exposure Without An Accident

Even without a transport accident, people are exposed to ionizing radiation from nuclear waste shipments. The U.S. Nuclear Regulatory Commission permits the following radiation dose to the public:

1,000 millirem (1 rem) per hour at the cask surface
10 millirem per hour hour six feet from cask surface

Risk of Terrorism and Sabotage From Irradiated Fuel Transportation

Nuclear power reactors remove and replace their enriched uranium fuel rods after they become contaminated by the atomic fission process. These contaminants include radionuclides such as plutonium which has a half-life of 24,000 years. Also, large quantities of uranium remain in the waste fuel rods, the element is rendered unusable for power generation by the contaminating radionuclides. The risks of deliberate diversion and/or destruction of irradiated waste transport cask are high. The strategic value of the uranium and plutonium in the waste fuel for new weapons increases the threat of diversion. Safety depends on adequate personnel and procedures. Acts of sabotage in recent years reveal the dangers of highway and railway transport of irradiated fuel.

On October 9, 1995, a ten car Amtrak train with 248 passengers and twenty crew was derailed near Hyder, Arizona. Spikes had been removed from the rail bed, a metal bar connecting the rails had been removed, and the missing section wired to circumvent the electronic warning system. A terrorist group, Sons of the Gestapo, left a note at the scene claiming credit and criticizing law enforcement agencies, citing the Waco and Ruby Ridge incidents.

On October 1, 1995 a jury convicted Sheik Omar Abdel Rahman of conspiracy to use diesel-fertilizer bombs which would have been used to blow up United Nations headquarters, the Lincoln

and Holland tunnels, the George Washington Bridge, and the New York federal building. The George Washington Bridge has been used for shipments of irradiated fuel and plutonium from Brookhaven National Laboratory to the Savannah River Site.

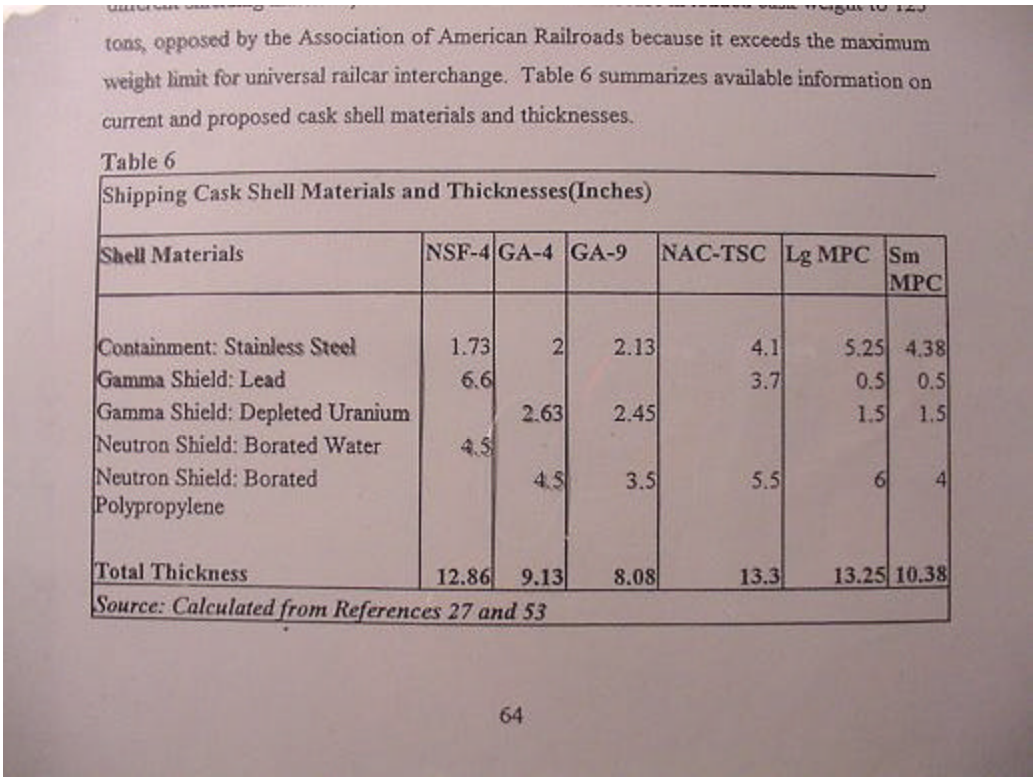
"The willingness of terrorists to kill or injure large numbers of Americans, demonstrated in the World Trade Center and Oklahoma City bombings, compels any current assessment to focus on incidents that are clearly intended to cause, or could cause, radiological sabotage." The FBI's Terrorism in the United States: 1995 reported: "In the past year, the country witnessed the re-emergence of spectacular terrorism with the Oklahoma City bombing. Large-scale attacks designed to inflict mass casualties appear to be a new terrorist method in the United States."

