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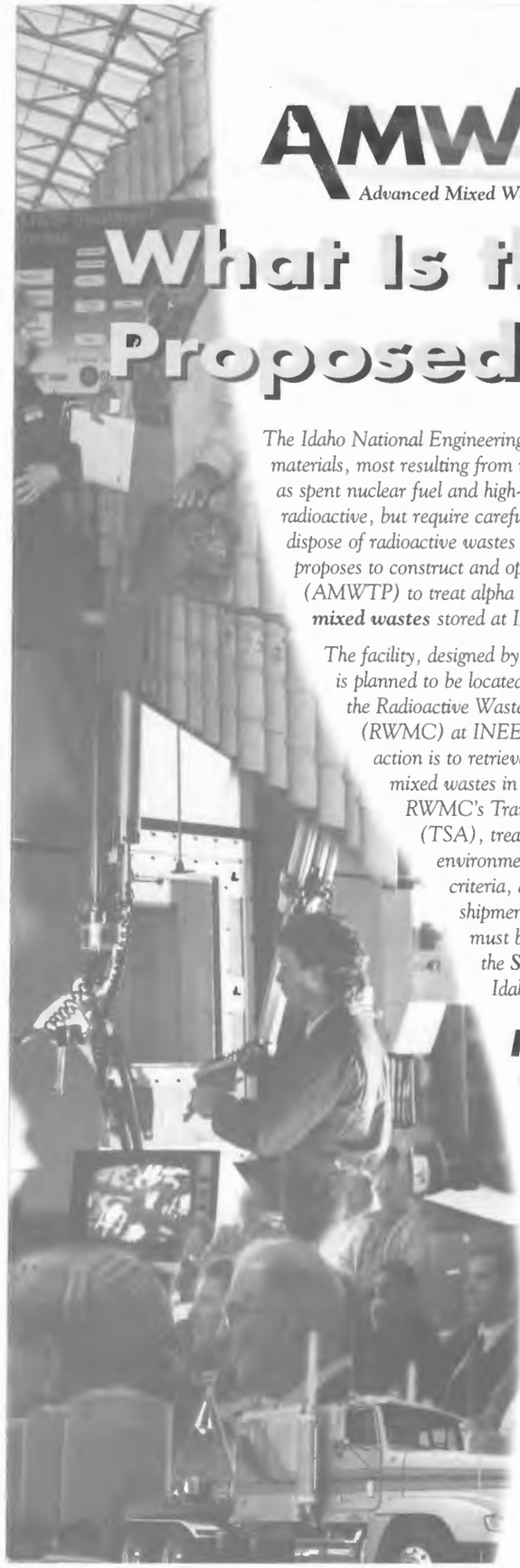
AMWTP

Advanced Mixed Waste Treatment Project

Public Reading Room
U. S. Department of
Idaho Operations Offi



What Is the Proposed Action?

The Idaho National Engineering and Environmental Laboratory (INEEL) stores a variety of radioactive materials, most resulting from national defense programs. Some of the material is extremely radioactive—such as spent nuclear fuel and high-level waste; other types, such as low-level and transuranic waste, aren't as radioactive, but require careful handling and special disposal. In line with its responsibility to manage and dispose of radioactive wastes in an environmentally sound manner, the Department of Energy (DOE) proposes to construct and operate a facility called the Advanced Mixed Waste Treatment Project (AMWTP) to treat alpha low-level and transuranic ***mixed wastes*** *stored at INEEL.*

The AMWTP's proposed location at the RWMC is adjacent to and replaces 65,000 cubic meters of mixed waste in TSA-RE. Some are shipment out of Idaho.

The facility, designed by a team led by BNFL Inc., is planned to be located within the boundaries of the Radioactive Waste Management Complex (RWMC) at INEEL. The goal of the proposed action is to retrieve 65,000 cubic meters of mixed wastes in temporary storage at the RWMC's Transuranic Storage Area (TSA), treat them to meet environmental laws and disposal criteria, and package them for shipment out of Idaho. All of this must be done in accordance with the ***Settlement Agreement****, which identifies milestones for getting waste out of Idaho and specifies monetary penalties for missing deadlines.*

Retrieval and Characterization

Before any treatment could begin, the waste must be retrieved and **characterized**. Some waste is already stacked in Type II storage modules (metal storage buildings set on concrete pads). Most of the waste is stored under an earthen berm enclosed within the Transuranic Storage Area Retrieval Enclosure (TSA-RE), a metal structure built to protect the environment during waste retrieval. The berm was constructed by stacking drums and boxes of waste on asphalt pads, and then covering the stacks with layers of plywood, plastic tarps, and soil up to 3 feet deep on top and up to 16 feet thick on the sides.

