Rx FOR SECURITY

Preventing Nuclear Terrorism

# SECURING RADIOACTIVE WASTE

There are currently 104 nuclear power reactors licensed to operate in the United States, producing about 20 percent of our nation's electricity. As a result of the nuclear fuel cycle, however, large quantities of radioactive waste are generated in this process. The storage and disposal of these materials presents a major health and safety challenge for the United States. Poorly stored nuclear waste is a tempting target for terrorists interested in causing mass panic. As International Atomic Energy Agency (IAEA) Director General Dr. Mohamed El Baradei warned in November 2004, the world has been "alerted to the potential of terrorists targeting nuclear facilities or using radioactive sources to incite panic, contaminate property, and even cause injury or death among civilian populations."[1] What is the nature of these risks, and can radioactive waste be secured?

**Types of Radioactive Waste**

Nuclear power plants produce both high-level and low-level radioactive waste.

High-level radioactive waste refers to materials produced as a direct by-product of nuclear energy or weapons production. High-level waste includes spent reactor fuel as well as the waste materials from spent fuel reprocessing. Spent fuel is thermally hot and highly radioactive.[2] U.S. nuclear power plants and nuclear weapons production activities have already generated over 40,000 tons of high-level waste that is stored around the country at various commercial and government facilities. Continuing nuclear power production in the country adds another 2,000 tons of additional waste every year to this highly lethal stock.[3]

*Low-level radioactive solid waste storage tanks: DOE*

Low-level radioactive waste includes materials that have become contaminated through exposure to radiation or radioactive particles. This includes filters, tools and equipment, rags, protective clothing, and construction supplies. Although characterized as "low-level," the radioactivity of these materials ranges from levels just above those found in nature to very high levels.[4]

The current classification of nuclear waste in just two categories, high-level and low-level, is considered of limited utility by a number of scientists and public interest organizations because, as indicated, it permits huge quantities of nuclear waste containing levels of radiation with potential significant public and environmental risk to be regarded as a "low-level" risk. A prudent proposal that could offer more health protection would be to create a separate mid-level nuclear waste category that would facilitate the design of better storage, transportation and disposal methods based on the true radioactive content of the material.

**THE DEPARTMENT OF ENERGY PREDICTS 66 TRUCK ACCIDENTS; OTHERS PREDICT AS MANY AS 130 ACCIDENTS DURING SHIPMENT OF HIGH-LEVEL WASTE**

**On-Site Storage of Radioactive Waste**

With current technologies, nuclear waste can only become safe through gradual radioactive decay. Therefore, the waste must be stored and disposed of in a way that protects the public from exposure to these materials which will remain for up to hundreds of thousands of years.

Under current regulations, low-level waste is typically stored on-site until it has decayed and can be disposed of as ordinary trash or until volumes are large enough for shipment to a low-level waste disposal site. Since high-level waste contains higher levels of radioactivity, its storage and disposal is more complicated. Spent fuel rods are stored, on-site, in large tubs of water called spent fuel pools. The pools are filled with circulating water, which removes heat from the rods and acts as a radiation shield. After cooling for at least one year, the rods can be moved into dry storage casks.[5] Because dry storage is more expensive; however, many nuclear power facilities choose to leave rods in the spent fuel pools until they reach capacity. Some spent fuel pools hold 800-1,000 tons of radioactive spent fuel rods.[6]

Spent fuel pools are not secure from attack or sabotage. Many are above ground, protected by a corrugated steel super-structure unlikely to withstand an attack. A plane crash or large explosion could displace or evaporate enough water to leave the radioactive rods exposed. The resulting build-up of heat would trigger a release of radiation large enough to have significant public health and environmental impacts. In fact, the damage from an attack on a spent fuel pool could exceed the effects of the Chernobyl accident in 1986.[7]

A National Academy of Sciences report concluded in March 2005 that there is a significant risk of a terrorist attack on a spent fuel pool and that the federal government should act to expedite the transport of spent fuel rods to dry storage casks that are more resilient against attacks.[8] In April 2005, the U.S. Government

Accountability Office criticized the nuclear power industry and Nuclear Regulatory Commission (NRC) for failing to keep track of nuclear spent fuel.[9] In one "worst-case" scenario, unsecured waste at nuclear power facilities could be stolen and used by terrorists to build "dirty bombs," which use conventional explosives to disperse radioactive material.

*Road Transport of high level nuclear waste. (Cherbourg, France)*

**Transportation of Radioactive Waste**

At present, most high-level radioactive waste is stored at the power plant at which it was generated. Because of plans to open a central storage repository at Yucca Mountain in Nevada, however, transportation of high-level waste is projected to increase in the future. Nuclear power plants are located throughout the U.S., so shipments would pass through 44 states and the District of Columbia to get to the Nevada repository.

