An Analysis of WIPP after Five Years of Independent Oversight - 11059

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ABSTRACT

This paper examines the efficacy and efficiency of the Waste Isolation Pilot Project (WIPP) of DOE with respect to the disposal of transuranic (TRU) waste. It will present an evaluation of the science, engineering, and operations management of WIPP starting from the pre-regulatory period and going through 2010.

As WIPP evolved from the original concept of deep geologic disposal recommended by the National Academy of Science in the late 1950's to a Congressionally mandated program in the late 1970's to the facility that began disposing radioactive waste in 1999, the impact of the anti-nuclear forces and the "not in my backyard" mentality were manifest and resulted in many arguments against WIPP being raised. The result was legal maneuvering and inclusion of requirements without necessarily valid scientific basis but with extensive delays and costs and in some instances corrective actions that were potentially more detrimental to the health and safety of the public and workers than the action being corrected. Topics that demonstrate the affect of accepting unnecessary requirements that are addressed include the evolution and logic for the engineered barrier system in WIPP (magnesium oxide), the panel closure system, and the return of an errant drum to the generator site after being emplaced in the repository.

Assessments will be also be made as to whether repeated delays for resolution of controversy and protests over proposed changes to the WIPP operations including shielded containers, redefinition of prohibited items and other operational changes was based on good science and engineering and whether the responses by the regulatory agencies was driven by the scientific presentations made by DOE and others or other factors.

INTRODUCTION

For the past five years PECOS Management Services, Inc. (PECOS) held the Independent Oversight Contract for the Waste Isolation Pilot Plant (WIPP). This paper sums up the oversight tasks undertaken by PECOS in terms of how selected; methodology; interaction with DOE, the State of New Mexico, the EPA, and various Citizen Groups; the product of the Oversight Contract; and, an oversight view of the current WIPP status.

Even though the contract was funded by DOE, PECOS operated completely independently with neither assignments nor direction from them. Task selection was made by the Project Management Committee comprised of senior management personnel meeting formally on a quarterly basis and informally otherwise as required. Information for conducting oversight tasks was that same as was available to the general public but directly accessible from DOE by request and from other DOE contractors as authorized by DOE. Aside from directly interfacing with DOE for information exchange as needed PECOS also interfaced with Sandia National

Laboratories, Los Alamos National Laboratory – Carlsbad, and Washington TRU Solutions (WTS), the WIPP Management and Operations contractor, again as authorized by DOE. Additionally PECOS participated in quarterly meetings between DOE and the New Mexico Environmental Department (NMED); observed public meetings conducted by and between DOE, NMED, and the Environmental Protection Agency (EPA); observed audits and surveillances of selected waste generator sites as well as the annual EPA inspection of WIPP; and, provided extensive review comments concerning the five year Compliance Recertification Application submitted to the EPA and the ten year Hazardous Waste Facility Permit renewal application submitted to NMED.

In this oversight experience during the period of fiscal years 2005 through 2010, PECOS completed oversight tasks including those dealing with technical issues, operational issues, and regulatory issues. The results of these tasks were published initially to DOE and later on the internet. This paper will address how the WIPP condition became what it is and assess its status relative to its original and continuing mission.

HISTORICAL BACKGROUND

The WIPP is an underground repository for permanently disposing US Department of Defense radioactive waste generated by the Manhattan Project, the Cold War, and ongoing defense activities. It is a repository located near Carlsbad, NM 655 meters (2150 ft) below the surface in an ancient salt bed, the Salado formation, Figure 1.[1] Before WIPP became operational it had a long and controversial history involving site selection, design requirements, politics, environmental issues, and regulatory control. The history of WIPP began with the Atomic Energy Commission in 1955 requesting the National Research Council recommend a method of disposing high level waste.[2] Following the selection of burial in salt deposits, studies by the U. S. Geological Survey identifying possible locations, and Oak Ridge National Laboratory salt behavior studies, a site near Lyons Kansas was selected. Two years later in 1973 this site was rejected because of extensive prior drilling in the area and concerns about water leakage in abandoned boreholes. The continuing search for the best site led to a location in the southern end of the Permian basin in southeast New Mexico. In 1975 an exploratory well labeled ERDA-6 was drilled striking high pressure brine at approximately 823 meters (2700 ft) depth. The site was then moved approximately seven miles southwest. After drilling a twelve foot diameter exploratory shaft, and following a recommendation by Environmental Evaluation Group (EEG), an earlier exploratory well, WIPP-12, was extended to approximately 884 meters (2900 ft) deep where it also struck high pressure brine in November 1981. The WIPP design was modified as recommended by EEG to its current orientation retaining the use of the exploratory shaft.

