WIPP Status and Plans – 2014 - 14442

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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 15th year of operations. Six of the ten planned disposal panels have been filled and sealed from ventilation, with about half of the legislated volume capacity consumed. Over 11,700 shipments have been made successfully, traveling more than 45 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 was first used in 2013 for waste from Argonne national Laboratory. Remote handled waste packaged in these shielded containers is shipped, handled and emplaced as contact handled waste. Also licensed by the Nuclear Regulatory Commission last year 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 the back end of the nuclear fuel cycle.

Several major regulatory change processes were begun in 2012 and continued through 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 WM2014. 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.

2013 HIGHLIGHTS

- Celebrated 14+ years of operations, receiving more than 30,000 shipping packages in more than 11,700 shipments (including more than 700 remotely handled), achieving more than 23 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 large Type B shipping package called the TRUPACT-III, thereby minimizing or avoiding resizing of large waste items at DOE's Savannah River Site (SRS). To date, WIPP has shipped over 200 TRUPACT-III shipments.
- WIPP received the Safe Operator of the Year Award by the New Mexico Mining Association and New Mexico Bureau of Mine Safety (25^{th} time out of the last 27 years).
- The US Nuclear Regulatory Commission (NRC) granted a license for shipping a new criticality control over-pack (as a payload container) in the TRUPACT-II shipping cask that allows almost twice the fissile content than previously possible, and thereby reduce the number and cost of shipments of Special Nuclear Material (SNM) declared as waste from National Nuclear Security Administration (NNSA) sites.
- Successfully shipped and emplaced remote handled waste packaged in a new shielded container. This augments the way WIPP is able to dispose of remote handled waste using contact handled methods and equipment.
- Completed disposal operations in Panel 6 and initiated disposal operations in Panel 7. As in the past when a panel is filled and operations began in the next, mining of the next Panel (No. 8) also began. Mining Panel 8 will take approximately 2 years, while Panel 7 is filled.
- Completed mining to develop a new test area underground at WIPP. 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 mine the test bed was granted, but additional evaluation will be required before field tests can be conducted.

WIPP FACILITY STATUS

Disposal operations continued in panel 6 during 2013, with 4,500 m^3 of contact handled waste emplaced on the floor of disposal rooms 1-3 and 90 canisters of remote handled TRU waste emplaced in boreholes in the walls through November 2013. Remote handled waste emplacement in boreholes moved into Room 7 of panel 7 at the end of 2013. At this writing (November 2013), the final contact handled waste emplacement in Panel 6 is planned for mid-January 2014. This volume represents a reduction from previous years, due primarily to lower funding levels in 2013. Through mid-November 2013, WIPP has averaged a receipt of 15 contact handled and 2 remote handled shipments per week. Such a lower shipping rate allowed several major infrastructure revitalization efforts to be completed in 2013. For example, replacement of the headstock ropes on the waste hoist was completed, and the tailstock ropes will be replaced during the winter maintenance outage at the beginning of 2014. Figure 1 shows the schematic layout of the WIPP repository.

