DECOMMISSIONING STARTS AT STADE
FOCUS ON WASTE MANAGEMENT
REPOSITORIES AND THE LOCALS

ON THE ROAD TO WIPP:
TRANSURANIC EXP.
WIPP into action

The need to manage US radioactive wastes was recognised early in the nuclear age. But decades passed while defence facilities produced nuclear weapons to meet Cold War demand – and plutonium-contaminated transuranic wastes accumulated in temporary storage at generator facilities across the USA.

In 1970, the US Atomic Energy Commission (AEC) turned its attention to the burgeoning stockpiles of radioactive waste. Transuranic (TRU) waste generators were ordered to maintain wastes in 'retrievable' storage until a repository for permanent disposal could be built.

To permanently isolate TRU wastes left from the US nuclear weapons programme, government scientists and engineers focused on deep geological disposal, and, in particular, a 610m-thick Permian Age bed of salt in southeastern New Mexico. In 1979, Congress authorised AEC's successor, the US Department of Energy (DoE), to construct the Waste Isolation Pilot Plant (WIPP). Twenty years elapsed before the world's first licensed deep geological repository, the cornerstone of DoE cleanup efforts, received its first shipment of radioactive waste in 1999.

Nearly five years into operation, geotechnical data from WIPP's 655m-deep repository continues to support a 10,000-year regulatory timeframe for long-term radionuclide containment. For the near-term, DoE has implemented bold plans in 2002 that cut generator-site cleanup of legacy wastes by 15 years.

In the months following WIPP's opening, initial waste shipments to the plant were intermittent; some shipments arrived with partial payloads. To increase the flow of waste from generator sites to WIPP, DoE's Carlsbad Field Office directed its contractors to establish an effective infrastructure for standardising waste characterisation, packaging and shipment activities at TRU waste storage facilities.

Working together, WIPP's prime contractor, Washington TRU Solutions, its scientific advisor Sandia National Laboratories, and Los Alamos National Laboratory created the National TRU Waste Program (NTP) to spearhead cleanup efforts. While NTP management is headquartered at the Carlsbad Field Office, designated project managers are located at...
larger TRU waste sites to ensure integrated schedules.

In 2000, 'filling the pipeline' became NTP's mantra. The term was used to describe a continuous flow of radioactive wastes from generator sites to WIPP. NTP looked to streamline waste characterisation processes, improve waste packaging methods, leverage payloads, augment the transportation fleet and re-examine waste handling and disposal processes for efficiencies. Evaluations were carefully weighed against a backdrop of safety and regulatory compliance.

With more than 20 oversight agencies at WIPP, effecting change has proven to be a challenge. The project operates to a prescriptive state-issued permit designed to regulate the hazardous waste constituents (such as solvents and toxic materials) mixed with TRU radioactive wastes; a US Environmental Protection Agency (EPA) compliance certification for long-term radionuclide disposal that requires recertification at five-year intervals; and rigorous US Nuclear Regulatory Commission (NRC) and US Department of Transportation packaging and shipping standards.

Since operations began, WIPP has made more than 28 requests for substantive changes to its hazardous waste permit. To date, eleven have been approved and nine are pending. The approval process, which includes regulator review and a public comment period, may take as long as two years per modification.

Nevertheless, WIPP has made great progress toward cleanup of the nation's TRU waste.

SAFETY AT WIPP

During the construction and permitting phase, DoE instituted a strong culture of safety among employees. WIPP personnel are encouraged to take protective actions for themselves and colleagues; all are empowered to stop work if a hazardous condition is perceived. The project's accident/injury rates are well below industry averages and WIPP has received numerous honours for a world-class safety culture:

- WIPP continues to maintain 'star' status for its Voluntary Protection Program - DoE's most prestigious programme for safety excellence. WIPP was the first government facility to earn 'star' designation when the programme was instituted in 1994.
- For the 17th consecutive year, WIPP was named 'Mine Operator of the Year' by the New Mexico state mine inspector based on low injury/accident rates for underground mining operations.
- Most notably, the project has received more than 2300 waste shipments, and WIPP drivers have logged well over 7 million km without serious injury or at-fault accidents. The project has had no radiological releases or contamination events since operations began.

