CAN THE U.S. DEPARTMENT OF ENERGY ENVIRONMENTAL MANAGEMENT PROGRAM CONTINUE TO IMPROVE

J. J. Fiore, J. W. Neave II, D. C. Gupta
U.S. Department of Energy

ABSTRACT

The U.S. Department of Energy Environmental Management program has been focused on delivering cleanup that is safe for the worker, protective of the environment, and responsible to the taxpayers. Significant progress has been made in response to the recommendations of the Top-to-Bottom Review Team, chartered by the Secretary of Energy in 2001. During last three years, the program has implemented initiatives that have delivered significant risk reduction and cleanup results. This paper describes a study (the study") by the EM staff that is aimed at investigating if further efficiencies can be incorporated in the program and the cleanup of EM sites can be proficiently completed using further improvement.

The study is an ongoing effort; however, preliminary findings have been made and the identified opportunities are being examined by EM management. The set of opportunities identified through the study present programmatic, regulatory and technical issues that will need to be addressed. Many of these issues carry substantial programmatic risks or implementation challenges. In a number of cases, further analyses or trade-off studies would need to be conducted, in consultation with stakeholders, prior to developing detailed implementation plans. The "next steps" for the study have been identified in terms of the near-term actions to be taken to begin or improve implementation of the initiatives and incorporation into site and programmatic baselines.

INTRODUCTION

During 2002 and 2003, significant progress was made by the U.S. Department of Energy Environmental Management (EM) program in response to the recommendations of the Top-to-Bottom Review Team, chartered by the Secretary of Energy in 2001. [1] Taking a more improved approach to cleanup, the program was substantially restructured to be more responsive to the taxpayers and our neighbors while continuing to respect resources and the environment. Letters of intent endorsing improved approach to cleanup were signed by twelve states and the Department of Energy (DOE); eighteen sites wrote new Performance Management Plans (PMPs) that halted continual life-cycle cost increases and schedule slippages that previously characterized the program. Integrated Project Teams (IPTs) were created for 10 key initiatives identified in the Top-to-Bottom report. The IPTs have formulated a number of corporate-level initiatives to implement opportunities in a more cost-effective manner. The Department recently reported to Congress the progress made, including but not limited to:

- Reduction of Environmental Risks and Challenges Resulting from the Legacy of the Cold War.
- Streamlining the Implementation Process of the EM Program.
- Improving the Responsiveness and Effectiveness of the EM Program.

- Identification of Proposals for Legislation the Secretary Considers Necessary to Carry out Such Initiatives

While much has been accomplished, these and other initiatives resulting from the Top-to-Bottom review continue to carry significant challenges and programmatic risks to achieve the 2035 goal.

EM recently issued the Office of Environmental Management Closure Planning Guidance to turn the initiatives from the Top-to-Bottom Review into formal processes that can predictably improve results and safely complete cleanup of the EM program. [2] The Closure Planning Guidance clearly establishes objectives, goals and performance expectations. It documents and integrates all corporate reforms undertaken since the publication of the Top-to-Bottom Review and identifies key initiative in all areas of EM work (project management, contract management, safety, stabilization of high-risk materials, human capital, etc).

In March 2004, EM staff initiated a study to determine the feasibility of achieving continuous improvements. The purpose of the study was to identify opportunities and the potential next steps that enable the goal to become a reality embodied in requested baselines. This paper summarizes the results of the study thus far.

Purpose of the Study

Improve Closure Process. The primary purpose of this study is to identify initiatives to further improve process for closure of the EM program, including assessment of the feasibility of enhanced closure.

Reduce Life-Cycle Costs. A secondary purpose of the study is to assess the magnitude of potential cost savings resulting from such an improvement, or in other areas of the program independent of improvement.

Identify Required Framework. Finally, the study identifies the framework to make the cost and schedule improvements happen. With a focus on the scope of the EM program and the critical path activities at several major sites, the study identified those programmatic, regulatory, policy, acquisition, or cultural changes that would need to be in place to enable accomplishment of the stated goals.