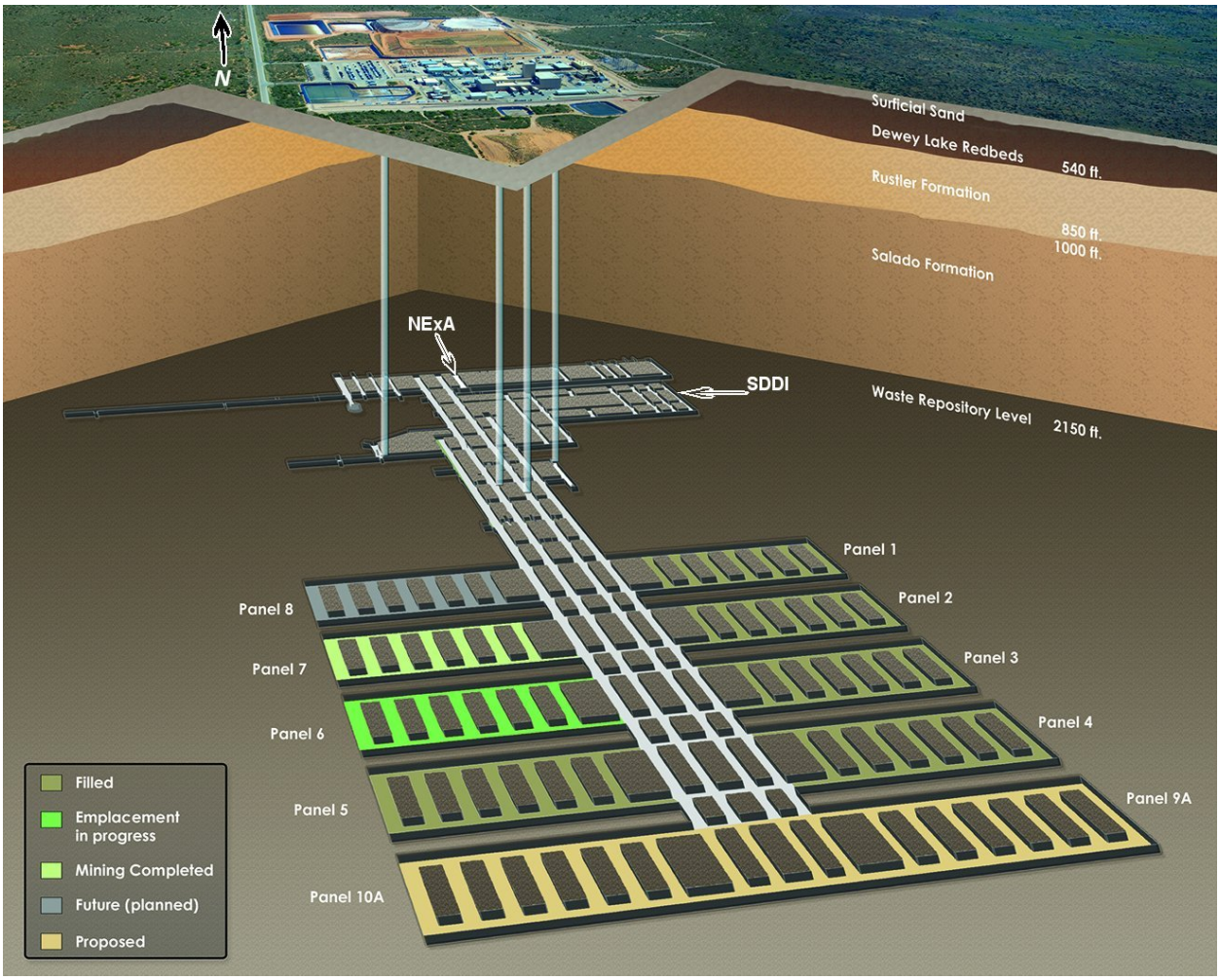

Fig. 1. Schematic Layout of the WIPP Repository

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. Every five years, EPA must re-certify that WIPP continues to meet the long-term repository standards. 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 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 2013 include:

- Approval from NMED as a class 2 hazardous waste facility permit modification to revise waste characterization methods. These changes eliminated the requirements for sampling and analysis of homogeneous solids waste streams, and will save significant cost in the future;
- DOE prepared the third 5-year re-certification application during 2013, and will submit it to EPA on the 15th anniversary of disposal operations; March 26, 2014;
- EPA continued with a rulemaking process to change the design of disposal panel closures from a complex and expensive engineered (e.g., poured saltcrete) barrier to a simple run-of-mine salt barrier 33 meters long and filling the access drifts; and
- Progress on regulatory approval to reconfigure the geometry and location of future disposal panels 9 and 10. See Figure 1 for the location of these two disposal units.

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.

DOE established a goal to ship and emplace the first shielded containers in 2013. The first shipment of shielded containers was from Argonne National Laboratory, with final disposal in September 2013. Figure 2 shows photos of the waste unloading and emplacement process underground. Note the contact handled nature of these operations for inner waste containers with unshielded dose rates of the order of 100 mSv/hr.

Fig. 2. Photos of Remote Handled Waste Being Emplaced Using Contact Handled Methods.

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 considered this panel closure design change to require a rule making, initiated that process in 2012, and continued it through 2013. At this writing, EPA plans to conduct a final public meeting in December 2013 before issuing its decision. NMED considers this change to require a Class 3 permit modification request, which is also in progress as part of the disposal unit reconfiguration described in the next section.

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. See Figure 1.

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 [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 WM14.

SHIPPING TRU WASTE TO WIPP

DOE has developed a wide range of shipping casks for the WIPP program. All shipping casks are licensed by the Nuclear Regulatory Commission as Type B containers. Although DOE has the legislated authority to license its own shipping casks, the WIPP Land Withdrawal Act of 1992 requires that shipments to WIPP be made only in containers licensed by the NRC.

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 continued through 2013 and is planned to end in early 2014. At that time, the fleet of six TRUPACT-III units will likely be used to ship large waste packages from Los Alamos National Laboratory (LANL) and Idaho National Laboratory (INL). It may also play a role in shipping large TRU waste containers from the Hanford Reservation, which is planned to resume TRU waste shipping operations in 2015. Figure 3 shows photos of the variety of shipping casks employed for the WIPP shipping program.

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.