COMPLIANCE AND PERMITTING

At the suggestion of a National Academy of Sciences expert panel that evaluated WIPP operations and regulatory requirements for improvement, WIPP reviewed its regulatory permits for requirements that did not have, according to the panel, 'a safety, technical or legal basis.' Based on operational data from handling 50,000 waste drums, a number of regulatory requirements were identified as unnecessary or redundant. At present, WIPP is seeking state approval to eliminate three permit-required waste characterisation processes that increase the potential for worker exposure, add costs and are quantified through other methods: headspace gas sampling and analysis to measure volatile organic compounds; solids sampling and analysis; and visual examination as quality control check on radiography.

As WIPP gains experience, requests to modify regulating permits have become routine. Engineers continually assess waste throughput processes and new technologies to improve operations.

CHARACTERISATION

As previously mentioned, DoE facilities that generated or store TRU wastes were part of a vast weapons complex (see Figure 1). Research, testing, fabrication and enrichment activities were performed at numerous sites, resulting in a variety of waste streams, facility configurations and state regulations.

To optimise cleanup at the diverse sites, the NTP established the Central Characterisation Program (CCCP) and mobile teams of specialists and equip-
ment. The teams are deployed to large sites to augment those sites' cleanup operations and to smaller TRU waste facilities that lack the needed infrastructure or specialised personnel to characterise, package and ship wastes to stringent WIPP waste acceptance criteria.

With CCP team assistance, WIPP waste cleanup has been completed at four small quantity waste sites in Missouri, California, Illinois and Pennsylvania.

**TRANSPORT**

WIPP shipping rates have dramatically increased from 1-2 shipments per week in 1999 to 25 per week in 2004. Payload efficiency has climbed steadily as well. Capacity for WIPP's most-used shipping package, the TRUPACT-II, is three per shipment. In the past year, payload averages have risen from 2.17 TRUPACT-IIs per shipment to 2.80.

In 1999, WIPP had only one Type B shipping package approved for use by the NRC. Today, there are four NRC-approved packages: WIPP's primary shipping container, the TRUPACT-II; the HalfPACT, used for heavier loads; and the CNS10-160B and RH-72B for shipping remote-handled TRU waste once the programme receives regulatory approval.

DoE has contracts with two dedicated carriers to ship waste to WIPP. Together they provide 28 commercial trucks and 55 highly trained drivers. The fleet includes 102 shipping packages and 76 customised trailers.

Looking to the future, two new WIPP shipping package prototypes were successfully tested in 2003 and requests for certification will soon be submitted to the NRC: the horizontal-load TRUPACT-III shipping package designed for transporting large-sized wastes by truck and rail; and the high-density polyethylene ARROWPACK that fits inside the TRUPACT-II for shipping wastes that generate a large amount of hydrogen.

**DISPOSAL**

In conjunction with accelerated cleanup schedules, WIPP has now safely and permanently disposed of more than 17,500 m³ of radioactive wastes beneath New Mexico's desert floor.

Last July, WIPP shut off its first waste-filled panel of seven disposal rooms with a 3.6 m-thick block wall. Panel 1 was the first of eight panels that will be mined out of the 250 million-year-old salt beds (see Figure 2). Due to the host rock's average annual convergence rate of 8 cm, mining is performed on a just-in-time basis.

Waste is now being disposed in Panel 2, which is scheduled to be filled by January 2005, and mining of Panel 3 is 75% complete.

Next month, DoE plans to submit documentation to EPA to confirm that WIPP complies with certification for disposal of TRU waste. The original 110,000-page compliance certification application was submitted in 1996; certification was granted two years later. WIPP must re-certify at five-year intervals from the date first waste was received.

WIPP scientists and engineers are using data gathered since operations began to document that the repository continues to meet EPA's long-term disposal standards. The recertification package includes operational information and geotechnical and scientific data that project repository performance 10,000 years into the future.

WIPP is also seeking regulatory approval to manage, store and dispose of remote-handled TRU waste as part of its congressional mandate. Remote-handled TRU waste will constitute approximately 4% of the total volume of waste to be disposed of at WIPP.

At present, only one category of TRU waste is disposed at the plant: contact-handled TRU and TRU mixed wastes (maximum dose rate of 0.002 Sv or less per hour at the container surface). Remote-handled TRU waste emits more penetrating radiation (0.002 Sv to 10 Sv per hour) than does contact-handled waste and must be handled with robotic equipment and transported in shielded casks.

WIPP will work closely in the coming months with state and federal regulators to improve waste characterisation processes and align resources to meet accelerated disposal schedules.