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WIPP Status and Plans – 2013 - 13379

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ABSTRACT

An up-to-date look at the many aspects of America's only deep geologic long-lived radioactive waste repository is presented in this paper. WIPP's mission includes coordination of all Department of Energy (DOE) sites to prepare, package and characterize defense transuranic waste for final shipment and emplacement in WIPP.

The Waste Isolation Pilot Plant (WIPP) is completing its 14th year of operations. Five of the ten planned disposal panels have been filled and sealed from ventilation, with about half of the legislated volume capacity consumed. About 11,000 shipments have been made successfully, traveling more than 40 million kilometers across the nation's highways.

A fleet of new Type B shipping packages, the TRUPACT-III, has been added to the transportation capability, with an ongoing campaign to de-inventory large waste items from the Savannah River Site, while minimizing size reduction and repackaging.

A new shipping and emplacement method for remote handled waste in shielded containers has been approved for disposal, and will significantly improve operational efficiency. Remote handled waste packaged in these shielded containers will be shipped, handled and emplaced as contact handled waste. Also described is a new criticality control over-pack container, which will improve efficiency when shipping high fissile-content waste streams consisting of Special Nuclear Material declared as waste from nuclear weapons sites.

The paper describes the importance of the infrastructure at WIPP to ensure disposal site availability for defense transuranic waste sites across the weapons complex. With the facility reaching its original design lifetime, there are many infrastructure maintenance and improvements being planned and performed.

INTRODUCTION

WIPP was legislatively authorized in 1979, following a rich US history of planning for permanent isolation of all long-lived radioactive wastes from the production of nuclear weapons in a deep geologic salt formation. Constructed during the 1980's, the facility was ready for disposal operations in 1988. Two decades passed from WIPP authorization to operation with waste criteria limited to only defense-related Transuranic (TRU) waste, and full scale shipping and emplacement began March 1999. Numerous descriptions of the history, design, operation and regulatory structure of WIPP have been published over the years, and will not be repeated here. An excellent overview was published in Radwaste Solutions Magazine (May/June 2009), which devoted the entire issue to WIPP in recognition of the facility's tenth operating anniversary. For a detailed look at WIPP and its many attributes, along with a complete description of its operation, the reader is encouraged to review that issue [1].

WIPP continues to garner significant interest, both from domestic and international parties. It was portrayed as a model of a consent-based approach to siting a nuclear waste repository by the Blue Ribbon Commission on America's Nuclear Future [2]. And it is still the only fully licensed

operating deep geologic repository for long-lived radioactive waste. Dozens of domestic and international groups visit WIPP every year to interview both technical experts and the WIPP stakeholders to learn how this successful project was able to overcome the otherwise ubiquitous controversy surrounding such endeavors.

Several major regulatory change processes were begun in 2012 and are scheduled for completion in 2013 (e.g., the way disposal panels are closed when filled and the geometric layout of future disposal panels). Some of these changes will be individually discussed in companion papers at WM2013. Others include National Environmental Policy Act actions. This paper will present an overview of how they all fit together and their possible implication for future WIPP operations.

2012 ACCOMPLISHMENTS

- Celebrated 13+ years of operations, receiving almost 30,000 shipping packages in more than 11,000 shipments (including more than 600 remotely handled), achieving more than 21 million loaded kilometers of safe transportation, and filling WIPP to about 50% of its legislated capacity for contact handled TRU waste.
- Continued shipping contact handled TRU waste in a new Type B shipping package called the TRUPACT-III, thereby minimizing or avoiding resizing of large waste items at DOE's Savannah River Site (SRS). In 2012, the TRUPACT-III fleet size was increased to six units.
- WIPP received the Safe Operator of the Year Award by the New Mexico Mining Association and New Mexico Bureau of Mine Safety (24^{th} time out of the last 26 years).
- Submitted an application to the US Nuclear Regulatory Commission (NRC) for approval to ship a new criticality control over-pack (payload container) in the TRUPACT-II shipping cask that will allow almost twice the fissile content than previously, and thereby reduce the number and cost of shipments of Special Nuclear Material (SNM) declared as waste from National Nuclear Security Administration (NNSA) sites.
- Received approval of a permit modification request from the New Mexico Environment Department (NMED) to use a new shielded container to ship and emplace remote handled TRU waste as contact handled waste, thereby enhancing efficiency.
- Mining to develop a new field test area underground at WIPP continued. When completed, this new area will be used as an underground research laboratory (URL) for evaluating the efficacy of salt for disposal of heat-generating waste. Regulatory approval by EPA to begin the mining was granted, but additional evaluation will be required before field tests can be conducted.