Additional Improvement: A Significant Challenge

It was recognized in the very early stages of the study that achieving additional schedule improvement and cost reductions on the heels of a dramatic re-baselining and other efforts would be extremely challenging.

Any incremental improvement in a mature program which already carries substantial programmatic risks, and which has just undergone dramatic program improvements, will require continuous performance improvement, reduction in technical and programmatic risk areas, innovative breakthroughs, and an integrated EM-wide approach.

Implementation of Continuous Performance Improvement Philosophy Needed. These challenges will require a sustained and rigorous effort. This initiative is not about periodic acceleration exercises, it is about establishing a culture to continually drive toward safe and improved cleanup process. EM program and its sites continue to seek opportunities for improving the program and addressing environmental risks.

Significant Programmatic Risks Exist in Current Baselines. The challenge of additional improvement is even tougher because the starting point (PMPs and new baselines) is already a major improvement from earlier baselines and required many new ideas and changes. As such, the current baselines already carry substantial technical and programmatic risks, not including risks associated with new, untested approaches.

Innovative Thinking and Breakthroughs Needed to Achieve Goal. Cost and schedule improvements are not achievable by adjusting or fine-tuning existing approaches; dramatically different thinking and approaches are needed to achieve changes of this magnitude. It will take innovative thinking combined with another round of management and programmatic breakthroughs in order to achieve this vision.

Goal Requires an Integrated EM-wide Approach. As with the Top-to-Bottom results, programmatic enablers (e.g., acquisition management, human capital planning, leveraging of technology development activities, regulatory or policy changes, etc) will play a critical role in this initiative. Contributions from sites already planned to be complete in the near term will also be needed to ensure success.

Study Requirements, Assumptions and Criteria

Identification of requirements to guide the conduct of the study and key assumptions for the study were developed to ensure a focused effort on opportunities that have the greatest potential for impact on the EM program.

Requirements

The requirements that governed this study are summarized below:

1. Maintain EM core principles:
   - Protect health and safety of the public and workers
   - Protect the environment
   - Comply with applicable regulations
   - Use project management principles for performing work
   - Conduct a performance-based program
2. Focus on environmental, safety, and health risk reduction
3. Focus on the areas contributing over 90 percent of the remaining EM scope. These include:
   - High-level waste disposition
   - Facility decontamination and decommissioning
   - Solid waste stabilization
   - Environmental Restoration
   - Nuclear material stabilization and disposition

- Operation of waste disposal facilities
- Spent nuclear fuel storage and disposition
- Safeguards and Security

4. Focus on EM scope extending beyond 2020
5. Focus on six sites with high-potential for cost and schedule reduction:
   - Office of River Protection/Richland Operations Office (Hanford)
   - Savannah River Site
   - Idaho National Engineering and Environmental Laboratory
   - Portsmouth Gaseous Diffusion Plant site
   - Paducah Gaseous Diffusion Plant site
   - Oak Ridge Reservation
6. Identify planning and implementation issues associated with opportunities for improvement
7. Identify interfaces/disconnects with other Program Offices, e.g., Office of Civilian Radioactive Waste Management, Nuclear Energy, Legacy Management, Science, etc.
8. Identify statutory, regulatory and DOE policy obstacles to implementing opportunities

Study Assumptions

The key assumptions for this study are summarized below.

1. Logic for end states and identified variances at each site is an important basis for identifying opportunities [3]
2. Long-Term Stewardship scope is not part of the scope of the study
3. Risks associated with current site baselines or PMPs will be effectively managed
4. Limitations and use of the study are as follows:
   - Study is for purposes of identifying, evaluating, and recommending opportunities to enhance completion of EM program and reduce life-cycle costs, and
   - Study does not contain budget-quality data
5. No new missions added
6. Technologies will be available

Opportunity Selection Criteria

The key criteria used in selecting opportunities were as follows:

- Potential Schedule Improvement
- Potential Cost Savings
- Ease of Implementation: technical, programmatic, and regulatory/legal risk, as well as the level of near-term investment needed (i.e., Technology Development, Capital, or Operations funding)

The recommendations also consider dependencies/interfaces with other sites/programs. The proposed set of opportunities and strategies would need to be implemented in an integrated manner, recognizing that some are independent, some may depend on future decision points, and others may warrant multiple approaches or benefit multiple sites.

