

TECHNOLOGY DEVELOPMENT AND DEPLOYMENT PROJECT PLAN

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ABSTRACT

The Office of Environmental Management (EM) is making a transition to “projectize” EM’s Technology Development and Deployment (TDD) activities. The purpose of moving TDD into a project mode is to fully align the TDD activities, now through the time of site closure, with the sites’ cleanup activities. The principal challenge for site managers and contractors will be to look beyond current contract baselines and goals, and to identify technology needs throughout the entire project schedule to the estimated time of site closure. Phase I of the current program was completed in Fiscal Year 2004 with the preparation of the TDD Project Plan; a summary of the results of Phase I is included in this paper. A Phase II revision of the TDD Project Plan is underway to support the FY 2007 budget request for project-based technology needs. EM staff will continue to update the Project Plan on an annual basis to capture the sites’ changing priorities.

INTRODUCTION

In an effort to more directly support opportunities identified in the Office of Environmental Management (EM) cleanup acceleration initiatives, the Office of Environmental Cleanup and Acceleration has been directed to “projectize” EM’s Technology Development and Deployment (TDD) program. This represents a transition from the former approach, which was designed to develop technologies that were alternatives to existing site baseline technologies, to provide short-term technical assistance, and to support near-term closure needs. The new, projectized approach is to address the technology needs being identified by the EM sites that will enable them to accelerate their cleanup schedules by eliminating technical barriers and/or provide the technical foundations for establishing end states. The intent of moving TDD into a project mode is to fully align the TDD activities, now through the time of site closure, with the sites’ cleanup activities. The principal challenge for site managers and contractors is the need to look beyond current contract goals and identify technology needs throughout the entire project schedule to the estimated time of site closure.

As indicated by a review of existing site Performance Management Plans and site baselines, such a focus would allow a significant shortening of the TDD effort itself and associated cost savings. The current Integrated Planning, Accountability, and Budgeting System indicates a TDD completion date of 2020. The end-date for TDD requirements, but not necessarily the closure date itself, is defined as the end-of-[TDD] mission. EM is recasting its TDD budget structure to reflect the technology deployment opportunities through the end-of-mission.

In planning for the FY 2006 budget submission, the Office of Environmental Cleanup and Acceleration worked directly with each of the sites to review their current technology needs. The sites were requested to identify technology needs that would enable them to accelerate their cleanup schedules. For those technology needs that EM should address, funding estimates and

priorities were established in consultations between headquarters and field contacts. In order to provide timely analyses for the Environmental Management fiscal year (FY) 2006 Office of Management and Budget submission, these consultations and documentation were completed in July and August, 2004.

EM's strategic goal, as stated in DOE's strategic plan, is "to protect the environment by providing responsible resolution to the environmental legacy of the Cold War and by providing for the permanent disposal of the Nation's high level radioactive waste."

In February 2002, EM's Top-to-Bottom Review team reported that EM's past cleanup performance had been characterized by uncontrolled cost and schedule growth and a misplaced emphasis on managing risk, rather than reducing risk to workers, the public, and the environment.

In response to that review, the cleanup program now focuses on configuration-controlled baselines and metrics for achieving site cleanup and closure in accordance with individual site Performance Management Plans (PMP's). This effort is structured in three phases, which are represented within the EM budget process with three funding accounts: (1) sites scheduled to close by 2006, (2) sites scheduled to close by 2012, and (3) sites scheduled to close by 2035. EM's present cleanup plan is targeted to complete cleanup of legacy waste at a total estimated life-cycle cost of \$144 billion (constant FY 2004 dollars). EM's vision for its cleanup program includes a strong, technically based effort to search continually for ways to accelerate the completion of the program.

This acceleration effort, which primarily affects those sites with high-level waste, significant soil or ground water contamination, and large quantities of legacy transuranic wastes, will involve examining, modifying, and pursuing opportunities for accelerating their overall cleanup schedule. Among possibilities for acceleration is the application of technology to reduce the resources required for high-cost elements of the legacy waste cleanup program (e.g., dispositioning of tank wastes).