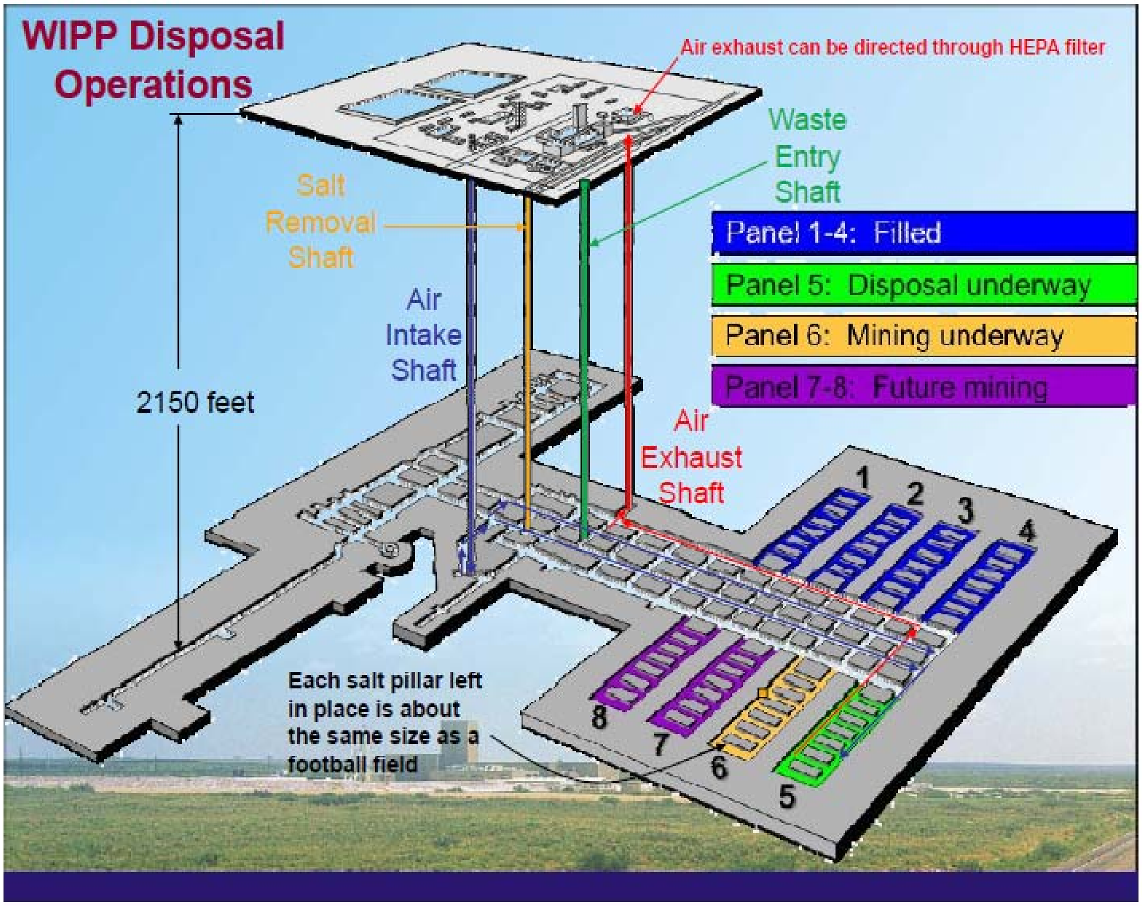

Fig. 1. Schematic of the Waste Isolation Pilot Plant illustrating repository layout and panel fill status as of July, 2009[1]

The State of New Mexico became actively involved in WIPP in 1975 with the establishing of the Governor's Advisory Committee on WIPP by Governor Jerry Apodaca [3], as site selection evolved into on-site geological studies and conceptual design. As the federal government actions, through DOE and the Bureau of Land Management (BLM), were initiated to set aside land for the use of WIPP, New Mexico became concerned about preserving its rights and obligations regarding the welfare of its citizens, EEG was established late in 1978 as an independent technical assessment group and, though funded by DOE, was operated administratively by the Environmental Improvement Division of the NM Health and Environment Department.[2]