WIPP FACILITY STATUS

Disposal operations continued in panel 6 during 2012, with 4,819 m^3 of contact handled waste emplaced on the floor of disposal rooms 5-7 and 78 canisters of remote handled TRU waste emplaced in boreholes in the walls through November. Figure 1 shows a schematic of the waste emplacement progress in panel 6.

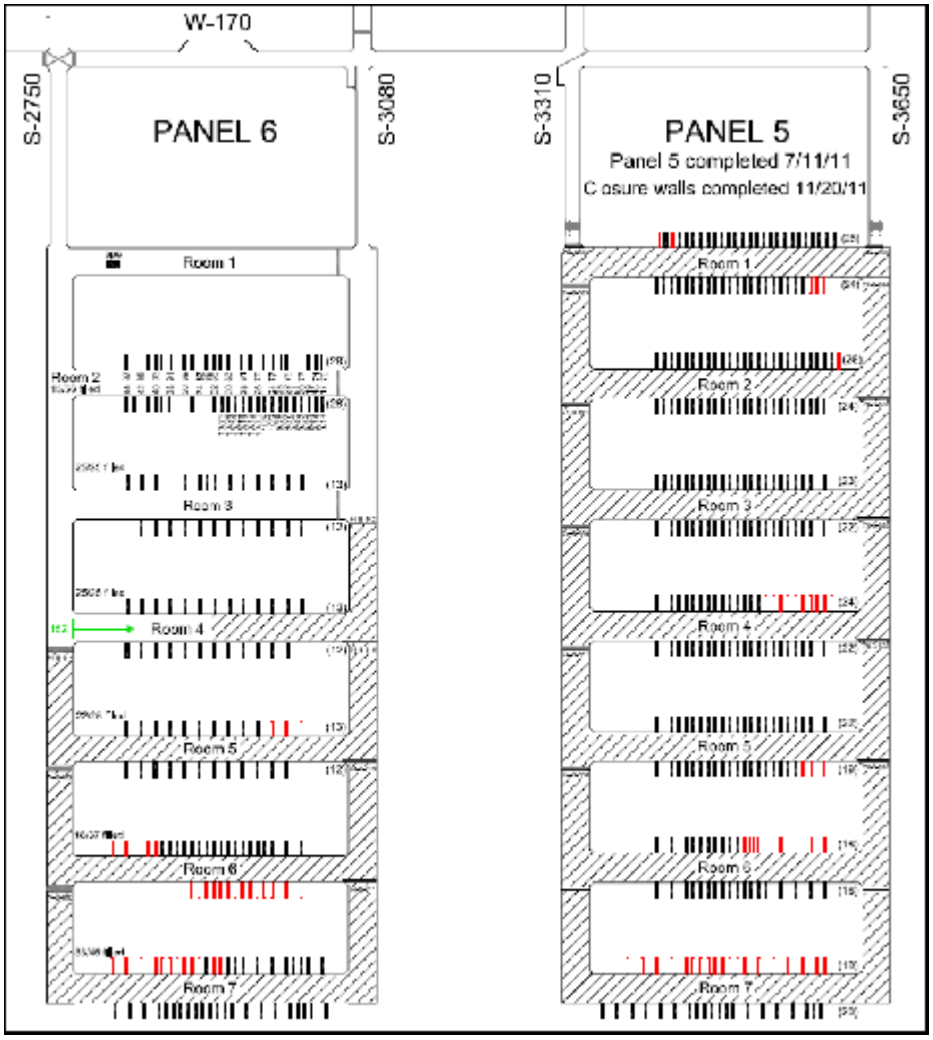

Fig. 1. Disposal status in Panels 5 and 6 at WIPP (through October 29, 2012).

Unfilled boreholes that were augered (drilled) but not filled (abandoned) are shown in red, while predrilled, but not yet used unfilled holes, are shown in black outline. Solid symbols indicate locations with a remote handled TRU waste canister emplaced in the disposal room walls. The cross hatched areas indicate contact handled TRU waste emplacement on the floor of open rooms. The explanation for why some remote handled boreholes are left empty is related to the relative receipt rates of contact handled versus remote handled waste. Contact handled waste is emplaced on the open floors of disposal rooms, and remote handled waste emplacement in the walls cannot be simultaneous in the same disposal rooms due to the size of the in-wall emplacement equipment. Thus if the contact handled receipt rate gets ahead of the remote handled receipt rate, remote handled waste emplacement operations may have to move to the next disposal room before all pre-drilled holes have been filled to allow contact handled waste emplacement in that room.