The EM mission requires research and development (R&D) and applied technology to achieve schedule acceleration and reduction in baseline technical risks. Previously, alternatives to baseline technologies had been proposed to reduce programmatic risks, improve schedules, and reduce costs. The purpose of the new approach is to ensure that technically improved and more cost-effective R&D and technology options are fully integrated into ongoing projects. It is anticipated that the transition to the new TDD project structure will be conducted in two phases. The first phase, which was completed in 2004, addressed the immediate need to provide a basis for the FY06 budget request. A second phase is now underway in conjunction with the FY 2007 budget formulation cycle to provide additional time for sites to identify their complete technology needs and budget through to the end-of-mission. In Phase II, EM staff will review sites' input and progress on Phase I activities, as well as the needs not currently being addressed through the end of mission.

Our goal is to seek funding that will fully support the sites' needs, build on site PMP's and end states, support well-defined end dates for completion of closure, and reduce life-cycle costs.

PHASE I PROCEDURE AND RESULTS (2004)

Several large EM sites and near-term closure sites were selected to participate in Phase I. These sites were Savannah River (SR), Oak Ridge (OR), Idaho (ID), Hanford (ORP and RL), Ohio (OH), Portsmouth/Paducah, Carlsbad, West Valley and Rocky Flats. The sites technology needs were evaluated in 2004 as the first step to achieve a projectized technology program, or one that would serve cleanup and closure projects to the end of cleanup. Due to the limited amount of time for the preparation of Phase I recommendations to support the FY 2006 budget submission, the prioritization of candidate technologies for each site was done jointly and in parallel with close contact between the respective site and headquarters' contacts. The primary means of communicating progress was through weekly conference calls and iterative assessments of TDD candidates by email and telephone exchanges between the site and headquarters contacts.

A TDD data template was prepared and distributed to site contacts for review and consensus. Following agreement on the format, site representatives worked with site contractors and managers of current baseline technology development to complete the template for each proposed technology.

EM technical staff analyzed the requests for the potential to accelerate risk reduction and remove technical barriers in closure projects. Remaining questions were then discussed with site contacts, who also provided additional clarification. Following these discussions, a recommended list of needs for new funding was provided to EM management. At the same time, reviewers were asked to identify significant site problems or technology needs that were not identified in site proposals. Final decisions were made primarily upon expert judgment of subject matter reviewers and whether the proposals overlapped or could be more effectively addressed with ongoing plans for Technical Assistance or Alternatives Projects.

Eighty-seven proposals were received from the sites. They related primarily to four major problem areas: High-Level Waste, Ground Water and Soils, Decontamination and Decommissioning, and Transuranic Waste. Rocky Flats and Carlsbad did not submit technology needs as they were being addressed by other means. The Ohio office, Portsmouth/Paducah and West Valley submitted closure needs with strong justifications for near-term technical assistance beginning with FY05 funding and execution that will be reviewed separately by EM. The distribution of proposals is provided in the Table I.

Table I. Site vs. Technical Needs

	ID	ORP	OR	RL	SR	OH ¹	Ports/ Pad ¹	WV ¹	Total
HLW	2	11			9			2	24
TRU/Pu/SNF	3		1	3	1				8
GW/S	4		13	3	4	9	9		42
D&D	2		2	2		6		1	13
Total	11	11	16	8	14	15	9	3	87

¹ Technical Assistance Needs

Results of the review confirmed that there are a number of R&D needs that DOE must address in the future to provide technology solutions across the DOE complex. A majority of these activities are needed because there is no current solution available, and the site will be unable to meet or accelerate their cleanup and closure schedules. The problem areas are discussed below.

High-Level Waste

Retrieval, treatment and disposal of high level waste (HLW) is one of EM's most challenging and costly programs. Wastes at ORP, INEEL, and SR must be treated and immobilized, and prepared for shipment to a repository for disposal. Storage and processing facilities must be cleaned up, closed, and brought into conformance with site risk-based end states. TDD is needed in each of these areas to accelerate schedules, cut costs, and reduce programmatic risk. Twenty-four proposals were received from HLW sites in the following areas: retrieval of sludges and solids, separation of wastes into HLW and low activity waste (LAW) fractions, waste processing of both HLW and LAW, means to increase higher waste loading in glass, and tank closures.

Ground Water and Soils

Forty-two proposals were submitted that relate to ground water and soils contamination, which reflects the significance of this issue at every cleanup site. The time horizon for the proposals spanned from the current time (closure sites) to long times that are associated with intractable and widespread contamination by chlorinated solvents, metals, and radionuclides, e.g. Richland, ID, OR, and SR. Many of the longer term problems also capture needs that are common to establishing end states, such as characterization instrumentation to confirm performance confirmation and long-lasting solutions, e.g. better caps or barriers.