Recommended Opportunities

The study identified several EM program critical path activities and the key opportunities for improvement or cost savings. In addition to identifying site-specific opportunities, the study identified a number of programmatic and complex-wide initiatives which would enable success in improving site closures. These key activities and opportunities are considered critical in order to meet the study objectives.

Site Specific Opportunities

Richland Operations Office (RL). The RL mission scope includes essentially all cleanup at the Hanford site except treatment and disposition of high level waste and cleanup of the associated facilities. RL and the Office of River Protection (ORP) prepared an Integrated Hanford Baseline (IHB) document in March 2004 which presents an interim step in the integration and planning for Hanford closure. [4] The IHB provides an initial approach to improve the completion of the majority of the RL mission.

Two key RL opportunities for the Central Plateau core zone considered critical for an improved closure goal are described below:

Optimize Central Plateau Waste Sites Remediation. The current baseline remediation approach assumes: 32% of waste sites will require robust surface barriers (modified Resource Conservation and Recovery Act [RCRA] or Hanford barrier), 40% of waste sites removed and disposed in the Environmental Restoration Disposal Facility (ERDF), 28% of waste sites under natural attenuation or no action, and a mix of remove/dispose and "leave-in-place" for Transuranic Waste (TRU) contaminated soil sites. The proposed improved remediation approach assumes: multiple types of barriers utilized (evapotranspiration or simple soil barriers); waste sites removed when cost/protectiveness indicates; monitored natural attenuation utilized at additional sites (federal control maintained); TRU contaminated soil sites left in place under protective barriers; and where practical, contaminated soil disposed of beneath nearby barriers or use as void fill rather than ERDF disposal.

Improve Disposition of Major Processing Facilities. The current baseline disposition approach assumes: (1) five Canyon facilities (U-Plant, B-Plant, T-Plant, REDOX, PUREX) – voids below canyon deck are filled, upper structure is collapsed, ancillary facilities demolished and disposed in ERDF or under canyon barrier, barrier installed over remaining canyon structure and surrounding waste sites, PUREX tunnel filled with grout, and large portion of underground piping removed, and (2) Plutonium Finishing Plant (PFP) – most residual radiological material removed, all structures demolished to slab on grade, slab and soil removed 1 meter below foundation, and barrier installed if necessary.

The proposed improved disposition approach assumes: (1) five Canyon facilities – mobile contaminants fixed, contaminated equipment and ancillary facility demolition debris/waste disposed within canyon facilities, robust roof installed and facility penetrations sealed, barrier installation limited to highly contaminated below grade structures, PUREX tunnel filled with grout, and in place disposal of most buried piping with some hotspot sections removed, and (2) PFP – most residual radiological material is entombed in place in Plutonium Reclamation

Facility and 234-5 concrete structures with barriers installed, ancillary structures demolished to slab on grade, and barrier installation limited to highly contaminated below grade structures.

The above closure-improvement opportunities are consistent with potential variances identified in the Hanford pre-decisional draft End State Vision document. Regulator endorsement of the following key enablers will be a significant challenge: an end-state based on an industrial exclusive scenario; long term federal control of Central Plateau; no future groundwater use; early precedent setting decision making and utilization of presumptive remedies; and a future contracting strategy for optimized remediation process.

Office of River Protection (ORP). The study has identified a number of initiatives which, if executed, have potential to improve the completion of the tank farm mission at the ORP. Some of these initiatives are already envisioned by the ORP, though they are not in the baseline. These initiatives may require a substantial departure from the current regulatory expectations, and could require waiver of some regulatory requirements. Such deviations are founded on the end state approach, previously identified by EM strategic initiatives, and on the Environmental Protection Agency's "One Cleanup" policy.