For the first time, WIPP established an alternate underground haul route for waste in 2012. Since WIPP's opening in 1999, all waste has been brought underground via the waste hoisting system, and a specific haul route (called E-140) was used to gain access to disposal panels 1-6. This is part of the nuclear safety authorization basis for WIPP. In recent years, the E-140 drift has shown progressive deterioration. While this is not surprising (creep is one of the important

attributes for a deep geologic waste repository in salt), the possibility now exists that the main E-140 drift may have to be reconditioned to maintain its safe usage. This effort, should it be necessary, would likely require 4-6 months to complete. Without an alternate haul route from the waste hoist to the disposal panels, WIPP shipments would have to be delayed while repair was made. Therefore, an alternate route (called W-30) was established in 2012, by widening the W-30 drift and installing appropriate air locks and ventilation control equipment to allow it to be used within the nuclear safety authorization basis.

The surface facilities at WIPP are reaching the end of their design life. Facility construction was completed in 1988 with a design life of 25 years. Through the years, DOE maintained a robust preventative maintenance program, and has routinely repaired or replaced ageing equipment. However, as the facility reaches its design lifetime, it is expected that the rate and magnitude of repair and replacement will increase. It will be important to adequately budget and schedule for this in future years in order to minimize their adverse impact on waste disposal rates. If the facility must shut down for extended repair outages, it would adversely impact TRU waste retrieval efforts at DOE's generator sites.

WIPP REGULATORY UPDATE

TRU waste retrieval, packaging, characterization, shipping and emplacement operations are regulated by a number of authorities. The vast majority of TRU waste destined for WIPP is considered "mixed"; it contains both regulated chemically hazardous and radioactive materials. The State of New Mexico Environment Department (NMED) regulates the chemically hazardous constituents, while a combination of Federal entities regulates the radioactive constituents. The US Environmental Protection Agency (EPA) is assigned responsibility for ensuring the WIPP repository will safely isolate the radioactive materials for 10,000 years from the accessible environment. EPA is also responsible for regulating WIPP's compliance with its regulations limiting emissions of airborne radioactivity. The NRC regulates WIPP though a licensing process for all type B transport casks that DOE uses to ship radioactive waste to WIPP. These regulatory roles are assigned through the WIPP Land Withdrawal Act of 1992 [3], which also elevated the "pilot" plant status of WIPP to a fully functional geologic waste repository.

It is important to remember that DOE itself also serves in a regulatory role for WIPP operations. DOE establishes nuclear safety requirements and expectations for all of its own operations to ensure protection of workers, the public, and the environment from the hazards associated with nuclear operations. It also establishes general facility safety requirements in the areas of fire protection, natural phenomena hazards, and quality assurance (QA). These regulatory requirements are established through a series of DOE Orders, Directives and Guidance Manuals. DOE also is assigned enforcement authority for the requirements defined in CFR, Title 10, Part 830 (10 CFR Part 830), Nuclear Safety Management, and 10 CFR Part 835, Occupational Radiation Protection. Particularly important is DOE's enforcement authority under the Price Anderson Act and its Amendments.

Notable regulatory events in 2012 include:

- Approval from NMED to use shielded containers for shipment and emplacement of remote handled waste using methods common to contact handled waste operations;
- Initiation of a rulemaking by EPA to change the design of disposal panel closures; and
- Progress on regulatory approval to reconfigure the geometry and location of future disposal panels 9 and 10.

Shielded Containers

Even before regulatory authorization for disposal of remote handled waste was received in 2006, DOE began planning to add another disposal configuration for remote handled waste. Remote handled waste is legislatively defined as a function of the surface dose rate on contact of an unshielded container. Packages with more than 2 milliSievert per hour (mSv/hr) on contact are defined as remote handled waste and packages with less than or equal to 2 mSv/hr are defined as contact handled waste. These definitions (and limits on the total volume of remote handled waste that may be emplaced at WIPP) are made by the WIPP Land Withdrawal Act [3].

