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Title: OPTIMIZING THE NATIONAL TRU WASTE SYSTEM TRANSPORTATION PROGRAM

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Optimizing the National TRU Waste System Transportation Program

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Introduction

The goal of the National TRU Waste Program (NTP) is to operate the system safely and cost-effectively, in compliance with applicable regulations and agreements, and at full capacity in a fully integrated mode. One of the objectives of the Department of Energy's Carlsbad Field Office (DOE/CBFO) is to complete the current Waste Isolation Pilot Plant (WIPP) mission for the disposal of the nation's legacy transuranic (TRU) waste at least 10 years earlier thus saving approximately $7B. The National TRU Waste Optimization Plan (1) recommends changes to accomplish this. This paper discusses the optimization of the National TRU Waste System Transportation Program.

The Waste Isolation Pilot Plant (WIPP) Land Withdrawal Act (LWA) (2,3) requires that the TRU waste shipped to WIPP for disposal must be shipped in Nuclear Regulatory Commission certified Type B shipping packages.

The current National TRU Waste Transportation System is truck only and the emphasis to date has been put on truck shipments. The Transuranic Package Transporter Model II (TRUPACT-II) is the baseline for the transportation of CH TRU wastes. The TRUPACT-II packaging, certified by the NRC as a Type B container, is designed for the shipment of CH TRU wastes from the DOE TRU waste sites to the WIPP. Since it was originally issued in 1989, the TRUPACT-II Certificate of Compliance (C of C) has been

amended several times, primarily to expand the allowable payload of the packaging and allow shipment under less restrictive conditions. The NRC imposed strict limits for flammable, volatile, and semi-volatile gas concentrations in each waste package to ensure safety during the 60-day shipping period. Two primary limits imposed by the NRC on the shipping payload are: 1) the concentration of flammable gases (i.e., hydrogen and methane), must not exceed 5 percent (by volume), and 2) the gas phase concentration of flammable volatile organic compounds (VOCs) must be less than 0.05 percent (500 ppm). As a result, 20-40% of the TRU waste currently stored at the DOE sites could not be shipped in the TRUPACT-II unless it would be repackaged (which would result in a significant volume increase and an increase in potential exposure), prior to the approval of Revision 19 of the TRUPACT-II Safety Analysis Report (SAR).

Revision 19 of the TRUPACT-II SAR was by far the most complex submitted to date to the NRC for approval. This revision included: 1) revised packaging and payload assembly drawings to remove unnecessary details and clarify requirements; 2) simplified chemical compatibility methodology—all chemicals identified by the sites were included and listed; 3) revised pressure calculations to increase wattage limits; 4) additional methods to determine aspiration times based on measurement inside the rigid liner at the time of venting; 5) increased decay heat limits for 55-gallon drums overpacked in a standard waste box; 6) addition of 100-gallon drums as an authorized payload container; 7) two new shielded pipe configurations (S100 for neutron [sealed sources] and S200 for gamma; 8) revised Operations, Maintenance, and Acceptance Tests to incorporate lessons learned from experience to date; and 9) made the TRU Authorized Methods for Payload

Control (TRAMPAC) a separate document which contains all relevant appendices. It is estimated that Revision 19 increases the amount of CH TRU waste that is shippable in the TRUPACT-II by approximately 94%, assuming that the waste meets all other shipping requirements.

In conjunction with Revision 19 of the TRUPACT-II Safety Analysis Report, the automated TRUPACT-II Authorized Methods for Payload Control (eTRAMPAC), an implementation tool for the Revision 19 initiatives, has been developed for site use. The eTRAMPAC performs all compliance evaluations and generates necessary transportation documentation for site use.

Proposed Optimization Strategies

Contact-Handled (CH) TRU Waste:

Strategies to optimize the waste shipments include:

- Ensuring cost-effective shipment of TRU waste that is currently not shippable because of size, weight, gas generation rates, fissile gram equivalents, or dose rate limits
- Making improvements to the baseline transportation system to ensure shipment under less restrictive more cost efficient, and optimal conditions.