The first step for retrieval would be to uncover the waste containers. As planned, a vacuum system designed to minimize dust would be used to expose the wood and plastic for removal. Then, drums containing waste would be retrieved with a mobile crane, and a forklift would be used to remove boxes from the berm. As planned, all waste containers would be transferred to the Stored Waste Examination Pilot Plant (SWEPP), for non-intrusive characterization.

Words You Should Know

Characterization:

Examining or testing a waste to determine its physical, chemical, and radiological composition and properties.

Debris:

Solid material that is considered waste and is intended for disposal. Examples are pieces of metal, plastic, or wood.

Inert:

Having few or no active properties.

Inorganic:

Generally speaking, materials that do not contain carbon and are not derived from organic life forms, such as animal or vegetable. Examples of inorganic waste to be treated at the proposed facility are metals and glass.

Mixed Waste:

Waste that is contaminated with both radioactive and hazardous constituents.

Organic:

A chemical compound containing carbon. An example is carbon tetrachloride.

Physical Treatment:

Treatment that does not chemically alter the waste or destroy components, but rather alters the shape or arrangement of the waste.

Privatization:

A contract reform to boost performance and save taxpayer dollars by substituting private market mechanisms for government programs. Privatization seeks to improve management, reduce the costs of doing business, and shift financial risk to the private sector.

Characterization can be a simple process—such as looking in a container of waste to see what's in it, or more complex—such as collecting a sample for laboratory testing. We also can use our experience of how the waste was generated (process knowledge) or non-destructive examination using technology called **real-time radiography** to help determine the contents of unopened waste containers—similar to the airlines' use of non-destructive technology to check baggage. Once we know what's in them, the waste containers would be grouped by waste type in the storage modules. For example, soils would be stored in a certain area, metal debris in another, and so forth, enabling workers to efficiently gather similar wastes for similar treatment.

Pretreatment

After characterization, containers would be sent to the Pretreatment Building, where a series of operations would prepare the waste for treatment. Boxes would be opened on a sorting table in one area, drums in another. We would use tools, such as shears, to reduce the size of large objects. Wastes would be placed into drums according to the treatment process they await. For example, sheets of stainless steel would be placed into drums marked for macroencapsulation. Finally, drums would be moved to a staging area until treated.

What Are the Proposed Treatment Technologies?

The wastes at TSA vary greatly in their physical and chemical makeup. BNFL Inc. plans to use four primary technologies at the AMWTP that would enable us to treat almost 100% of the inventory: supercompaction, macroencapsulation, incineration, and vitrification. Supercompaction and macroencapsulation are **physical treatment** technologies; incineration and vitrification provide **thermal treatment**. The AMWTP would produce two final waste forms—vitrified waste and macroencapsulated waste—which are to be certified, packaged, and transported to the Waste Isolation Pilot Plant for disposal.