Most of the remote handled waste inventory across the complex is yet to be packaged, and estimates indicate that the majority will result in surface contact dose rates less than about 100 mSv/hr. The nominal remote handled waste shipping cask and emplacement equipment at WIPP was designed to allow safe operations with canisters with surface dose rates on contact up to about 5 Sv/hr. Thus, this very heavily shielded configuration will be inefficient (overkill) for shipping and handling the majority of remote handled waste in the future inventory of remote handled waste to WIPP. Therefore DOE began planning a more efficient method for packaging, transporting and emplacing this lower dose rate waste (less than ~100 mSv/hr) using shielded containers that would be shipped and emplaced using contact handled waste methods [4]. NRC approved the shipment of shielded containers in the contact handled waste shipping cask called the HalfPACT in 2010, and EPA approved their emplacement along with other contact handled waste in stacks on the floor of disposal rooms in 2011. Subsequently, NMED reviewed and approved use of shielded containers in November 2012, and DOE established a goal to ship and emplace the first shielded containers in 2013.

Disposal Panel Closures

Each disposal panel in the WIPP underground facility is considered a disposal "unit" by NMED and EPA. The approved panel closure design (required by both EPA and NMED) calls for a very large robust engineered plug involving several hundred cubic meters of special salt-based concrete and an explosion-isolation wall installed at the entrance and exit drifts in each of the 10 disposal panels. DOE presented five options for panel closure in its initial compliance certification application in 1996. At that time, DOE did not recommend a particular design choice, but simply described five concepts that would survive a postulated flammable gas deflagration. While unlikely, the postulated presence of flammable gases was considered possible because of incomplete knowledge of the gas generation mechanisms that might be observed once waste disposal rooms were filled. It was considered prudent to plan for the worst case. Both regulatory bodies imposed the most robust closure design, referred to as "Option D", as their concept of a conservatively effective way to "seal" each disposal panel from other parts of the underground facility.

When Option D was written into the EPA certification and the permit from NMED, DOE conducted a feasibility test to see if the specifications for the special concrete could even be met. These tests indicated it would be extremely difficult to produce such a large and massive structure underground that would meet the restrictive specifications. DOE believed at the time of application, and continues to believe today, that such a robust structure is not necessary to effectively close individual disposal panels.

DOE submitted a planned change request to EPA in 2011 to change the panel closure design to a relatively simple plug consisting of ~30 meters of run of mine salt pushed, and possibly blown

floor-to-ceiling, within both the inlet and outlet drifts of each disposal panel [5]. DOE believes this design will be even more effective than Option D in precluding inter-panel communication (in the event of a hypothetical future intrusion that introduces brine into the repository). This is because the fully reconsolidated state of the run of mine salt (in a few hundred years) will resemble the porosity and permeability of undisturbed native salt of the formation, which would be much tighter than any man-made material placed in the inter-panel drifts. This is one of the primary attributes for using a salt rock host media for isolating long-lived radioactive waste from the biosphere in the first place. EPA considers this panel closure design change will require a rule making, and initiated that process in 2012. NMED considers this change to require a Class 3 permit modification request, which may be conducted in parallel with EPA rulemaking in 2013.

Panels 9 and 10 Reconfiguration

DOE's original WIPP disposal panel design layout called for 10 disposal panels. Panels 1-8 would be driven east and west of a common set of four main north/south drifts that would eventually also serve as "equivalent" panels 9 and 10, once panels 1-8 were filled and sealed from ventilation. Portions of these four common main drifts have been open since 1988, when the facility was first readied for operations. While these drifts are still safe for use as access and ventilation, their use for disposal operations would require widening them from about 6 meters to 10 meters. DOE believes that a more prudent plan (less risk and less cost for substantial added geotechnical ground support) is to abandon the idea to use the common drifts and simply mine two new disposal panels to the south of panels 4 and 5, which would serve as the ninth and tenth disposal panels.

Initial discussions with EPA indicate it believes that a rule making would not be required to make this change in layout, since it considers the difference to be a simple design change. DOE has shown that long-term repository performance would not be affected by simply changing the geometric location of the 9^{th} and 10^{th} panels. A planned change request to allow this simple footprint change was submitted to EPA in late 2011, and it is undergoing review at the time this paper was written [6].

A subsequent permit modification request to seek regulatory approval to make the footprint change in the hazardous waste facility permit by NMED is being "bundled" with the panel closure class 3 modification discussed in the previous section. This permit modification may be pending by the time of WM13.