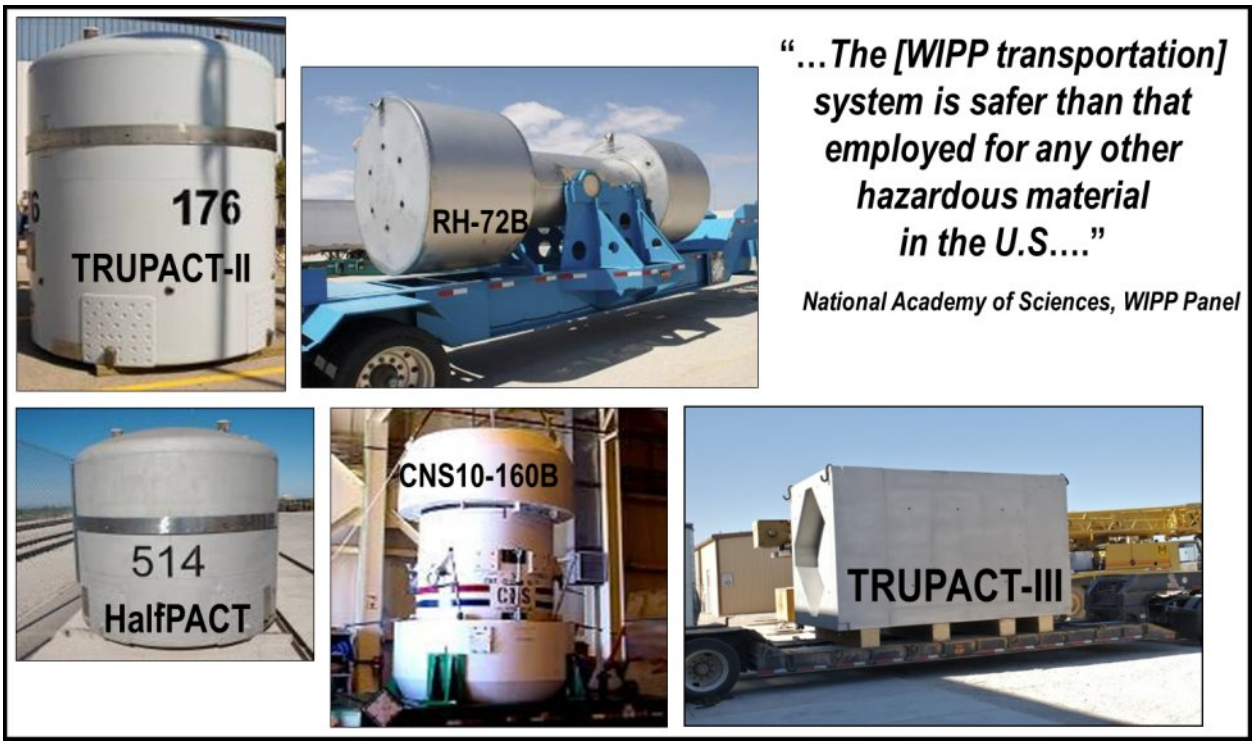

Fig. 3. WIPP Operates a Large Fleet of Different Waste Shipping Casks.

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. 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) with safeguards terminated and directly discarded as TRU waste to WIPP [8].

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).

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 2014 and 2015, WIPP will be primarily focused on three generator sites: LANL, INL and Oak Ridge National Laboratory (ORNL). The status of TRU waste retrieval and shipping from each is provided in the following sections.

Los Alamos National Laboratory

Near-term planning for TRU waste shipments from LANL is derived from agreements in various settlements with the State of New Mexico. The NNSA has committed to complete removal of all non-cemented, above-ground Environmental Management legacy TRU waste and newly generated TRU waste stored at Area G as of October 1, 2011, by no later than June 30, 2014. This inventory of above-ground TRU waste is defined as 3,706 m3 of material. This will be the primary objective of waste removal from the LANL site until it is completed, prior to the agreed-upon date.

There are other plans for work to be performed at the LANL site over the next several years. The DOE has committed to the complete removal of all newly generated TRU waste received in Area G during FY12 and FY13 by no later than December 31, 2014. The NNSA developed a schedule to complete the disposition of below ground TRU waste and will issue a determination on whether shafts containing RH TRU waste will require retrieval by September 2015. This below-ground TRU waste has a projected volume of 2,395 m3 and has been included as a portion of the Framework Agreement.