Selectively Stabilize Waste In-Place for Some Single Shell Tanks. About 40 tanks are identified for which waste contents already meet either Low Level Mixed Waste or Low Activity Waste (LAW) criteria. Because there is some risk to workers from having to retrieve and treat such wastes, because it is envisioned that after treatment the waste product would be disposed on site, and because the tanks after stabilization form a confinement which is itself very robust, it may be prudent from a human risk basis not to retrieve these wastes, but to stabilize them in place.

Increase Waste Treatment Plant (WTP) High-Level Waste (HLW) System Throughput. Two means may be employed to accelerate HLW treatment - Increasing glass canister waste loading, and increasing melting and pour rates. Increasing glass loading is more desirable, because it reduces the number of canisters required to be buried at Yucca Mountain National Repository. Increasing melt and pour rates may require advanced melter designs, such as improved mixing (bubblers), improved materials to further increase melt temperature and prolong melter life, etc.

Increase WTP LAW System Throughput. Minor change in melter insulation configuration, removal or diversion of sulphate content and blending of waste feeds to optimize waste loading of glass product also can accelerate LAW treatment in the waste treatment plant. Insertion of a third LAW melter in the WTP space reserved could substantially increase WTP capacity.

Improve LAW Supplementary Treatment (Bulk Vitrification). Planned testing of bulk vitrification may be improved and followed by enhanced procurement of at least one supplementary treatment facility. This could enable commencing supplementary treatment earlier than the baseline for wastes not requiring pretreatment in the Waste Treatment Plant

Retrieve Waste More Efficiently. Improvement of retrievals can be achieved by testing at least one Single Shell Tank in each farm for integrity, then using it to stage waste retrieved from other tanks before transfer to a Double Shell Tank and subsequently to treatment. Another means of effecting retrieval efficiency lies in selecting retrieval technologies which optimize retrieval of

the highest risk portion of the wastes, and operating the retrieval systems to a point of minimum attainable plateau risk.

Treat Waste Based on the Risk That It Poses, i.e. LLMW, TRU, LAW, High Activity waste (HAW). The intent of this initiative is to tailor treatment and disposal rigor to the risk posed by the waste. This initiative would seek simple ways to perform separation of lower risk waste from higher risk. This enables treating and disposing of the lower risk waste using simpler and lower cost treatment and disposal, while minimizing the waste that must be treated in the Waste Treatment Plant.

Integrate Planning for Cleanup of RL Sites on Central Plateau with ORP Site Plans. Specific cleanup expectations may be determined by the one cleanup process, focused on the risk posed by the entire plateau rather than the individual zones now being described in the cleanup strategy. This initiative reduces the uncertainty in the cleanup plan and facilitates site cleanup planning integration by use of a set of applicable requirements based in part on the perpetual controls assumption for the core zone.

"One Cleanup" Approach. Cleanup of tank farms may use a single regulatory approach per the EPA policy on "One Cleanup," rather than the serial RCRA compliance and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) closure approaches currently described in the Tri-Party Agreement (TPA) and plateau cleanup strategy. This enables the use of same regulatory approach in tank farms as in other parts of Hanford's plateau and river corridor.

Improve Closure of Tank Farms and WTP. The time required to close tank farms and treatment facilities after treatment completion, therefore to close plateau disposal facilities, could be improved from four years to two. This can be accomplished by changing the sequence of tank retrievals to focus on specific tank farms/zones, thereby starting tank farm closure earlier and leaving fewer to be done after all retrievals are completed compared to the baseline critical path.