SHIPPING TRU WASTE TO WIPP

In 2011, the first shipment of large boxed TRU waste was made in the TRUPACT-III from SRS to WIPP. This packaging configuration minimizes the need to size-reduce large waste items to fit into smaller payload containers that are authorized for the TRUPACT-II. Use of the TRUPACT-III saves money and reduces the potential for worker exposure [7]. In 2012, DOE increased the certified TRUPACT-III fleet size to a nominal six units, and shipments from SRS of 4-5 per week were routinely achieved. The campaign to ship large items in the TRUPACT-III from SRS to WIPP will likely end by 2014. At that time, the fleet of six TRUPACT-III units will likely be used to ship large waste packages from LANL and then the Hanford Reservation, which is planned to resume TRU waste shipping operations in that time frame. Figure 2 shows the first time three different shipping packages (including a TRUPACT-III) were shipped from a single site to WIPP.

Fig. 2. Three different waste shipping configurations arriving for the first time at WIPP.

Retrieval, compliant packaging and shipment of retrievably stored legacy TRU waste dominated WIPP efforts since operations began 13+ years ago. But because most of this legacy waste has successfully been emplaced in the WIPP repository, the TRU waste clean-up focus is gradually turning to newly-generated TRU waste streams. A major component will be Special Nuclear Material, currently managed in safeguards-protected vaults around the weapons complex. As DOE and the National Nuclear Security Administration continue to consolidate and shrink the weapons complex footprint [8], it is expected that significant quantities of SNM will be declared surplus (waste) to the nation's needs.

To enhance the efficiency of shipping waste with high fissile content to WIPP, DOE designed an over-pack container, similar to the pipe component, called the criticality control over-pack (CCO). Prototype units were tested in 2011, which indicated that shipments with about 350 grams of plutonium equivalent fissile content could be shipped safely as contact handled waste in the TRUPACT-II shipping casks. In contrast, the pipe component, which was used to ship several tons of impure oxides from the Rocky Flats site in 2003-2005, was limited to less than 200 grams fissile equivalent. The CCO was also designed so that fabrication costs would be substantially less than the pipe component. While it is too early to predict, DOE is targeting a cost savings of one half and a fissile content limit of twice that of the pipe component over-pack, thereby realizing an efficiency gain of a factor of four for SNM (waste) directly discarded as TRU waste to WIPP.

In May 2012, DOE submitted an application to the NRC to allow the CCO as an approved payload container in the TRUPACT-II. At almost the same time, SRS began a program to lower SNM attractiveness level D material to attractiveness level E by blending SNM plutonium oxide with stardust [8] and terminating safeguards when packaged in pipe components. Shipment of this material to WIPP as TRU waste in pipe components began in August. As the likelihood of approval of the CCO as a more cost effective option for the same purpose has grown, SRS decided to delay further packaging into pipe components to take advantage of this improved efficiency. NRC approval of the CCO is expected in early 2013, and DOE plans to seek regulatory approval from NMED and EPA for handling and emplacement of CCO containers immediately thereafter.

TRU WASTE GENERATOR SITE STATUS

DOE manages the complex interface between the disposal site at WIPP and the TRU waste generator sites via the National TRU Program (NTP), which facilitates the removal and disposal of TRU waste from sites across the country to the WIPP. To date, TRU waste has been totally

removed from many small quantity sites and one large quantity site (Rocky Flats). Figure 3 provides a status of the TRU Waste Complex.