[Nuclear Waste Transportation Security and Safety Issues: The Risk of Terrorism and Sabotage Against Repositort Shipments, Halstead and Ballard, December 1998]

Incidents of rail and highway sabotage reveal that: 1) terrorist attacks would likely be designed to inflict maximum human injury, 2) electronic warning systems designed to alert officials and prevent accidents can be defeated by technical countermeasures, 3) effective attacks using home made explosives are possible, avoiding the need for exotic military weapons to breach transport containers, and 4) saboteurs have the ability to create damage which exceeds the containment standards of NRC certified shipping containers.

Halstead and Ballard state that risk assessments must consider direct attacks on transport casks using high energy explosive devices with or without capture of the shipments. Capture and control of the cask by terrorist agents would allow the cask to be breached with a variety of devices including commercially available conical shaped charges and cutting charges, or a massive diesel fuel-fertilizer truck bomb. Attackers may use transport personnel as hostages to retain control of the cask for hours. With the timed gained, attackers could increase the effect of explosives by removing barriers and applying them to the most vulnerable part of the cask. A GA 4 truck cask with four PWR conventional fuel assemblies would contain 850,000 curies. The NAS-TSC rail cask with 26 assembles would hold 5.5 million curies.

Shipping Cask Shell Materials and Thicknesses



tons, opposed by the Association of American Railroads because it exceeds the maximum weight limit for universal railcar interchange. Table 6 summarizes available information on current and proposed cask shell materials and thicknesses.

Table 6

Shipping Cask Shell Materials and Thicknesses(Inches)

Shell Materials	NSF-4	GA-4	GA-9	NAC-TSC	Lg MPC	Sm MPC
Containment: Stainless Steel	1.73	2	2.13	4.1	5.25	4.38
Gamma Shield: Lead	6.6			3.7	0.5	0.5
Gamma Shield: Depleted Uranium		2.63	2.45		1.5	1.5
Neutron Shield: Borated Water	4.5					
Neutron Shield: Borated Polypropylene		4.5	3.5	5.5	6	4
Total Thickness	12.86	9.13	8.08	13.3	13.25	10.38

Source: Calculated from References 27 and 53

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From Nuclear Waste Transportation Security and Safety Issues: The Risk of Terrorism and Sabotage Against Repositort Shipments, Halstead and Ballard, December 1998, page 64

Full scale tests by Sandia National Laboratory published in 1983 utilized a military shaped charge (US Army M3A1) on a GE IF-200 truck cask containing unirradiated fuel. Even this outdated test demonstrated that the cask could be breached and that radioactive materials would be released. Based on these tests, NRC proposed relaxed rules for shipments in 1984, but public criticism caused the rulemaking to be "terminated."

Sandia Full-Scale Test Results

Hole diameter	**6.0 inchs (15.2 cm)**	
Fuel rods damaged	**111 of 223**	**50%**
Fuel mass fractured	**45.8 pounds (20.82 kg)**	**10%**
Fuel masss released	**5.6 pounds (2.55 kg)**	**1%**
Released as aerosol	**1/10 ounce (2.94 grams)**	

Current weapons, such as the Superdragon anti-tank missile, are more powerful and can penetrate 18 inches of armor plate. This weapon was used by the U.S. in Operation Desert Storm, and is used by at least ten other nations.

Superdragon Anti-Tank Missile

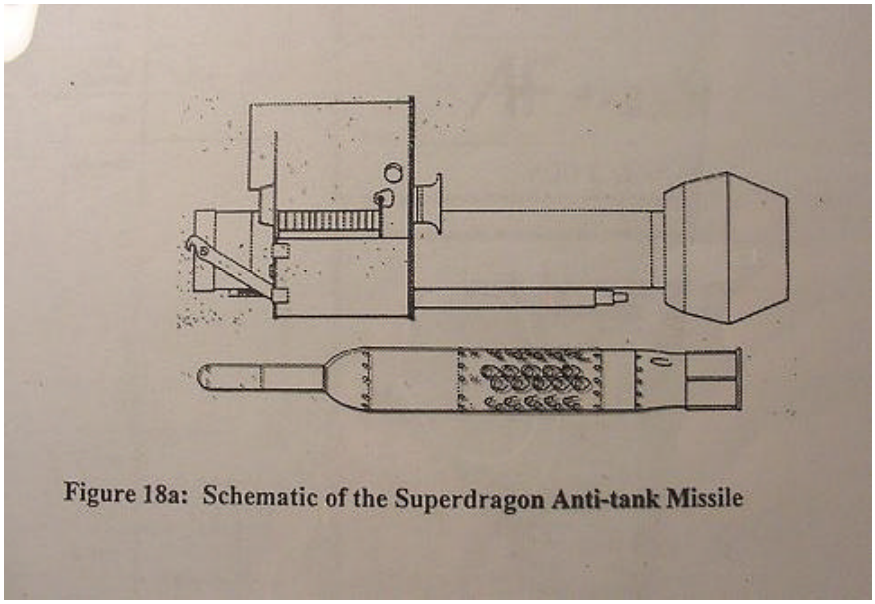

Figure 18a: Schematic of the Superdragon Anti-tank Missile

From Nuclear Waste Transportation Security and Safety Issues: The Risk of Terrorism and Sabotage Against Repositort Shipments, Halstead and Ballard, December 1998, page 57

The release of even more toxic radioactive elements would cause more fatalities immediately following an accident. Lindsay Audin's analysis of fuel rod behavior during incidents involving sabotage explains how much greater amounts of fine particles and vapors would be released from a conventional irradiated fuel cask.