After Defense Department objections following the publishing of a Draft Environmental Impact Statement which described WIPP as a combination defense and commercial repository, the Congress enacted legislation which limited the project to providing a research and development facility demonstrating safe disposal of radioactive waste related to United States defense activities not controlled by the Nuclear Regulatory Commission. The scope of WIPP was limited to defense TRU waste as determined by the DOE through use of acceptable knowledge for each waste stream being sent to WIPP. This Act also required the Secretary of the

Department of Energy enter into a written Consultation and Cooperation Agreement with the State of New Mexico. Even though New Mexico Attorney General Jeff Bingaman declared the resulting draft deficient in protecting the State's rights DOE proceeded to issue the Final Environmental Impact Statement and Record of Decision to proceed with construction. Attorney General Bingaman filed suit in Federal Court against DOE and the Department of the Interior alleging violation of federal and State law. The result was a Stipulated Agreement to which was appended an accepted Cooperative Agreement signed on July 1, 1981. [2] The agreement calls for additional geotechnical studies and the timely exchange of information and provided the State a mechanism for conflict resolution. Changes to the Cooperative Agreement and the development of a Supplemental Stipulation agreement have resulted in additions and changes to the two documents — notably, among others, waste must be shipped in NRC approved containers meeting Department of Transportation regulations, must comply with all state and local standards as well as EPA regulations, requires continued performance assessment, and provides for funding for WIPP transportation by-passes and relief routes.

DOE issued its Final Supplement Environment Impact Statement (SEIS-I) on WIPP in 1990[4]; issued the Final Safety Analysis Report later that year; and finally that year announced the Record of Decision (ROD)[5] to proceed with a phased approach to opening WIPP including a first phase five year experimental test plan. Actual opening of WIPP was delayed almost ten years by law suits and protests and the finalization of land set aside for the project. The Land Withdrawal Act (LWA) was signed into law in 1992 and later amended in 1996. In addition to setting aside permanently sixteen square miles of land the act also specifies certain regulatory requirements and designates EPA as the primary responsible government agency for assuring regulatory compliance and the suitability of the repository for permanent transuranic waste disposal. DOE issued a second supplemental impact statement, SEIS-II [6], in September, 1997[5] followed by a ROD in January 1998 [5]. DOE submitted the original Compliance Certification to EPA as required by the LWA [7]. The application was approved by EPA in 1999. EPA has since approved the Compliance Recertification Application of 2004 (CRA-2004) and CRA-2009). Additionally the LWA required the design to include at least one engineered barrier to prevent migration of radiological waste components to the accessible environment. Finally DOE submitted its Resource Conservation and Recovery Act (RCRA) Part B permit application to NMED in 1995; it was declared technically complete in 1996; in 1997 its technical acceptance was rescinded; and in 1998 after modification was again declared technically complete. In December of 1998 NMED made a determination that a TRU waste stream ready for shipment to WIPP from Los Alamos was non-mixed waste and in March 1999 that waste became the first delivered to WIPP. The RCRA permit was subsequently issued by NMED in May 1999..

REGULATORY ROLES – PERMITS AND PERMIT CHANGES

Environmental Protection Agency: The EPA is required by the LWA to provide continuing involvement in the operation of WIPP until the site is closed.[7,8,9] This involvement included a) issuing final regulations regarding the disposal of spent nuclear fuel, high level radioactive waste, and transuranic waste, b) providing EPA authority to develop the criteria that implement the final WIPP specific radioactive waste disposal standards, c) requiring compliance recertification every five years, and d) determining that WIPP complies with all other federal environmental, safety and public health requirements.[10]

Final regulations were put in place in December, 1993, with amendments to 40 CFR Part 191. With these amendments disposal systems must be designed to protect individual radiation exposure for 10,000 years compared to the previous requirement for 1000 year protection. Additionally, for 10,000 years, contamination in off site underground sources of drinking water must not exceed the maximum contaminant level for radionuclides established by the EPA under the Safe Drinking Water Act. Criteria for complying are included in 40 CFR Part 194. It basically includes requirements for implementing the regulations in areas such as performance assessments and the use of computer modeling, quality assurance, and other measures that provide confidence that the 10,000 year contaminant containment requirement will be met. 40 CFR Part 194 also provides for public participation in the certification and recertification decisions. The WIPP Certification Compliance Application was approved in May, 1998 and was recertified in 2006 and again in 2010(Compliance Recertification Application {CRA 2004 [11] and CRA-2009 [12]).