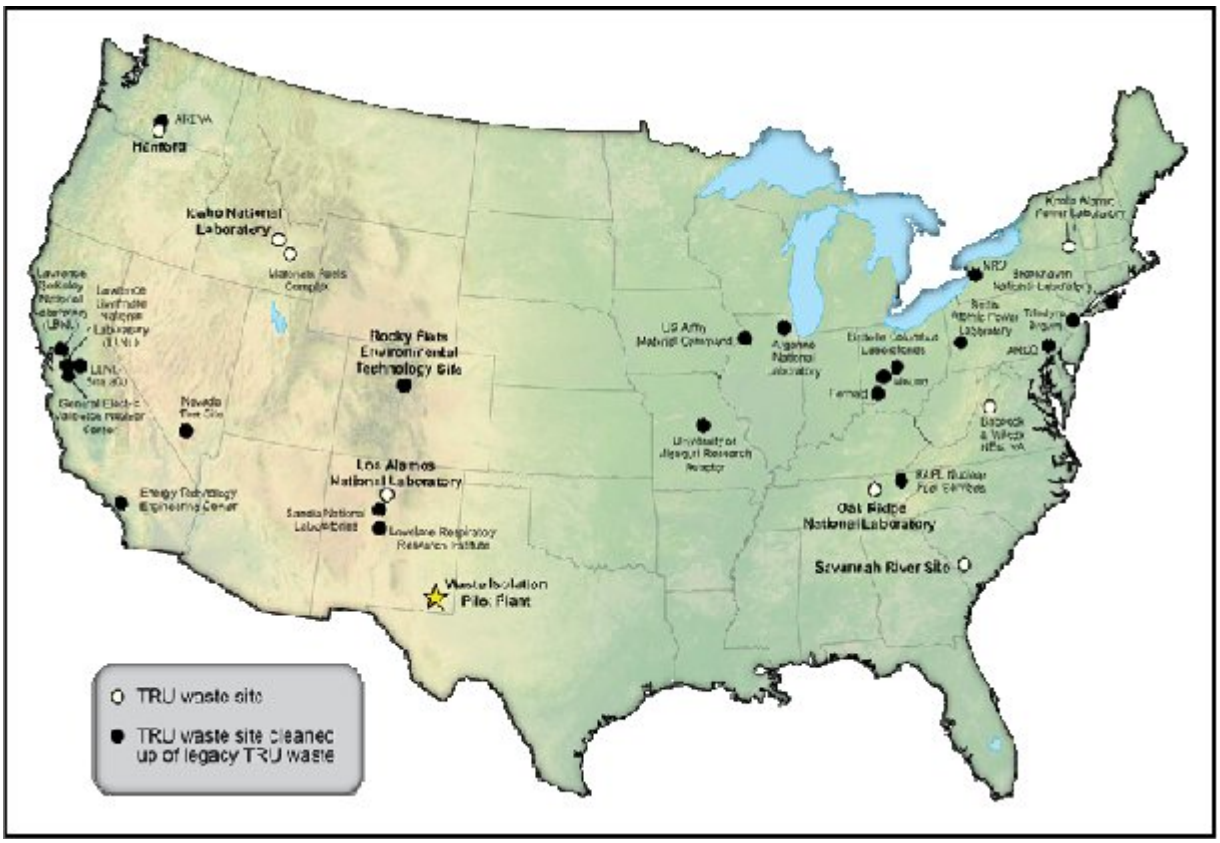

Fig. 3. Status of the sites comprising the TRU Waste Complex.

The NTP provides TRU waste program certification authority in accordance with regulatory requirements. It coordinates initial certification audits at each active shipping site, with participation by EPA and NMED as inspectors of DOE's certification process. Subsequent to audits, including resolution of any issues, NTP seeks approval from EPA and NMED and then issues certification authority. Typically, a site's transportation authority is granted during the initial site certification audit; however, transportation authority may be granted independently.

NTP is responsible for packaging management, transportation management, and corridor management activities. Packaging management includes fabrication, maintenance, operation and assignment of the fleet of Type B packages used to transport TRU waste. WIPP manages over 100 type B packages in the WIPP fleet. Transportation management activities include carrier contract management and WIPP Management and Operations (M&O) Contractor Transportation Department oversight. Corridor management primarily focuses on maintaining viable routes. Preferred shipment routes are established under U.S. Department of Transportation (DOT) rules (49 CFR Part 397, Subpart D) for the routing of highway route controlled quantity (HRCQ) shipments. The TRU Waste Transportation program uses interstate highways and state-designated alternatives where practicable, unless a route deviation is necessary. Establishing routes is a negotiated process that can take many months to complete. Corridor management involves interface with state and regional groups for information on routes and training. The primary groups involved include the Western Governors' Association (WGA), Southern States Energy Board (SSEB), the Council of State Governments (CSG) and Native American

tribes/pueblos. DOE also provides funding and training for emergency response personnel along the routes.

In 2012 and 2013, WIPP is primarily focused on three generator sites: Los Alamos National Laboratory (LANL), the Idaho National Laboratory (INL) and SRS. Status of TRU waste retrieval and shipping from each is provided in the following sections.

Los Alamos National Laboratory

The NNSA has committed to complete removal of all non-cemented above-ground legacy TRU waste and newly generated TRU waste stored at Area G at LANL (as of October 2011) by no later than June 30, 2014. This inventory of above-ground TRU waste has become known as the 3,706 m^3 inventory, and will be the primary objective of waste removal by LANL until complete. WIPP has committed to provide all characterization and shipping resources necessary to meet this important milestone between DOE and the State of New Mexico.

DOE has also committed to the complete removal of all newly generated TRU waste received in Area G during Fiscal Year 2012 (FY12) and FY13 by no later than December 31, 2014. At the time of writing this paper, DOE/NNSA had also committed to develop a proposed schedule for disposition of the below-ground TRU waste requiring retrieval at Area G. This below-grade TRU waste has an approximate volume of 2,400 m^3.