Revision 20 to the TRUPACT-II SAR was submitted to the NRC in November 2001. This revision contains administrative changes.

A new packaging, the HalfPACT, has been developed to transport heavier-than-average drums of CH TRU waste. The HalfPACT is a shorter version of the TRUPACT-II and has the capability to transport seven 55-gallon drums, one standard waste box, or four 85-gallon overpacks. The C of C for this packaging was received from the NRC in November 2000.

Work is ongoing for two hydrogen getters (materials that will "get" hydrogen and bind it irreversibly to other materials to reduce hydrogen build-up in a TRUPACT-II. Along with the hydrogen getter, work is ongoing for an innovative technique that will breach the inner layers of confinement (bags container waste) so that hydrogen cannot build up in the inner layers and contain greater than 5% hydrogen.

The TRUPACT-III initiative addresses shipment of oversized boxes of TRU waste that are too large to be shipped in standard waste boxes or ten-drum overpacks in the TRUPACT-II or HalfPACTs. Approximately 24% by volume (4) of CH TRU waste inventory is stored in oversize boxes.

An alternative to shipping by truck is to ship the TRU waste to WIPP by rail. In September 2000, a Rail Study was performed to study the feasibility of shipping CH TRU waste from four major TRU waste sites to WIPP by commercial rail. Those sites are Rocky Flats Environmental Technology Site, the Idaho National Engineering and Environmental Laboratory, Hanford Site, and the Savannah River Site. Based on documented risk analyses, both truck and rail shipments are safe but environmental

impacts and having fewer total shipments through rail transport may reduce risks. Recommendations from this study include:

- Develop a strategy to negotiate lower rail costs for transport of CH TRU waste to WIPP, perhaps on a site-to-site basis since there are separate rail lines serving individual sites
- Identify the infrastructure (scope, cost, schedule) necessary for rail shipments
- Continue development of an alternative packaging (the TRUPACT-III) for shipment of CH TRU waste by either rail or truck

An alternative waste package that is being evaluated by the DOE/CBFO is the ARROW-PAK™, a macroencapsulation technology.

Remote-Handled (RH) TRU waste:

The first receipt of RH TRU waste at the WIPP is expected in fiscal year 2003. The RH TRU waste packaging includes two Type B containers, the 72-B cask and the 10-160B casks. The 72-B cask represents the current baseline for the shipment of RH TRU waste and the NRC approved Revision 2 of the Safety Analysis Report in July 2001. Revision 3 is currently at the NRC for review and approval. The 10-160B cask is a commercial cask that could potentially be used in conjunction with the 72-B cask. This cask is currently approved by the NRC for the shipment of RH TRU waste from the Battelle Columbus Laboratories only.

Strategies to optimize RH TRU waste shipments include:

- Prepare future revision to the 72B Cask SAR
- Deploy an RH TRU waste mobile loader
- Pursue use of additional authorized payloads (site-specific) for the 10-160B cask.

Revision 3 of the 72-B cask has been submitted to the NRC for review and approval. The revision includes:

- New site content codes
- Payload expansion initiatives to address gas generation, dose rate, and criticality requirements

The design for an RH TRU waste mobile loader (which can also be used to load CH TRU wastes) has been completed and will provide mobile loading capability at the small quantity sites.

Currently, Battelle Columbus Laboratories is the only site approved by the NRC to ship RH TRU waste in the 10-160B cask.

Conclusion

The proposed end-state of the optimization of the National TRU Waste Transportation System is a system that will minimize repackaging and size reduction and ensure the shipment of all TRU waste under less restrictive conditions. By following the

recommended strategies, the proposed end-state for the NTP Transportation System will be realized.

References:

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4. IT Corporation, 2001, "CH-TRU Waste Inventory Shippability Analysis: Waste Requiring Path Forward After Approval of Revision 19 of the TRUPACT-II SAR," Revision 1, IT Corporation, Albuquerque, New Mexico