Savannah River Site (SRS). In April 2004, the Savannah River Operations Office published a draft "Environmental Management Program Performance Management Plan" (PMP) which describes a comprehensive project to achieve improved cleanup of the SRS. [5] This draft 2004 PMP presents the scope, cost and schedule for achieving the improved cleanup of SRS, and describes twelve individual Project Baseline Summaries (PBS) that constitute the projects necessary to support this initiative. The most significant PBS projects address nuclear materials stabilization and disposition, spent nuclear fuels stabilization, storage and disposition, liquid tank waste stabilization and disposition, solid waste stabilization and disposition, nuclear facility deactivation and decommissioning, and, soil and water remediation. The study identified the following opportunities to complement SRS PMP:

Improve Completion of HLW Stabilization and Disposition Activities by At Least Two Years. In order to achieve an improvement of two years, a number of key enabling improvements would be required including:

- improved salt waste processing through the Salt Waste Processing Facility (SWPF)
- increased waste loadings in Defense Waste Processing Facility (DWPF) canisters

- bulk waste removal from the HLW tanks
- improved plutonium vitrification operations in conjunction with DWPF acceleration

Restructure the Environmental Restoration Program to Prioritize Significant Cleanup Efforts When Facility Missions Have Been Completed. In order to achieve this objective, the following initiatives are proposed.

- Reduce near term (next five year) budget outlays to address the minimum effective cleanup program commensurate with the level of risk.
- Implement the results of the End State analyses in determining the most effective and compliant cleanup program.
- Complete Decontamination and Decommissioning (D&D) of F Canyon by 2010.

Complete All Processing in H Canyon/HB Line by the End of FY 2007 and Immediately Begin Deactivation. This initiative would begin the shutdown and decommissioning of the H Canyon and HB Line facilities as soon as the processing is completed for the onsite SR nuclear fuels and other materials that require reprocessing in these facilities. While other nuclear materials requiring disposition would remain, other disposition facilities (e.g. Treatment and Storage Facility and Pu vitrification) would be used for this purpose.

Improve Completion of Spent Nuclear Fuel (SNF) Stabilization and Disposition Programs by Three Years. This initiative would complete all SNF stabilization, packaging and shipments of SR SNF to Yucca Mountain by 2018. The current schedule for completion of this program assumes a continued requirement for a receipt capability for domestic and foreign research reactor fuels beyond the policy expiration date of 2017.

Dispose of Pu-238 Contaminated Waste Onsite. This initiative would avoid construction and operation of facilities to retrieve, package, and dispose of approximately 3900 cubic meters of Pu-238 contaminated waste to Waste Isolation Pilot Plant (WIPP). The onsite disposition would eliminate a high potential for worker risk and avoid modifications to the TRUPACT II shipping container required to transport this material.

Idaho (ID). In May 2002, DOE, the Idaho Department of Environmental Quality, and the Environmental Protection Agency signed a letter of intent formalizing an agreement to pursue improved risk reduction and cleanup at Idaho. The following opportunities have been identified for improved completion of EM mission:

Evaluate Alternates for Calcine Treatment and Disposal. This opportunity would require an analysis of the National Environmental Policy Act (NEPA) coverage for alternative treatment and disposal options for calcine. The strategy would identify specific regulatory, statutory, guidance, or policy changes required to pursue options. Based on the completed analysis, EM can prepare a revised Draft Record of Decision (ROD).

Improve Calcine Retrieval and Packaging for Disposal. An analysis can be performed to determine the suitability of calcine as a waste form to be disposed at Yucca Mountain. If it is found that Calcine can be disposed of as is, without adversely impacting performance of the repository, it can be packaged without additional treatment and safely disposed of at Yucca

Mountain. EM will need to identify specific regulatory, statutory, guidance, or policy changes required to pursue this option.

Improve Shipping Schedule and Optimize Packaging of SNF. This opportunity would pursue the improved shipment of SNF from Idaho to Yucca Mountain such that all SNF would be removed from Idaho. In addition, the following waste forms, not currently included in the initial Yucca Mountain Repository License Application, would be analyzed for acceptance and disposal at Yucca Mountain: Sodium-bonded SNF (Fast Flux Test Facility, Fermi), and "un-standardized canister" Fort St. Vrain SNF, "un-standardized canister Three Mile Island fuel.