The EPA Office of Radiation and Indoor Air is responsible for overseeing WIPP operations,. Included in this oversight they conduct annual inspections covering waste management and storage operations, waste emplacement, and environmental monitoring programs. In addition to WIPP operations, EPA also oversees compliance monitoring through audits and inspections of waste generation sites preparing and characterizing waste destined for WIPP.

State of New Mexico: New Mexico looks after its regulatory interest in the WIPP through the WIPP Working Group (WWG) comprised of representatives of six agencies. The prevalent member of the WWG is the New Mexico Environment Department (NMED) New Mexico is authorized by EPA to enforce base RCRA and mixed waste programs in lieu of equivalent Federal programs. NMED has been assigned that responsibility and exercises its regulatory responsibilities through a RCRA Part B Hazardous Waste Facility Permit (HWFP) [13]. The initial permit issued in 1999 only applied to CH-TRU waste. The most significant modification to the HWFP has been the addition of the provision for RH-TRU waste in October of 2006. The initial HWFP, issued for a period of ten years, has been recently renewed for a second ten-year period.

Authorization to dispose of CH-TRU and RH-TRU waste in WIPP was founded upon the DOE National Security and Military Applications of Nuclear Energy Act of 1980 and the LWA including the criteria of RCRA regarding disposal in WIPP. Combined these three entities make up the bulk of the WIPP Waste Acceptance Criteria (WAC)[14]. The WAC in turn is included among the requirements of the HWFP. The relationship of the WAC to higher tier documents in the overall WIPP scheme is shown in Figure 2.

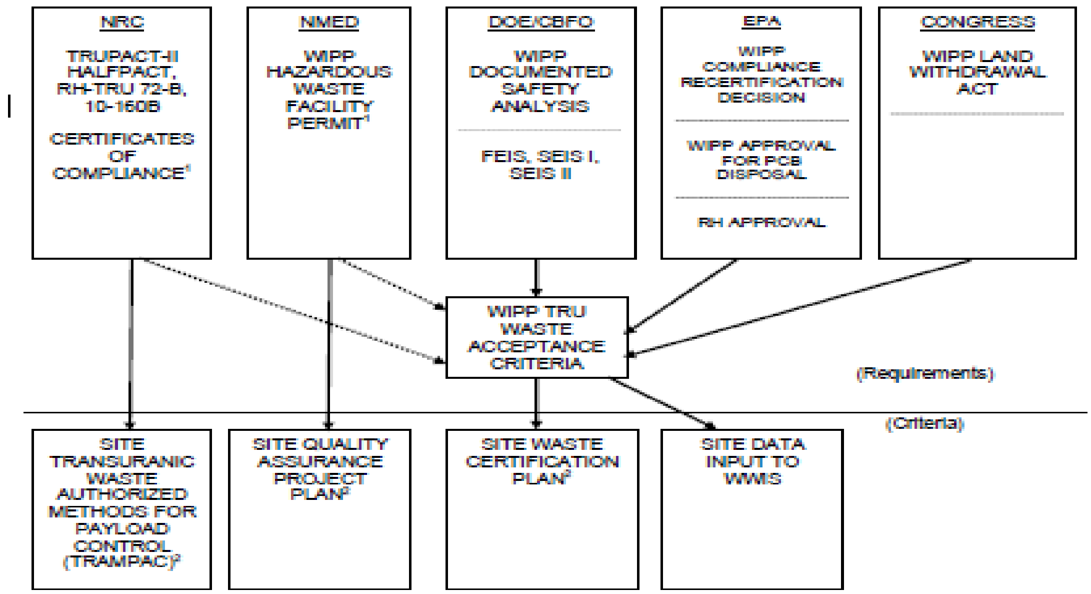

Figure 2: Regulatory Basis of TRU Waste Acceptance Criteria [14]

It is noted that even though the WAC is included in the HWFP, it does not concern the identification of hazardous waste. This determination is made through the HWFP Waste Analysis Plan

Prior to WIPP, disposal of radioactive waste in the nation had been accomplished in shallow land fills; therefore the characterization, transportation, and disposal procedures for WIPP were derived from that experience, which was not necessarily directly correlateable to disposal of waste in a deep geological repository. Thus the original WAC was developed using input from low level waste and hazardous waste disposal criteria. These criteria included DOT requirement considerations. This original WAC has been modified numerous times with fourteen changes to revision numbers. The last revision, Revision 6.5, dealt primarily with clarification of language dealing with residual liquid and confusion defining total and internal container volumes. Included in the change was the removal of the term “residual” and replacing it with “observable”.

