Savannah River Site Citizens Advisory Board

Recommendation 163

High Activity TRU Waste Packaging

Background
Transuranic (TRU) waste is defined in DOE Order 435.1 as waste contaminated with alpha-emitting transuranic radionuclides (radionuclides with atomic numbers greater than 92) with half lives greater than twenty years and in concentrations greater than 100 nanocuries per gram of waste matrix. The Waste Isolation Pilot Plant (WIPP) has been developed as the repository for all of the DOE TRU waste. The Savannah River Site (SRS) has two principal types of TRU waste, a low activity waste contaminated with Pu-239 and a high activity waste contaminated with Pu-238. Activity is based upon half-life; thus, Pu-239 has a half-life of 24,500 years whereas Pu-238 has a much shorter half-life of about 88 years. This means that a gram of Pu-238 is approximately 280 times more radioactive weight for weight than a gram of Pu-239.

However, depending upon the amount or weight loading of each radionuclide, both waste streams can present significant risk levels, especially for Pu-238 wastes intermixed with organics (hydrogen containing materials), which can generate flammable hydrogen gases. As of April 14, 2003, 100 shipments of Pu-239 waste have been shipped to WIPP. SRS has 80% of the high activity TRU waste, Pu-238, in the DOE complex. However, no shipments of Pu-238 waste have taken place. This is mainly due to the transportation challenges associated with the size of bulk containers holding the high activity waste and the need to mitigate the hydrogen gas concerns. These issues can be resolved with the use of the TRUPACT III shipping container for the bulk containers and the Arrow Pak shipping container for wastes with the potential to generate hydrogen gas (Ref. 1).

Hydrogen gas generation issues have been an area of concern for the transport and storage of radioactive materials in the DOE Complex for a number of years. The mechanism of radiolytic formation of hydrogen gas is the interaction of radioactive decay with hydrogenous materials such as water, plastics, and oils. Radioactive wastes, residues, and nuclear materials frequently contain hydrogenous matter that generates hydrogen. The potential for a detonation or deflagration of flammable gases in a package containing radioactive materials is mitigated by not allowing a flammable mixture.

Gas getters chemically scavenge hydrogen from the gas phase and bind it in a solid state. Gas getters have the potential to mitigate hydrogen gas generation in packages containing waste and hydrogenous materials. If gas getters can be shown to be reliable, they may expand the payload for packages containing nuclear materials, TRU waste intended for disposal at WIPP (Ref. 2).

Comment
The SRS CAB has been a strong advocate for DOE to institute an accelerated schedule for removing all of the TRU wastes from SRS (Ref 3 & 4). Since SRS has the largest inventory of high activity TRU waste in DOE and no waste shipments are planned in the near future, this waste remains a great risk to the environment and the public near SRS and a great concern of the SRS CAB.

Recommendation
The SRS CAB makes the following recommendations:

1. DOE accelerate shipments of high activity TRU waste from SRS by expediting the design, certification and fabrication of the TRUPACT III shipping containers. These

containers must be designed to alleviate the hydrogen gas concerns. These shipping containers are needed as soon as possible and should be available to allow the first shipment of SRS high activity TRU waste to be compatible with the PMP shipping schedule of FY 05.

2. DOE expedite the design, certification and fabrication of the Arrow Pak shipping containers. These shipping containers are needed as soon as possible and should be available to allow the first shipment of SRS high activity TRU waste with the potential to generate hydrogen gas to be compatible with the PMP shipping schedule of FY 05.
3. DOE continue the investigation into hydrogen "getters" and have them available as soon as possible to ensure that the shipments of SRS high activity TRU waste with the potential to generate hydrogen gas is compatible with the PMP shipping schedule of FY 05.

References

1. Transuranic (TRU) Waste, presentation to the WM Committee by Sonny Goldston, April 17, 2003.
2. "Hydrogen Gas Generation research and the Resolution of Programmatic Issues in the DOE Complex", ENG-RPT-022, Rev. 1, J. G. McFadden, April 29, 1999.
3. Citizens Advisory Board Recommendation No. 153 (adopted April 23, 2002), "TRU Waste Priority and Offsite Shipments".
4. Citizens Advisory Board Recommendation No. 155 (adopted July 23, 2002), "TRU Waste Shipment Acceleration".

Agency Responses

Department of Energy-SR