Designate Appropriate Areas of ID to be Federally Owned and Controlled in Perpetuity. Completion of EM mission can be improved by establishing risk-based points of compliance for ground-water remediation and risk-based cleanup levels for soil. Implementation of this approach would involve identification and assessment of alternative approaches and agreement with regulatory agencies to use an alternate compliant approach.

Oak Ridge Operations Office (OR). The Oak Ridge EM improved cleanup baseline is scheduled to be completed earlier than larger sites like Hanford and SRS. Therefore, the OR life cycle baseline may have fewer opportunities for significant improvements.

However, some contribution to schedule improvement and cost savings may come from the K-25/27 D&D project at Oak Ridge. Although this project is viewed as relatively high risk, innovative technical, managerial, and waste disposal approaches, coupled with the application of learning curve efficiencies and appropriately incentivized contracting approaches could result in project efficiencies and cost savings. Early proactive coordination between EM Headquarters, OR, and Bechtel Jacobs Company LLC (BJC), aimed at reducing the security posture during the K-25/27 D&D project, is critical to any potential savings. Finally, by leveling the funding profile in FY'05/06, acceleration of the K-25/27 D&D project is also possible.

Portsmouth / Paducah (PPPO). The EM scope is scheduled to be complete in 2012 at Portsmouth and 2019 at Paducah, with two exceptions being continued operation of the Depleted Uranium Hexafluoride (DUF_6) conversion facilities and continued surveillance and maintenance (S&M) at each site. In addition, a remediation activity that cannot be completed until demolition of the uranium enrichment production facilities is deferred. The baseline strategy at both sites is to implement cleanup work by addressing sources of groundwater contamination, remediating groundwater plumes, disposing of surface debris and legacy and newly generated waste, demolishing non-leased facilities, and addressing contaminated soils and sediments.

There are three opportunities for schedule acceleration and cost reduction included in the End State Vision document, and the site is pursuing these opportunities with regulators as appropriate. These are:

- Implementing cleanup goals for groundwater using selective source reduction, monitored natural attenuation for plume remediation, and institutional controls.
- Capping burial grounds at Paducah.
- Limiting soil excavation to hot spot removal for industrial rather than residential land use and eliminating sedimentation basin construction at Paducah.

West Valley Demonstration Project (WVDP). It appears feasible to transport the 275 HLW canisters to the Savannah River Site for interim storage as early as 2006. This would result in the elimination of a potential roadblock to turning over the WVDP site to the State of New York.

Programmatic Opportunities

High Level Waste. The United States has approximately 400 million liters of liquid HLW stored in underground tanks and approximately 4,400 cubic meters of solid HLW stored in bins. The current U.S. estimate for converting these liquid and solid wastes into stable forms for shipment to a geological repository exceeds $50 billion expended over several decades. With such a high cost estimate, it is imperative that DOE-EM focus on identifying a candidate technology and/or programmatic changes which will improve the cleanup schedule, worker safety, and cost savings. There are several opportunities in the HLW program which are needed for improvement. They are summarized below:

Treat Waste Based on Characterization and Actual Risk. The current treatment process for HLW tanks is not always based entirely on detailed characterization and risk data, but rather by groupings or tank farms. It would be beneficial to determine the treatment process for each tank on an individual basis, using the actual historical characterization and risk data available.

Improve the HLW Treatment Process. This activity will focus on increasing the Hanford WTP operating capacity, as well as improvements to SRS's process to treat HLW. Improvements include increasing the waste loading of the glass, optimization of the HLW melter to increase throughput/capacity, and evaluating alternate waste forms for consideration.

Enhance HLW Processing. Based on the responses DOE received on a Request for Information issued in October 2003, a decision was made to solicit industry for innovative technologies for improving the processing of HLW. A Request for Proposals (RFP) was issued in July 2004.

Evaluate Alternative Plans for Calcine Disposal. By utilizing alternate plans for disposing the calcined waste and its decay, DOE could potentially dispose of this waste efficiently, and save on the retrieval and treatment costs.