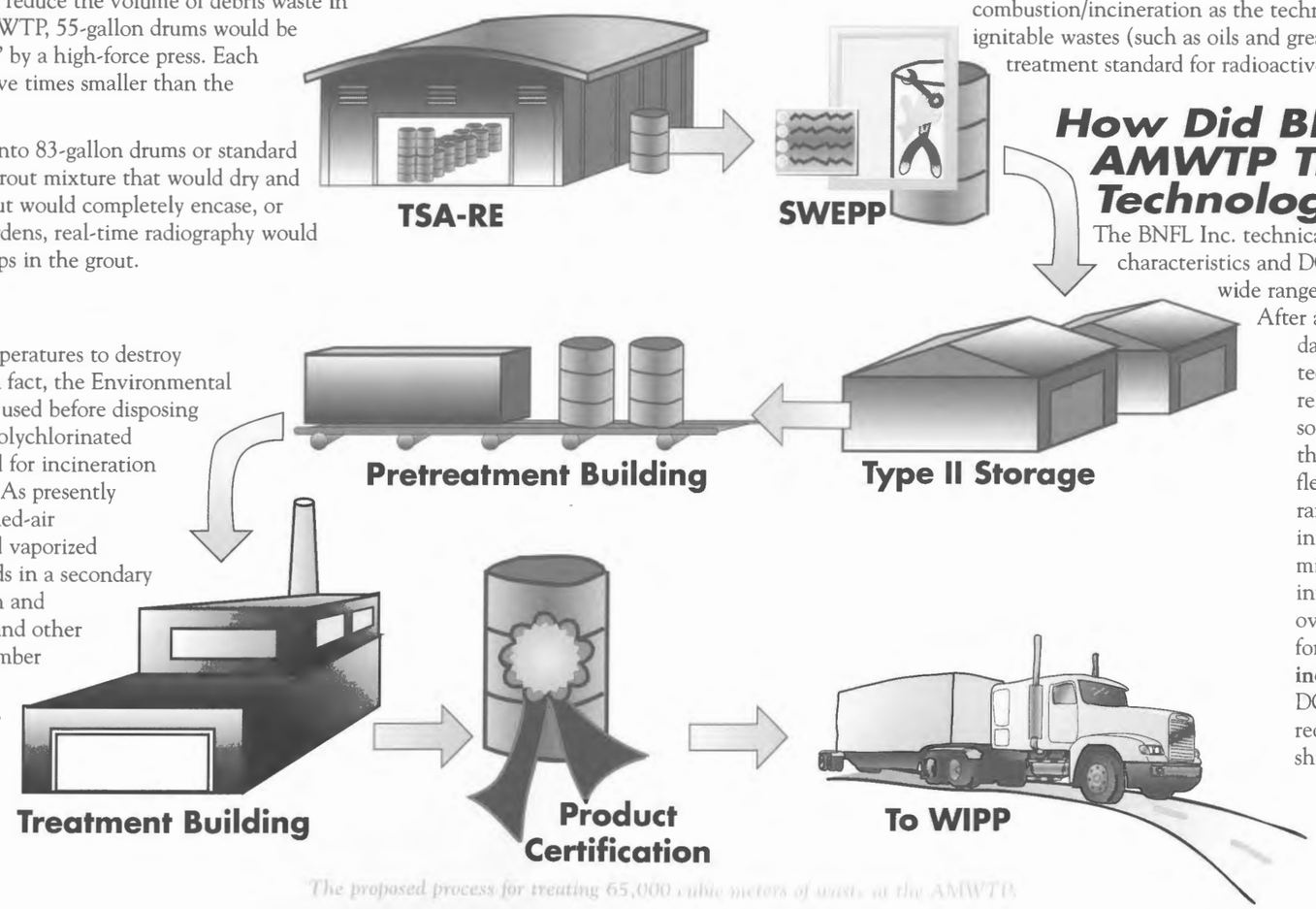
Physical Treatment

Physical methods will be used on heterogeneous **debris**—a diverse category including paper, plastic, wood, and metal. The primary purpose of supercompaction would be to reduce the volume of debris waste in preparation for macroencapsulation. At the AMWTP, 55-gallon drums would be supercompacted into smaller bundles, or "pucks," by a high-force press. Each puck would have about an 11-gallon volume—five times smaller than the original drum.

Waste for macroencapsulation would be loaded into 83-gallon drums or standard waste boxes, which would then be filled with a grout mixture that would dry and harden around the waste, like concrete. The grout would completely encase, or macroencapsulate, the waste. After the grout hardens, real-time radiography would be used to confirm that there are no cracks or gaps in the grout.

Thermal Treatment

Incineration is the burning of wastes at high temperatures to destroy hazardous **organic** (carbon-based) compounds. In fact, the Environmental Protection Agency specifies that incineration be used before disposing of waste containing certain toxic organics, like polychlorinated biphenyls (PCBs). Waste at TSA currently slated for incineration includes soils and organic and **inorganic** sludges. As presently planned, the waste would be burned in a controlled-air incinerator. Then the gasses (including unburned vaporized compounds) would spend a minimum of 2 seconds in a secondary combustion chamber to ensure a high destruction and removal efficiency of polychlorinated biphenyls and other organics. The exhaust leaving the secondary chamber would enter the air pollution control system, passing through quenching, scrubbing, demisting, and reheating equipment; fans; high-efficiency filters; and then out the stack. Stack emissions would be monitored to ensure protective air quality standards are met.



The proposed process for treating 65,000 cubic meters of waste at the AMWTP

Vitrification is a high-temperature process that immobilizes waste material, resulting in a glass-like solid. At the AMWTP, ash and residues remaining from the incinerator would be fed to the vitrifiers, along with glass-forming additives. The vitrifiers would heat the mixture to a temperature in the range of 1100-1300 degrees Celsius (2012-2372 degrees Fahrenheit). The molten glass product would be poured into 40-gallon drums, which would be overpacked into 55-gallon drums to meet requirements for transportation and disposal. Off-gasses would pass through an air pollution control system to meet air quality standards.

What is DOE's Basis for Treatment Technology Selection?

In 1994 DOE selected three teams of companies to do feasibility studies for treating the alpha low-level and transuranic mixed wastes at TSA, and encouraged all parties to explore innovative approaches to waste treatment. Each team delivered plans for business, technology, licensing and regulations, transportation and waste transfer, and public acceptance. All three reached similar conclusions regarding what they could treat and how they could do so most efficiently. DOE used the teams' recommendations as an initial step in procuring treatment services from the private sector. After an exhaustive competitive bidding process, DOE awarded the **privatized** contract to a team led by BNFL Inc.