OPERATIONAL EXPERIENCE

Engineered Barriers. Containment of hazardous waste in a permanent repository must deal with health and safety under two specific scenarios: protection of the work force and the general public during the construction-operation period and the protection of the public throughout an extended long term post closure period including the time when institutional knowledge of the existence of the repository may have been lost. An additional consideration is the separate issues associated with radiological emissions and the issues associated with hazardous waste. Barriers are required to deal with each of these requirements.

Radiological Emissions: Among the WIPP activities regulated by EPA under the LWA are the containment requirements of 40 CFR.191.13 that limit the amount of radioactive emissions to that corresponding to reasonable expectation that the cumulative releases over 10,000 years based upon performance assessment will have a likelihood of less than one chance in ten of exceeding one EPA unit and a likelihood of less than one in 1000 of exceeding ten EPA units. 40CFR 194.44 gives specific direction in achieving this requirement. 40 CFR 194.44 includes requiring the repository design to include both natural and engineered barriers to stop or delay the migration of radioactive constituents to the accessible environment. The selection of disposal in ancient salt beds rather than other deep geological structures as the preferred means of isolating high level radioactive waste from the accessible environment was to a large extent because of the unique characteristics of salt beds. Principal among these characteristics is the response to stress, referred to as creep, which results in cracks and void spaces being filled, or healed, over time thus encapsulating the waste. The very existence of a salt bed requires that no significant amount of water has passed through it therefore there can be no significant natural migration to the accessible environment. Thus salt encapsulation is a natural barrier. (It is noted that a performance assessment is required to demonstrate the expected performance of the engineered barrier, but no similar assessment was used to determine whether one was actually needed to meet the technical requirements of 40 CFR 191.13).

One hundred eleven engineered barrier concepts [15] were proposed for evaluation for WIPP. Most were eliminated for a variety of reasons in a fairly elaborate evaluation-scheme. Eighteen proposed engineered barriers including systems based upon cementation, shredding, super compaction, incineration, vitrification, improved waste canisters, grout and bentonite backfill, chemical control of pH/actinide solubility, melting of metals, alternate configurations of waste emplacements in the disposal system, or alternative disposal system dimensions were selected for evaluation using eight criteria including cost benefit analysis specified in paragraph 194.44. Chemical control of pH/actinide solubility was selected as the preferred engineering barrier.

Magnesium Oxide (MgO) became the selected engineered barrier material because it will buffer pH in slightly alkaline solutions where solubility is thus minimized, is relatively inexpensive, and is relatively easy and safe to implement. The quantity of MgO has been determined based upon the total organic carbon component to be emplaced with the waste assuming it will all be converted to carbon dioxide (CO_2), the closed repository will become filled with CO_2 saturated brine and neither the waste metal, alkaline waste material, nor portland cement contaminants will react to consume either CO_2 or carbonates.[16] This is extremely conservative given that other than an alkaline environment would result in reaction with these components.

Hazardous Waste. Under RCRA, WIPP is defined as a Miscellaneous Unit. Per 40CFR 264.601(c)(2) control systems must be included in the construction, operation, and closure of WIPP to reduce or prevent omissions of hazardous constituents to the air [17]. For WIPP the primary RCRA concern is a potential release of unacceptable levels of volatile organic compounds from TRU mixed waste during the 35-year operating period. A secondary concern has been the possibility that waste sequestered in repository closed panels would generate an explosive mixture. Responsibility for control systems required by 40CFR 264.601(c)(2) lies with the New Mexico Environment Department under delegation from the EPA. That approval is in the Hazardous Waste Facility Permit [13].

The DOE evaluated numerous alternate panel closure systems in preparing for the CCA and RCRA Part B application. After determining that RCRA requirements were controlling, a fifteen point design criteria was established. Finally, a choice of four design concepts was submitted to the regulatory agencies from which Option D, Figure 3, was selected. This concept using a special salt resistant concrete for the plug provided the most rigorous closure to the panel. Following being filled with waste, Panel 1 and Panel 2 were sealed with the explosion wall portion of Option D. However, two developments have led to modifications in the panel closure approach.