"An attempt to disperse the fuel would likely involve a high explosive device that must first penetrate a transport cask. Such a device would penetrate one or both sides of the cask, shatter the fuel rods and pellets in its path, and heat the area along that path. The shock and heat involved would...initiate several processes not normally experienced by uranium dioxide and zirconium alloy. At high temperatures in the presence of oxygen, both materials will change form. Uranium dioxide UO_2 will "reoxidize" and become U_3O_8...expanding and forming a very fine power in the process. Zirconium will literally ignite, vaporizing itself.... The fuel pellets may also shatter back to the consistency of the uranium power involved in their manufacture. Ruthenium will vaporize and combine with oxygen to form minute particles, while other elements, such as iodine, will be released as gases."

[Analyses of Cask Sabotage Involving Portable Explosives: A Critique, Lindsay Audin, 1989]

Emergency Response Problems

Emergency response to rail or highway accidents must be well-prepared and rapid. Delays in response to accidents which involve the release of radioactive material would expose unknown numbers of people to negative health effects. In 1996, a DOE Transport and Safeguards Division Safe Secure Transport (SST) trailer carrying nuclear weapons slid off the road and rolled over in rural Nebraska. Four hours elapsed before DOE headquarters were notified, and it was 20 hours before a Radiological Assistance Program team determined there was no release.

A similar delay in response to a irradiated fuel accident could make effective emergency response dangerous and clean-up impossible. The following comment by the Georgia Environmental Protection Division cites vehicular tests of powdered materials deposited on roadways and reveals a fundamental problem with radioactive fuel which is in an oxide or powdered form.

"After passage of about 100 cars only a small fraction of the original contamination remained on the road surface. Unless emergency officials promptly close the accident scene to vehicle traffic (an unlikely situation), emergency responders may face an incident scene that is, unknown to them, extremely hazardous due to respirable plutonium. Post emergency actions may also be complicated due to the enhanced spread of contamination by vehicle traffic."

~Georgia Environmental Protection Division comments on DOE SPD DEIS

Nuclear Regulatory Commission Plans to Weaken Safeguards

Federal regulations require that the dose rate 6 feet from the external surface of the transportation vehicle not exceed 10 millirem per hour. But, according to the State of Nevada, there is no operating experience with spent fuel shipments in actual GA 4/9 transport casks. Also, traffic gridlock incidents could result in individual exposures of 30-40 millirem per person. [Comments of April 1999 by Nevada Agency for Nuclear Projects on need for spent fuel transport impact assessment by nuclear plant operators, FR 2/26/99]

"A terrorist incident resulting in a one percent release of cask contents would have radiological consequences far greater than those assumed in the outdated DOE and NRC consequence assessments."

[Nuclear Waste Transportation Security and Safety Issues: The Risk of Terrorism
and Sabotage Against Repositort Shipments, Halstead and Ballard, December 1998]

Incredibly, the Nuclear Regulatory Commission now proposes weakening the already inadequate requirements for Type B transport containers (used for irradiated fuel) without fully informing or involving all of the communities along the potential transport routes for irradiated fuel. The NRC also proposes to weaken the requirements for containment of plutonium at the very point in time that we face major increases in the amount of plutonium transport.

The United States Department of Energy predicts an accident rate of 11.9 rail accidents per million shipment miles, or an accident every 84,000 miles. For trucks the figures are 0.7-3.0 accidents per million shipment miles.

In a letter to the Secretary of the Nuclear Regulatory Commission, Janet Marsh Zeller, Executive Director of the Blue Ridge Environmental Defense League, opposed this rollback, saying,

"NRC must not abandon the double-lined containment for plutonium shipments. If, as some industrial representatives submitted on August 10, other radionuclide shipments are as dangerous as plutonium shipments, then the use of double containment must be extended to those dangerous transports. Further, the people of New Mexico and those communities along the transport routes to the WIPP facility have been promised by Congress that these shipments will have double containment. If the ill-advised plutonium fuel program moves forward for the Duke reactors in the southeast, the people of our region will demand transport containment with no radiation exposure."

September 29, 2000 BREDL letter to USNRC and USDOT

The Costliest Construction Project in History

To date, the federal government has spent $7 billion on studying and developing a nuclear waste dump for irradiated fuel rods from commercial nuclear power reactors. The Nevada Nuclear Projects Agency reports that $4 billion has been spent on Yucca Mountain alone. And an assessment commissioned by the state of Nevada reveals that the total cost of operating a repository at Yucca Mountain would be over $53.8 billion.

Originally, nuclear waste costs were supposed to be paid by a tax on electric power from nuclear reactors. The Nuclear Waste Fund now totals about $10 billion, and DOE estimates the fund will provide only $28 billion. U.S. taxpayers would have to pay the remainder: $25.8 billion.