In choosing a suite of technologies, the BNFL team gave preference to "Best Demonstrated Available Technologies," specified by the Environmental Protection Agency as the most effective commercially available means of treating specific types of hazardous waste. These technologies substantially reduce the toxicity of hazardous waste or reduce the likelihood that hazardous constituents will migrate from the waste. For example, the Agency has identified combustion/incineration as the technology-based standard for treating ignitable wastes (such as oils and grease) and macroencapsulation as the treatment standard for radioactive lead solids.

How Did BNFL Select the AMWTP Treatment Technologies?

The BNFL Inc. technical team evaluated the wastes' characteristics and DOE's processing requirements against a wide range of available treatment technologies. After analyzing abundant research and other data, the team selected a group of technologies that, together, offers the most reliable, safe, proven, and cost-effective solution. These technologies are proven for the treatments required, and provide flexibility for treating (or handling) a wide range of waste characteristics. Also, the integrated facility would produce only minimal secondary waste (which is fed back into the process) and would attain a high overall volume reduction. The final waste forms would be stable, highly durable, and **inert**. The treatment processes would enable DOE to meet regulatory and disposal requirements and would ready the waste for shipment out of Idaho.

Processing is scheduled to begin on March 31, 2003. The AMWTP would be designed to operate on an around-the-clock schedule (24 hours per day, 365 days per year) until the year 2015. This means that about one drum would be treated every 30 minutes, for 13 years.

Real-time Radiography:

A method of "seeing inside" an object, like a drum of waste, without penetrating or opening it. Using x-rays, a radiography machine provides immediate pictures.

Settlement Agreement:

A court-ordered agreement among the State of Idaho, DOE, and the Navy. Under the Settlement Agreement, DOE must ship out the transuranic waste stored at TSA by a target date of the year 2015 and no later than 2018. According to the Agreement, after January 1, 2003, a running average of no fewer than 2,000 cubic meters per year will be shipped out of Idaho.

Site-Wide Environmental Impact Statement:

A unique, two-volume National Environmental Policy Act study that evaluates national (programmatic) management of DOE-owned spent nuclear fuel (Volume 1) and site-specific waste management at INEEL (Volume 2). The actual title of this April 1995 Environmental Impact Statement: Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement.

Thermal Treatment:

Treatment by application of high temperatures to destroy hazardous components.

Safety and Health

The technologies selected have already been used at other facilities for treating radioactive wastes—we know from experience that they can be integrated into an efficient process able to be operated safely, with minimum maintenance. The AMWTP design incorporates multiple engineered measures and controls to keep exposure to workers and the environment as low as reasonably achievable. For example, most of the waste handling would be done remotely, with operators viewing operations through shielded windows and closed-circuit television. Equipment like conveyor belts and robotic manipulators would be used to handle waste. Safety design also would include enforced administrative controls, like safety and training programs, limiting the amount of waste in enclosed systems, and reducing the time workers handle waste. The controls used to protect workers would protect the rest of us also. Plus, all processes would include controls and off-gas systems to minimize the release of hazardous or radioactive constituents to the environment.

Why Is the RWMC the Preferred Site for Treatment?

In preparing its proposal for the project, BNFL Inc. evaluated three possibilities for the facility site: off the INEEL, on INEEL property but outside the RWMC, or at the RWMC. Using selection criteria of regulatory issues, project cost, and public opinion, BNFL Inc. decided the RWMC is the preferred site for the AMWTP. First, that is where the waste is, reducing the need to transport waste to the treatment facility. Other reasons are:

- The facility can use existing systems for water, electrical power, roads, telephones, emergency response, and communications and alarms
- Facilities for the permitted storage of mixed waste are already there
- The site is secure and isolated
- The area is already built upon, so undeveloped areas would not be disturbed
- DOE already owns the property, minimizing the cost of land and construction.

DOE submitted a siting license application to the State of Idaho to locate the facility at the RWMC. The siting license application cited the findings of the 1995 **Site Wide Environmental Impact Statement**, in which the potential environmental impacts of facilities like the AMWTP were considered. As discussed in the application, the potential environmental impacts of siting the AMWTP at the RWMC are similar to, or less than, the impacts of facilities analyzed in the Environmental Impact Statement. A public hearing was held on August 14, 1997, in Arco, Idaho as part of the licensing process—the first of several public events that are part of the overall permitting process.

Before construction of the AMWTP can begin, the regulators will have to issue permits and DOE will have to complete the National Environmental Policy Act analysis needed for the project. BNFL Inc. provides data to DOE on an ongoing basis in support of National Environmental Policy Act review, and will develop plans and designs necessary to support applications for environmental permits. For more detail, see another fact sheet in this series, *AMWTP and the National Environmental Policy Act*.

For More Information on the AMWTP Please Call

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United States Department of Energy

BNFL Inc.

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