Approximately 108,500 truck shipments would be required to move the 77,000 tons of high-level waste expected to be buried at Yucca Mountain nuclear waste dump. The U.S. Department of Energy predicts 66 truck accidents during this transportation process; others predict as many as 130 accidents during shipment.[10] According to the U.S. Department of Transportation, an accident could result in cask failure and the release of radioactivity. The resulting contamination could cause thousands of deaths and would cost billions of dollars to clean up.[11] Meanwhile, shipments traveling in or near major U.S. cities could put millions of people at risk of exposure to radiation. [12]

Although shipment casks are designed and tested for resilience against many accident-related stresses, their ability to withstand significant intentional damage has not been determined. A dedicated terrorist organization or saboteur could possibly obtain information about shipping dates and routes, making nuclear waste shipments vulnerable to attacks and sabotage.[13]

**Recommendations**

The risks associated with current storage and disposal methods for radioactive waste are too grave to ignore. Several short- and long-term actions should be taken to improve the security of radioactive materials and to reduce the threat to public health:

- For long-term on-site storage, spent fuel rods should be moved out of spent fuel pools and into more secure dry storage casks in fortified structures;
- The NRC should enforce existing federal regulations requiring nuclear power facilities to provide adequate security to protect spent fuel from theft or sabotage;
- The NRC should also require every licensed nuclear power plant to provide a comprehensive risk assessment regarding the survivability of its spent fuel storage facilities from a terrorist attack;
- The U.S. should encourage serious and objective research to develop scientifically-sound solutions to permanent storage and disposal of nuclear waste while ensuring that these solutions meet public health and environmental safety standards;
- The U.S. should work with the IAEA to develop appropriate international mechanisms for nuclear material tracking and control;
- Finally, in the long run, PSR believes there is no substitute for the phasing-out of nuclear power and replacing it and fossil fuels with safe, renewable and sustainable energy technologies as a viable path to improved health and security. There is a need to develop stricter domestic licensing, security requirements and inspection procedures for all dangerous radioactive material, and take steps to promote such measures internationally. In line with this recommendation, there is a need to:

1. Fund research aimed at finding alternatives to radioactive materials used in food sterilization, smoke detection, and oil well drilling. This will limit the spread of material that can be used in a dirty bomb.
2. Better fund, train and equip our first responders, our hospitals, and public health facilities so they can respond to an attack in the event that prevention efforts are not adequate.

**NOTES**


1. ElBaradei M. "Comment on the First Anniversary of the Terrorist Attacks in the United States." International Atomic Energy Agency. 11 September 2002.
2. "Low-Level Waste." http://www.nrc.gov/waste/low-level-waste.html. Nuclear Regulatory Commission. Accessed 7 April 2005.
3. "High-Level Waste." http://www.nrc.gov/waste/high-level-waste.html. Nuclear Regulatory Commission. Accessed 8 April 2005.
4. Pianin, E, "Nevada Nuclear Waste Site Chosen." Washington Post. 11 January 2002. A01.
5. "Dry Cask Storage." http://www.nrc.gov/waste/spent-fuel-storage/dry-cask-storage.html. Nuclear Regulatory Commission. Accessed 7 April 2005.
6. Vedantam S. "Storage of Nuclear Spent Fuel Criticized." Washington Post. 28 March 2005. A01.
7. Helfand I, Forrow L, Tiwari J. "Nuclear Terrorism." British Medical Journal. Vol. 324. 9 February 2002. 356.
8. Vedantam S. "Nuclear Plants Are Still Vulnerable, Panel Says." Washington Post. 7 April 2001. A12.
9. Vedantam S. "Nuclear Plants Not Keeping Track of Waste." Washington Post. 12 April 2005. A19.
10. Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High Level Radioactive Waste at Yucca Mountain, Nye County, Nevada (FEIS). U.S. Department of Energy. EOE/EIS 0250. February 2002. 6-47.
11. Lamb M, Resnikoff M. Radiological Consequences of Severe Real Accident Involving Spent Nuclear Fuel Shipments to Yucca Mountain: Hypothetical Baltimore Rail Tunnel Fire Involving SNF. Radioactive Waste Management Associates. September 2001. 13-16.
12. Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High Level Radioactive Waste at Yucca Mountain, Nye County, Nevada (FEIS). U.S. Department of Energy. EOE/EIS 0250. February 2002. J-37.
13. Ballard JD. Shelter in Place: Necessary Logic Behind Nuclear Waste Security. Prepared for the Nevada Agency for Nuclear Projects. January 2002.



1875 Connecticut Ave. NW
Suite 1012
Washington, DC 20009
202-667-4260
http://www.psr.org

PSR® Physicians for Social Responsibility

1985 NOBEL PEACE PRIZE
U.S. Affiliate of International Physicians for the Prevention of Nuclear War