Ongoing DOE/NNSA mission work and SNM vault cleanout will continue to produce newly generated TRU waste in the future. It is currently estimated that this waste will range from 1,000 to 1,600 drum equivalents per year from FY13 to FY20.

Idaho National Laboratory

The primary driver for TRU waste retrieval at INL is the Idaho Settlement Agreement, which requires that INL ship the identified quantities of TRU waste out of Idaho by the end of 2018 [9]. The waste identified in this agreement is the waste currently being removed at the Advanced Mixed Waste Treatment Project (AMWTP) and the waste retrievals occurring in several different Accelerated Retrieval Project (ARP) phases. DOE is committed to completing both tasks prior to their settlement agreement deadlines.

At the AMWTP, the box line and super compactor direct feed production will continue through the end of FY16. The AMWTP container repackaging enclosure will also be processing waste over the next few years. Inorganic drum repackaging production is expected to produce waste from FY13 until the third quarter of FY15. Organic drum repackaging production is expected to produce waste from FY13 until the second quarter of FY15. Soil and oversized box repackaging production will begin in the first quarter of FY14 and end in the second quarter of FY15. WIPP supports the AMWTP by providing loading and shipping resources and will continue to be maintained through FY16. It is estimated that this production schedule at INL will produce 8 to10 shipments per week to WIPP through FY16, which is the planned completion date for the TRU waste portion of the Idaho Settlement Agreement.

At the ARP, waste will be processed during FY13 and FY14 at a rate similar to that seen in FY12. The current resources provided by WIPP for the production and shipment of ARP waste will be maintained through FY16 in order for ARP to meet its schedule and comply with the Idaho Settlement Agreement.

The remote handled waste schedule at INL is still being defined and is identified in the INL contractor's agreement with the DOE Idaho Operations Office. This remote handled waste

continues to be generated by several different sources currently at INL, and the current schedule requires processing and shipping waste through the end of FY18, with a short break in shipments in FY14.

Savannah River Site

With the great majority of legacy TRU waste already dispositioned from SRS, the near term focus is to complete the work scope identified with their American Recovery and Reinvestment Act (ARRA) funding. Characterization of the waste associated with ARRA funding must completed by December 31, 2012, but the shipment of the characterized backlog will continue through 2013. At the onset of the ARRA work scope, roughly 200 m^3 of waste was identified that would be more difficult and would require more time to remediate. This work is scheduled to be completed during the first two quarters of FY13. SRS also has some remote handled TRU waste that must be characterized and shipped during FY13.

Newly generated TRU waste from SRS is projected to primarily result from proposed future missions currently within the National Environmental Policy Act (NEPA) process, as described in the next section.

Other TRU Waste Generator Sites

At the Oak Ridge National Laboratory, efforts to separate, package and characterize TRU waste and mixed low level waste at the TRU Waste Processing Facility are continuing. Plans call for resuming shipments of TRU waste to WIPP in FY14, with completion of legacy waste in FY17. At the Hanford Reservation, resumption of shipping drum and box contact handled waste and remote handled waste is planned for FY16, with anticipated continuation for many years afterwards, until the legacy waste campaign is completed. While the legacy waste removal from Lawrence Livermore National Laboratory was completed in 2010, there is ongoing defense-related TRU waste production, and campaigns to ship that waste to WIPP will continue into the indefinite future.

Ongoing NEPA Actions that Could Affect WIPP

DOE is currently in various phases of three different NEPA actions that could affect future waste stream inventories potentially destined for disposal at WIPP.

DOE's Office of Environmental Management was given the responsibility by Congress in 2005 to develop an Environmental Impact Statement (EIS) for the disposition of what is known as Greater Than Class C (GTCC) low-level radioactive waste (LLW). GTCC LLW encompasses a wide range of radioactive materials, some licensed under NRC regulations and some managed within DOE's authority under the Atomic Energy Act. Under NRC regulations, GTCC LLWs are generally considered to require isolation greater than shallow near-surface disposal sites can provide. DOE began this NEPA action in 2007 and issued a draft EIS in 2012 that includes disposition of some GTCC LLW, those that resemble TRU waste in physical, chemical and radiological form, to WIPP. A Final EIS is planned to be issued in 2013, but legislative authorization requires that DOE only report the recommended alternatives for GTCC LLW disposition to Congress, and then await Congressional action.