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

Idaho National Laboratory

The Idaho Settlement Agreement is an enforceable legal settlement between DOE, the Navy, and the State of Idaho that drives the schedule and funding for INL TRU waste disposition [9]. The Settlement Agreement applies to both RH and CH TRU waste stored at the INL and requires that all legacy TRU waste at the INL, estimated to be 65,000 m^3, be shipped out of Idaho by a target date of December 31, 2015, but not later than December 31, 2018. The waste identified in this agreement includes the waste currently being removed from the Advanced Mixed Waste Treatment Plant (AMWTP) and from the Materials and Fuels Complex (MFC). Additionally, the Settlement Agreement requires that a running average of 2,000 m^3 of TRU waste will be shipped out of Idaho per year. The 2006 Agreement to Implement, which is an addendum to the Idaho Settlement Agreement that governs TRU waste buried in the

Subsurface Disposal Area, requires that a minimum of 7,485 m^3 of buried TRU waste be retrieved. There are three primary TRU waste programs concurrently implemented at INL:

- Advanced Mixed Waste Treatment Project
- Accelerated Retrieval Project (ARP)
- Idaho Remote-Handled Waste

The current AMWTP contract runs through 2015, with plans to continue boxline and super compactor direct feed production through 2016. Inorganic and organic drum repackaging production is expected to produce waste from 2014 through 2016. The AMWTP will require an average of 10-16 shipments per week through 2018 to ensure compliance with the Settlement Agreement.

AMWTP solidified waste is expected to be processed in association with the Accelerated Retrieval Project at a rate of up to 180 product drums per week through the middle of 2014. ARP retrieval will produce two shipments per week starting in 2014 and is expected to continue through 2020. The current resources provided by the NTP for the production and shipment of ARP waste will need to be maintained beyond 2018 in order for ARP and AMWTP to meet their schedule requirements

The schedule for RH TRU waste through 2018 focuses on meeting the Idaho Settlement Agreement milestone and requires processing and shipping legacy RH TRU waste through the end of 2018. It will be necessary for INL to complete up to 80 shipments per year of RH TRU in FY2014 through 2015 to comply with the Settlement Agreement. INL will evaluate RH TRU shipping needs beyond 2015 once funding has been identified for this work by the Navy Nuclear Propulsion Program; however, based upon the best information currently available, INL estimates that shipments will need to continue at a rate of approximately two per week during this period.

In addition to shipping needs to support Idaho Settlement Agreement compliance for the INL RH TRU program, there are a significant number of new waste stream approvals that will be required through 2017. INL currently estimates that 20 separate waste stream approvals will be necessary during this timeframe to support INL's ability to successfully disposition the Idaho Settlement Agreement RH TRU backlog waste.

The RH waste schedule for non-Idaho Settlement Agreement waste processing at INL beyond 2018 is still being defined by the DOE Idaho Operations Office. There are several waste inventories and activities at INL that will create newly generated RH waste that will require WIPP disposal beyond 2018. INL has inventories of mixed low-level RH waste and other materials in storage at MFC that will require future repackaging and disposal. DOE expects that the repackaging of these inventories will produce RH TRU waste. Additionally, on-going research at MFC will continue to generate RH TRU waste from fuel specimen examination. The processing and shipping of this "newly generated" RH TRU waste is a lower priority than the completion of the Idaho Settlement Agreement backlog, and will therefore likely occur after 2018.

Oak Ridge National Laboratory

While ORNL actively shipped TRU waste to WIPP in 2008-2010, the primary effort over the past couple of years has been to separate the low-level waste/mixed low-level waste (LLW/MLLW) from the TRU waste at the ORNL storage facilities and to dispose of it accordingly. The goal was to separate the LLW/MLLW from the TRU to build up a backlog of TRU waste, thereby making the commitment to establish a characterization line there cost effective. Plans are to continue shipping from ORNL until the legacy TRU waste inventory has been completed in 2017.

Other TRU Waste Generator Sites

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.

NEPA Actions Affecting WIPP

There are three different National Environmental Protection Act (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 analyzes alternatives including 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 2014, 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 could be dispositioned as TRU waste to WIPP (up to 6 metric tons of plutonium) if the preferred alternative in the draft EIS were 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, which evaluated potential disposition alternatives for the 177 single and double shell tanks at Hanford. There are several tanks at 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. DOE issued a Record of Decision with the preferred alternative for these tanks as disposal at WIPP. First, DOE must make a waste classification that these tank's content is not HLW. DOE is currently evaluating possible methods to treat these tank wastes to meet the WIPP TRU waste acceptance criteria. In parallel, DOE submitted a permit modification request to NMED to remove the prohibition on tank waste from the current permit.

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 an area north of the waste disposal operations and close to the 1980s test drifts was completed in 2013. This area will be used to investigate the effects of simulated relatively low 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 at some possible future repository in salt. 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 an evaporite salt 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 15th year of operations. Another year of safe and compliant shipments to WIPP tops the list of accomplishments in 2013.

DOE continues to look at ways to improve TRU waste characterization, packaging, shipping and disposal operations. A new emplacement method for remote-handled TRU waste in shielded containers was achieved in 2013. The NRC has licensed 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 approvals expected in 2014 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 expects approval for a change in 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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