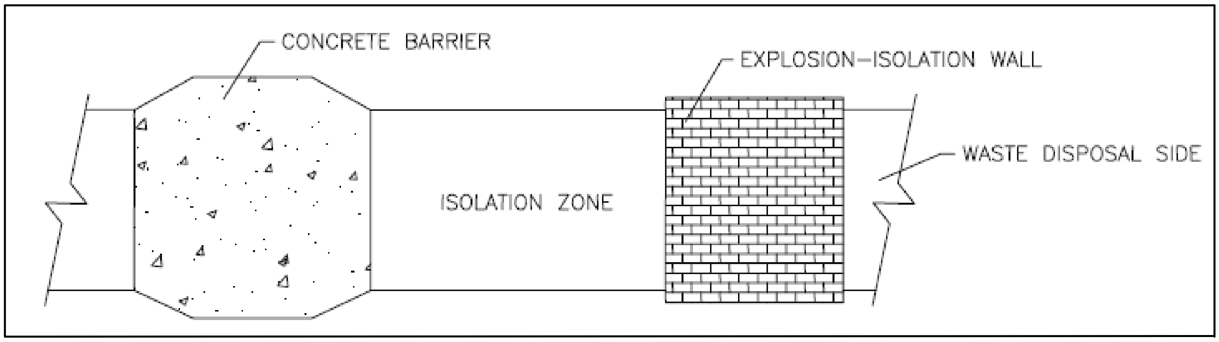

Fig 3. Option D Panel Closure [11] - Currently the Approved Panel Closure

Container head space gas analysis and vapor emissions from emplaced waste have indicated that an explosive environment in closed panels is unlikely; further analysis of the monolith barrier in the Option D design has led to the conclusion that it would be impractical to construct. Currently filled panels are being closed with less robust barriers that provide for both VOC and combustible gas monitoring. Additionally, in order to meet the requirements of the HWFP, panel barriers are being supplemented with VOC vapor adsorption units– the latter in response to an unanticipated occurrence of high carbon tetrachloride content in the WIPP ventilation exhaust that began occurring in 2009. The distribution of risk factors were re-evaluated assigning new EPA data and modifying the risk determination model to accommodate an experienced based distribution of carcinogenic volatile organic compounds in the ventilation exhaust system. Currently, Panels 3 and 4 are closed with barriers that permit monitoring for combustible components, hydrogen and methane.[18]

Transportation: TRU waste bound for WIPP is characterized as either contact handled (CH) or remote handled (RH). Both CH TRU waste, in containers with a surface dose rate of 2.00 or less millisievert (mSv) per hour, and RH TRU waste, in containers with surface dose rate between 2.00 mSv and 10.00 Sv, require transportation in Type B casks certified by the Nuclear Regulatory Commission (NRC) and approved by the US Department of Transportation (DOT). Type B containers require rigorous testing. Initially, CH TRU waste was to be transported in single containment casks designated as TRUPACT-I. Following testing and objections by state agencies, new double containment casks for CH TRU waste labeled TRUPACT-II and HalfPACT, were designed. These casks hold up to fourteen or seven 0.208 m^3 (55gallon) drums respectively. Each drum meets the criteria for CH TRU waste. RH TRU waste is transported in RH-72B lead shielded casks containing a canister capable holding three 0.208 m^3 (55gallon) drums of waste or is direct loaded. The canister is required to meet the criteria for RH TRU waste.

In addition to the transportation of waste to WIPP meeting the above mechanical requirements as enforced by the NRC and the DOT [19] there are agreements with other agencies such as individual state departments of transportation and ten tribal entities. WIPP transportation routes transverse these areas and WIPP bound trucks are restricted to specifically agreed to routes. Deviation from these routes requires prior approval. The Western Governors Association and their associated state agencies for example have developed safety and accident response programs which have contributed to an exemplary hazardous waste transportation safety record. [20] The LWA as amended provides for legally binding agreements with each state and tribe that assure technical assistance, emergency preparedness, funding, and training along WIPP routes. Cooperation with states has resulted in improved highways and bypasses around densely populated areas and extensive health and safety training programs along WIPP transportation routes.

Paramount in the success is the extensive training program for drivers, attention to mechanical integrity in the equipment, and routine DOT Level VI inspection conducted by states at each states entry portal. Included is a very sophisticated satellite tracking system. This system keeps drivers in constant communication with a central monitoring room at WIPP, is fully automated providing five-minute updates, and provides states and tribes password protected web site access.