A second NEPA action potentially involving TRU waste to be shipped to WIPP is the Surplus Plutonium Disposition EIS being conducted by NNSA. Treaty obligations with Russia, call for conversion of some of the US surplus weapons grade plutonium to Mixed Oxide (MOX) fuel for

use in commercial light water power reactors. Some of the surplus plutonium is not considered suitable as feed stock for the MOX fuel fabrication, and would be dispositioned as TRU waste to WIPP (about 6 metric tons of plutonium) if the preferred alternative in the draft EIS was to be included in the final EIS and Record of Decision. Additionally, the MOX fuel fabrication process would also generate some routine TRU waste during the multi-year fuel fabrication campaign.

The third NEPA action that could involve TRU waste disposition to WIPP is the Hanford Tank Closure and Waste Management EIS process, which is evaluating potential disposition alternatives for the 177 single and double shell tanks at Hanford. There are eleven single shell tanks on the Hanford Reservation containing radioactive material derived from early plutonium purification efforts known as the bismuth phosphate process. This batch process was used after the first stage of uranium and plutonium separation, prior to the development of more modern separations processes. Wastes from this batch process in tanks that were dedicated to it are potential candidates for disposition as TRU waste (since they do not meet the definition of high-level waste that is created in the nuclear fuel separation process). However, DOE previously issued a draft EIS that did not include segregation of the bismuth phosphate tanks from the larger population of tanks containing high level waste.

All three NEPA actions are ongoing at the time of writing this paper, and the impact on WIPP future inventory cannot be projected.

UNDERGROUND SCIENCE AT WIPP

In addition to the TRU waste disposal mission at WIPP, the underground facility also provides a unique capability for basic science and research. Ironically, experiments that require a very low background radiation environment are being performed in the underground research facility at the WIPP site. Levels of naturally occurring radioactivity (e.g., uranium and thorium) are very low in the salt formation. So levels of radon and thoron are low and there are few free neutrons from (alpha, n) reactions. WIPP's depth (655 m) also provides substantial shielding from muons from cosmic rays, with very few penetrating to this depth.

Another area of ongoing research at WIPP is a planned test of bedded salt as a host for heat generating radioactive materials. DOE's original design of WIPP was intended to allow disposal of high-level waste from nuclear weapons production. During the negotiations with the State of New Mexico and subsequent legislation [3], WIPP was limited to its current TRU waste disposal mission. Some heater tests were performed in WIPP in the 1980s with simulated high-level waste canisters in a vertical borehole (in the floor) emplacement concept. However, these tests were not completed and the data was not fully evaluated. Plans for further testing at lower heat levels are being developed.

Mining to gain access to an area north of the waste disposal operations and close to the 1980s test drifts continued in 2012 and is planned for completion in 2013. This area will be used to investigate the effects of relatively low simulated heat-generating waste. Carter, et. al., [10] recently compiled the total inventory of expected defense high-level waste that has been, or will be, produced from DOE's Office of Environmental Management clean-up programs at Hanford Reservation, Savannah River Site and Idaho National Laboratory. The vast majority of defense high-level waste canisters will generate less than a few hundred watts each, thereby making in-drift emplacement, with run of mine salt placed on top for shielding, a potential disposal concept. The primary goals for full scale heater tests of an in-drift emplacement concept focus on understanding the fate and transport of brine trapped within the formation.

CONCLUSIONS

This paper provides an up-to-date look at the many aspects of America's only deep geologic long-lived radioactive waste repository, which is completing its 14th year of operations. A record year of safe and compliant shipments to WIPP tops the list of accomplishments in 2012.

Six new Type B shipping packages, the TRUPACT-III, have been added to the transportation fleet, and large waste boxes are being shipped from SRS without the need for size reduction of large items and repackaging.

A new emplacement method for remote-handled TRU waste in shielded containers has received regulatory approval, and a goal has been set to ship and emplace the first shielded container in 2013. WIPP is in the process of licensing a new criticality control payload container that will allow almost twice the fissile content to be shipped than previously, thereby reducing the number and cost of shipments of SNM declared as waste. Other regulatory modifications planned in 2013 include approval of a design change that would replace the disposal concept for panels 9 and 10 from using the common access drifts (the "mains") with a new footprint south of panels 4 and 5. DOE also plans to change the panel closure design for WIPP set forth in its certification by EPA and the hazardous waste permit by the NMED. The panel closure design change is undergoing a rule making under EPA's procedures and a class 3 permit modification request under NMED procedures.

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