Transuranic Waste (TRU). EM plans to dispose of 141,314 cubic meters (m^3) of contact-handled (CH) TRU waste and remote-handled (RH) TRU waste at the Waste Isolation Pilot Plant (WIPP) near Carlsbad, New Mexico. As of the end of FY 2004, approximately 17 percent of this total had been disposed of at WIPP. This does not include the buried (pre-1970) TRU waste (approximately 126,000 m^3) at several DOE sites, including Hanford, Idaho, Los Alamos, Nevada Test Site, Oak Ridge, and Savannah River. In addition, there is estimated to be greater than 32,000 m^3 of TRU-contaminated soil as a result of liquid discharges and above ground safety and nuclear weapons tests at the above sites (primarily at Hanford). Carlsbad Field Office (CBFO) life-cycle baseline planning calls for completion of disposal of legacy TRU waste by 2015; completion of disposal of newly generated waste by 2030; and decommissioning of the WIPP facility beginning in 2031 and ending in 2035.

The opportunities discussed below include initiatives from the Transuranic Waste Performance Management Plan with further development through discussions with CBFO and the generator sites. [6]

Conduct Remedial Actions for Buried (pre-1970) TRU Waste Using a Consistent Approach to Cleanup. DOE's current approach for managing buried TRU-contaminated wastes and environmental media is to address them on a site-specific basis under CERCLA, RCRA, or applicable state statute incorporating input from impacted stakeholders. The resultant site-specific consensus plans could result in inconsistent cleanups between sites if not performed using a consistent risk-based approach.

Optimize TRU Waste Characterization.

- Improve and possibly expand implementation of mobile/modular approach to characterization at generator sites (Centralized Characterization Project [CCP]).
- Implement Regional Hub Sites Concept.
- Deploy large container Non-Destructive Assay / Non-Destructive Examination capability.
- Reduce characterization requirements through regulatory improvements.
- Identify and evaluate alternatives to accelerate regulator reviews and approvals of WIPP certification audit reports and key permit modification requests.

Optimize TRU Waste Transportation and Disposal.

- Increase accountability for TRU waste shipments from generator sites.
- Deploy TRUPACT-III shipping container to accommodate oversized boxes, which comprise approximately 40,000 m3 of the current CH-TRU waste inventory.
- Develop solutions for high wattage/gas generation waste.
- Increase WIPP onsite storage capability.
- Optimize shipping schedules to be in line with WIPP transportation and disposal capabilities.

Spent Nuclear Fuel (SNF). The opportunities identified by the study for improvement are based on continuation of the work conducted by the EM spent nuclear fuel (SNF) IPT. The IPT presented "Case 5" schedule of Integrated Acceptance Schedule which was an optimum case for shipment of DOE spent nuclear fuel, high-level waste, and immobilized plutonium to Yucca Mountain. This schedule was based on a set of assumptions that were valid at the time of completion of the report. However, considerable uncertainty existed in the waste forms and the rate of packaging capabilities at DOE sites. The study concluded that several decisions are required to complete a credible updated "Case 6" of the integrated acceptance schedule. These are presented below.

Foreign Research Reactor (FRR) Spent Nuclear Fuel Acceptance Activities. DOE has made a decision to extend the FRR program by several years. This would result in an increase in the amount of the fuel within DOE inventory.

Regionalization Decision. Based on a regionalization decision for the DOE fuel, stainless-steel clad fuel would be sent to Idaho and Aluminum fuel would stay at SRS. However, in view of a

tentative decision not to treat the aluminum fuel at SRS, it is not clear if the current strategy to segregate FRR at two sites is most economical.

Dry Storage Facility at ID. EM is proceeding with a privatization contract at ID for designing and building a dry storage spent nuclear facility. This facility is intended to package and store the ID fuel in preparation for shipment to Yucca Mountain. Future progress may affect the project schedule and ongoing activities.