As a result of the investment and attention to safety in the transportation system and program, this system has resulted in excess of 10 million loaded miles of transuranic waste transport without a significant traffic incident.

Payload Containers. Payload containers refer to those containers as specified in the Transuranic Waste Authorized Methods for Payload Control (TRAMPAC) and into which waste is directly placed and which are in turn placed in a Type B transfer cask for transport to WIPP. Payload containers are required to be made of steel and be classified as Speciation 7A, Type A containers. Approved payload containers include

- 0.208 m^3 drums
- 0.208 m^3 drums containing a pipe component
- 0.321 m^3 drums (capacity 0.294 to 0.321 m^3)
- Standard Waste Boxes filled either directly or with four 0.208 m^3 drums
- Ten drum overpacks filled directly, with ten 0.208 m^3 drums or with six 0.321 m^3 drums

In order to add flexibility in handling RH-TRU waste DOE has designed and received NRC approval for a new payload container referred to as a shielded container. It is a steel container approximately the size of a 0.208 m^3 drum that is constructed with a 22.4 millimeter lead liner and with a 67.2 millimeter thick steel bottom and lid. It will hold a 0.113 m^3 (30 gallon) drum of RH-TRU waste. Loading of the 0.113 m^3 drums will be limited so as to assure the surface dose rate of the shielded container to be no more than 2.0 mSv per hour. The shielded containers, though designated as RH-TRU waste, will then be placed on the repository panel floor along side

CH-TRU waste. Shielded containers have been approved by the NRC. EPA and NMED approval is anticipated.

Remote Handled /Contact Handled TRU Waste Balance: The LWA and the Consultation and Cooperation Agreement with NMED limits the total amount of TRU waste that can be emplaced in the WIPP repository at 175,600 m^3 with up to 7080 m^3 maximum allowed for RH TRU waste. RH TRU waste is placed in boreholes drilled into the sides of the repository rooms followed by placing CH TRU waste placed on the floor. Thus, in order to emplace the maximum amount of RH TRU waste, that emplacement must at all times precede the emplacement of CH TRU waste. In practice this has not occurred. Delays in getting regulatory approval to emplace RH TRU waste resulted in the first three panels receiving CH TRU waste only. Additionally whereas each panel can be constructed to accommodate 650 m^3 of RH TRU waste, somewhat less than that was approved for emplacement in Panel 4 and Panel 5. Finally, even less than that has actually been emplaced. Meanwhile CH TRU waste continues to be emplaced as scheduled with the effect that the capacity for RH TRU waste is being diminished. In order to accommodate the amount of this waste DOE proposed to emplace RH TRU waste using the new shielded containers. Additionally, it is planned that shielded containers will be used in the repository access drifts being labeled as Panel 9 and Panel 10.These containers will also be placed on the repository floor alongside CH TRU waste, but DOE has estimated no more than 30 percent of the RH TRU waste will qualify for the shielded containers. Waste in shielded containers will continue to be considered RH TRU waste for regulatory purposes.

As DOE has continued to identified and characterize TRU waste the estimate of RH TRU waste that qualifies for WIPP disposal has increased. The recent inventory, ATWIR-2009, completed by Los Alamos National Laboratory –Carlsbad Office estimated up to 12,400 m^3 of RH TRU waste may be qualified for emplacement in WIPP compared to the 7080 m^3 regulatory limit. Thus even without the apparent inability of WIPP to maximize RH TRU waste emplacement, WIPP will not be able to accommodate all of the possible defense related TRU waste without expanding the current configuration. DOE has suggested that expansion by extending Panel 7 and Panel 8 beyond the current seven room design is one possibility. As of November 2010, Panel 6 is being filled with mining of Panel 7 underway.

The stated goal by DOE for WIPP is to receive 17 shipments per week of CH TRU waste and 6 shipments per week of RH TRU waste. PECOS [21] has searched available sources of information related to transportation and emplacement of TRU waste in an attempt to pin point where DOE could make operational changes that would result in fewer bypassed RH TRU waste boreholes. Based upon performance through March, 2010, WIPP has met or surpassed this goal only one time since RH TRU waste shipments began. Therefore, it is unclear whether DOE can continuously receive and emplace twenty three shipments per week on a week to week basis. Assuming emplacement and transportation are not points of slippage in meeting the stated goal, one can conclude that packaging and characterization are the limiting areas. With regard to maximizing RH TRU waste disposal this could be because of a lack of funding or it could be related to emphasizing the total emplacement rate rather than the balancing of waste types.

