Fact Sheet

U.S. DEPARTMENT OF ENERGY | Legacy Management

Missouri University Research Reactor Site

An MED/AEC legacy site

The **Missouri University Research Reactor (MURR)**, is a university-owned site, known to the **U.S. Department of Energy Office of Legacy Management** as a **Manhattan Engineer District/Atomic Energy Commission Legacy Site**. In 2005, after remediation of DOE-related research, associated long-term stewardship activities transferred to the Office of Legacy Management (LM). LM is responsible for managing the records related to projects completed at MURR and as necessary, responds to stakeholder inquiries.

Site Information and History

A research project, titled the Transuranic Management by Pyropartitioning Separation (TRUMP-S), was performed in the Alpha Laboratory at the Missouri University Research Reactor (MURR) facility in Columbia, Missouri. This project evaluated the feasibility of separating radioactive fission products with longer half-lives from those with shorter half-lives. The research was intended to prove that longer-lived products, called actinides, would be converted into shorter-lived products through the process known as transmutation. Successful removal of actinides from the fission products by transmutation, could reduce the volume of high-level radioactive waste by extracting the long-lived transuranic elements and uranium from the shorter-lived elements in spent fuel without generating liquid radioactive waste.

Beginning in 1988, the DOE Oakland Operations Office, before its closure, participated in the TRUMP-S project to evaluate the feasibility of reducing the waste volume of spent nuclear reactor fuel. Other research partners involved in the project were Rockwell International, the Central Research Institute for the Electric Power Industries of Japan, and Kawasaki Heavy Industries of Japan. The Japanese agencies provided funding for the research and subsequent decontamination of the facility. DOE supplied the transuranic materials and agreed to manage the waste in return for information gained about actinide partitioning and the transmutation process. Rockwell and MURR technical staff conducted the research. Radioactive materials used in the TRUMP-S project were managed by the university under their NRC Broad Scope Materials License. “Transuranic” refers to man-made elements with an atomic weight greater than that of uranium, the heaviest naturally occurring element.

Two primary goals of the TRUMP-S project were to demonstrate that 99% of the actinides could be recovered from a radioactive PUREX (plutonium-uranium extraction) residue and that the recovered actinides could be concentrated in a product that is at least 90% actinides. A secondary goal was to demonstrate the rate at which the actinides could be recovered from PUREX residue while meeting the primary process goals. Experiments at the MURR facility used chemical and electrochemical separation in a process involving molten salts and cadmium (the pyropartitioning part of the TRUMP-S process). Transmutation of the actinides was not included in the scope of the project.

The TRUMP-S research project was completed in September 1997. The MURR facility completed decontamination and removal of all but the transuranic waste by late 1998. All TRUMP-S experiments took place inside the MURR Alpha Laboratory adjacent to the reactor room. The experiments involving radioactive materials were conducted inside three glove boxes, which are sealed compartments with long impervious gloves attached to ports for handling materials inside the boxes. Two of the boxes had a volume of about 1 cubic meter each; the third had a volume of about 2 cubic meters. The adjacent glove boxes were connected by ports, which allowed the transfer of samples and other materials from one box to the next. Laboratory equipment used during the experiments consisted of instrumentation cabinets, file cabinets, and a tool cabinet. Materials inside the instrument cabinets used during the experiments, glove boxes, and all piping and tubing associated with the glove boxes were disposed of as radioactive waste. All other equipment associated with

the experiments was surveyed for radioactivity, and uncontaminated equipment was released to the MURR facility staff. The glove boxes were decontaminated, surveyed for radioactivity, removed, and packaged for shipment to GTS Duratek's Bear Creek facility in Oak Ridge, Tennessee, for reuse. The Alpha Laboratory received a final radiometric survey to verify that no radioactivity exceeded background levels or levels present before the start of the project.

The project generated about 1.4 cubic meters of material classified as mixed transuranic waste, which was packed into seven drums. In all, the regulated waste material consisted of about 1,400 grams of cadmium, 0.8 gram of silver, 2.4 grams of americium-241, 1.5 grams of plutonium-239, 3.55 grams of neptunium-237, and 5.5 grams of uranium-238.

Regulatory Setting

All activities involving radioactive materials used in the TRUMP-S project were managed under MURR's U.S. Nuclear Regulatory Commission (NRC) Reactor License for the facility. MURR's NRC Material License imposed additional requirements regarding security of special nuclear materials and emergency response. The Federal Facility Compliance Act of 1992 (Public Law 102-386) required DOE to prepare a Site Treatment Plan describing the course of action DOE proposed for storing and treating mixed waste in compliance with state and federal regulations. The proposed Site Treatment Plan also had to meet state or U.S. Environmental Protection Agency approval. All mixed waste generated during the project was managed according to requirements of the Atomic Energy Act and the Resource Conservation and Recovery Act (RCRA). DOE's proposed Site Treatment Plan was approved by the Missouri Department of Natural Resources, which also has oversight for RCRA wastes in the state of Missouri.

Waste Disposal

DOE's objective was to ship the drums to the underground Waste Isolation Pilot Plant (WIPP) near Carlsbad, New Mexico. Although the drums were packed in compliance with WIPP's Waste Acceptance Criteria, the waste needed to be certified as acceptable for WIPP, which by law can accept only defense-related transuranic waste in special containers. The drums remained in storage at the MURR site pending certification of acceptability and the opening of WIPP. In June 2002, DOE's Argonne National Laboratory in Argonne, Illinois, applied to amend its RCRA permit so that it could receive the MURR waste and hold it for up to six months to conduct certification. The state of Illinois approved the modification, and DOE shipped the drums by truck to Argonne in May 2003. By then, WIPP had opened, and DOE shipped the drums to WIPP in July 2003. WIPP retains the records of waste composition, packaging, and burial location.

Legacy Management Activities

No monitoring, maintenance, or site inspections are required for the MURR site. LM's responsibilities consist of managing site records and responding to stakeholder inquiries.

CONTACT INFORMATION

IN CASE OF AN EMERGENCY AT THE SITE, CONTACT 911

LM TOLL-FREE EMERGENCY HOTLINE: (877) 695-5322

Site-specific documents related to the **Missouri University Research Reactor Site** are available on the LM website at **www.energy.gov/lm/missouri-university-research-reactor-murr-missouri-site**

For more information about LM activities at the **Missouri University Research Reactor Site**, contact:

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