EM Management of Office of Nuclear Energy Fuel at ID. EM is storing fuel at ID that is originated by NE facilities. It includes domestic research reactor fuel, Advanced Test Reactor Fuel, and Experimental Breeder Reactor (EBR-II) fuel. Decisions have to be made as to how long EM plans to continue managing NE generated spent nuclear fuel.

Decision about Disposition of Calcine. The waste form for disposition of calcine waste has not been decided. If facilities used for packaging and storing calcine are common with SNF handling facilities, the waste form and its packaging may affect the plans for SNF packaging capability and rate of packaging.

Sodium Bonded Fuel. "Case 5" of the integrated acceptance schedule is based on the assumption that the sodium bonded fuel can be shipped to Yucca Mountain without further treatment. Analysis for acceptance of this fuel by the Office of Civilian radioactive waste management (RW) for Yucca Mountain disposition has not been completed.

Other Shipping Assumptions. "Case 5" of the integrated acceptance schedule is based on the assumptions that (1) certain DOE fuel can be shipped to Yucca Mountain in current configurations; (2) these configurations will be acceptable to RW for handling at Yucca Mountain; and (3) this approach is the most cost effective for DOE. These fuels include TMI-II fuel in existing containers, Fort St. Vrain fuel at Colorado in existing containers, Fort St. Vrain fuel at ID in bare blocks. Further analysis is needed to ensure that these assumptions are valid.

Next Steps and Framework to Make it Happen

In a number of cases, the opportunities identified by the study represented a significant departure from the current baseline approach. They presented programmatic, regulatory and technical issues that will need to be addressed, many of which carry substantial programmatic risks or implementation challenges. Development of a comprehensive strategy to address these risks and challenges is being planned, including coordination and communication with stakeholders. In a number of cases, further analysis or trade-off studies would need to be conducted prior to developing detailed implementation plans. A draft list of "next steps" which represents the near-term actions to be taken to begin or improve implementation of the recommended initiatives, and incorporation into site and programmatic baselines has been developed. The list indicates the action, approximate schedule, and the responsible lead and supporting organizations.

A risk assessment would be necessary before attempting to implement the identified opportunities. The assessment would measure potential inability to achieve overall goal of improved completion of EM mission by identifying and examining uncertainties and possible

outcomes. The risk assessment would reflect a structured and formal review of factors potentially impacting the successful implementation, and would quantify the impact via an analysis of uncertainties.

CONCLUSIONS

The EM study is an ongoing comprehensive study to assess whether it is possible to further improve the completion of EM cleanup mission and if so, under what conditions and initiatives. The study team has concluded that if significant programmatic, regulatory, and technical issues can be successfully addressed, the mission can be accomplished more effectively. Next steps are being identified and assigned to focus resources on key areas for implementation or further study.

ACKNOWLEDGEMENT

Significant input to the study and the text incorporated in this paper was provided by Randy Kaltreider, Kurt Juroff, Barry Smith, Dick Blaney, and George Dixon, Office of Environmental Management, Department of Energy. Their contribution is gratefully acknowledged.

REFERENCES

1. U.S. Department of Energy (DOE), "A Review of the Environmental Management Program," U.S. Department of Energy, Washington, D.C. (2002).
2. U.S. Department of Energy (DOE), "Closure Planning Guidance," U.S. Department of Energy, Washington, D.C. (2004)
3. U.S. Department of Energy (DOE), "Use of Risk-Based End States," DOE P 455.1, U.S. Department of Energy, Washington, D.C. (2003)
4. U.S. Department of Energy (DOE), "Integrated Hanford Baseline," U.S. Department of Energy, Richland, Washington (2004)
5. U.S. Department of Energy (DOE), "Draft Environmental Management Program Performance Management Plan," U.S. Department of Energy, Aiken, South Carolina (2004).
6. U.S. Department of Energy (DOE), "Draft Transuranic Waste Performance Management Plan," U.S. Department of Energy, Carlsbad, New Mexico (2002).