Since March of 2010, WIPP has received funding through the American Recovery and Reinvestment Act to accelerate the emplacement rate. Time will tell whether this extra resource will provide a temporary or an extended time impact.

FIVE YEAR ANALYSIS CONCLUSIONS AND OBSERVATIONS

Geotechnical experience relating to WIPP repository performance has demonstrated and enhanced the understanding required for safe permanent radioactive waste disposal in deep ancient salt beds.

Concerns related to hydrology and hydrogeology have been addressed many times over including shallow subsurface and deeper Culebra formation aquifers. These studies have demonstrated repeatedly that there is no reasonable probability of radioactive health or safety concerns resulting from the WIPP. There is no reason to continue revisiting this concern.

The requirement for a computer model based performance assessment has consistently shown no reasonable probability of any releases of the WIPP repository radioactive contaminants during the next ten thousand years exceeding the personal exposure limit of 0.15 millisieverts (15 millirems) per year. Likewise the probability of total migration of radiological contaminants beyond the WIPP control area is less than one in one thousand for one EPA unit and less than one in ten thousand for ten EPA units.

The current practice of bypassing RH-TRU waste bore holes to accommodate a maximum rate of emplacing CH-TRU waste may be short-sighted. A cost benefit analysis of this practice based upon the eventual disposal of all WIPP qualified waste should be done. DOE should involve all waste generator sites in prioritizing waste preparation and characterization as a part of this analysis.

PECOS analyses indicate that not all of the identified RH-TRU waste qualified for WIPP disposal will fit into the current WIPP configuration. In addition, a report by Sandia National Laboratories [22] estimated that no more than twenty-seven percent of the identified RH-TRU waste will qualify for disposal in shielded containers. It has also been suggested that most of the RH-TRU waste currently emplaced would have been qualified for shielded containers. This leads to the conclusion that planning and programming should emphasize the higher level RH-TRU waste.

DOE has Los Alamos National Laboratory conduct annual inventories of WIPP qualified waste. These inventories have varied considerably from year to year as waste generator sites have improved their identification and characterization of waste and with some lingering uncertainty in defense versus non-defense determinations. These inventories and associated reports appear are geared toward supplying information to the performance assessment and are difficult to follow from year to year by the general public. A simpler report for the public would be helpful.

Stakeholder, public, involvement including information sharing from early on with an attitude of openness is essential to minimize public concerns and uninformed protests or legal challenges when planning a radioactive waste project.

A cooperative effort between DOE and state governments can be invaluable. Radioactive waste projects should emphasize this from the beginning. Convincing the involved state to go beyond its regulatory obligations and project value accompanied by qualified authoritative information should be emphasized to counter any “not in our back yard” attitude.

The very lengthy period of time between initiating activities culminating in site selection, data gathering, design, and construction and the beginning of waste disposal operations is testament to both the thoroughness and the wasteful inefficiency the process. The smooth beginning of operations without serious glitch during start-up illustrates the result of thorough technical planning and preparation.

The restricting of waste types, such as defense versus non-defense, permitted in a repository based upon neither safety, technical nor economic factors may be politically expedient but has no bearing on the overall public safety i.e., the hazardous nature of radioactive waste is obviously attributed to its characteristics, not its origin. Likewise, the ten year delay between the ROD and beginning of operations because of law suits, protests often by antinuclear groups without particular technical basis, and the finalization of land set aside illustrates costs and time spent for no real added value.

There are other examples that lead to the perception that these inefficiencies without value added merit have continued during the operating period. For example, delays in permitting the emplacement of RH TRU waste resulted in the loss of opportunity to utilize Panels 1, 2, and 3 and a significant part of Panel 4 for that purpose. The time to reduce excessive emplacement of MgO resulted in not only financial and resource waste but also additional transportation safety impacts. Indeed the requirement for MgO appears to be based only on a regulatory requirement for an engineered barrier in addition to natural barrier and without any technically demonstrated need for such barrier.

Finally the example described above of an applied remedy for a violation of liquid limits resulting in a negative health and safety benefit at a high financial cost illustrates the questionable wisdom of accepting an unwarranted restriction for project expediency. However, this is not to say that other factors which might slow the WIPP operations but are also related to the overall public interest and priorities should not be considered.

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