Inherent to this problem are the long-lifetime contaminants of concern -- radionuclides (Tc, Np, Pu), mercury and other toxic metals, and organics. Experience with caps, barriers, and other current containment methods is limited to deployment of new techniques for the past 10-20 years, and longer-term performance is uncertain. Current regulatory approaches extend for 30 years following closure.

For purposes of evaluation, proposals were considered within three categories. These were monitored natural attenuation, in situ treatment, and characterization/monitoring. These categories captured common themes among proposals from all sites.

An understanding of processes that affect the long-term effectiveness of natural attenuation is crucial to gaining confidence in planned site closure methods and regulatory acceptance. Several proposals were received that have good potential for sharing and enhancing technical progress across several sites. These were given a high priority. For example, ID and RL have similar unsaturated zone issues, and SR and RL have work underway that will benefit all sites.

In situ methods of treatment may be the only way to address remediation of persistent and toxic metals, principally mercury, and longer-lived radionuclides. To this end, proposals were received for in situ stabilization or immobilization techniques, and were also given a high priority.

Longer term monitoring and characterization of pre- and post-closure site environments are recognized in the TDD proposals, which are primarily related to needs for "tools" or methods to assure confidence in the performance of closed sites. Although important, this area may require a broader involvement of multi-site planning efforts to agree upon technology development needs.

Decontamination and Decommissioning

Thirteen proposals from multiple sites indicated the need for a "toolbox" of D&D supporting technologies for dust suppression and fixative applications. The D&D of gaseous diffusion plants requires a larger set of innovative tools, as was indicated by a proposal for a vendor's conference. This problem is being partially addressed through a currently funded alternatives project at Portsmouth.

One of the largest and most unique D&D challenges that the Department faces is the Alpha-4 Facility at Oak Ridge. Through a number of various processes conducted in the facility since 1947, there are thousands of pounds of solidified lithium remaining in the equipment and process lines, thousands of pounds of elemental mercury, mercury-contaminated equipment and structures, and hundreds of gallons of lithium hydroxide. Removal of these contaminants presents a serious risk to workers and the environment.

Transuranic Waste

Eight proposals were received from the sites on subjects related to the retrieval, treatment, and assay of transuranic waste. As mentioned in the TRU Waste Performance Management Plan there are several key technologies that need to be developed to achieve accelerated cleanup. These technologies will enhance characterization, transportation and disposal activities.

Development of characterization using NDA/NDE assay instruments for large TRU containers is a high priority item at all TRU-handling sites. SRS requested additional funding to assist with certification of this characterization technology.

Other proposals among the eight submitted appeared to fit more appropriately in site cleanup baseline funding. These specific needs that recognized related technologies under development for deployment addressed mostly characterization and some treatment of contact handled TRU. Several sites mentioned an overarching need for additional characterization of various TRU inventories, handling and packaging of contact and remote handled wastes, and support for transportation of TRU wastes to meet accelerated schedules.

Summary of Phase I Results

A total of 87 needs were identified by the sites, addressing HLW, Ground Water and Soils, D&D, and TRU waste. There was a high degree of interest among sites in filling gaps in technology needs that currently do not fall within contractor responsibilities. Some of these needs are partially being addressed by ongoing work under Alternatives Projects or through technical assistance activities, but more support is needed in those cases that were assigned a high priority. Examples include NDA work for TRU shipments, HLW treatment alternatives, and ground water remediation. Ohio, Portsmouth/Paducah, and West Valley submitted needs proposals to achieve closure in 2006 and beyond, and these will be addressed by EM.

Phase I provided valuable lessons-learned for proceeding with Phase II. On the positive side, there was significant site support for identifying technical needs in the limited time available to prepare input for the FY 2006 budget request. Overall cooperation was very good. Several process deficiencies have been corrected in Phase II. These include the need for more comprehensive involvement of subject matter experts at sites to assist in identifying longer-term visions and technology needs through the end of mission. Few long term needs (beyond 2008) were identified. Life-cycle "technology thinking" is required to achieve a projectized TDD integration with baselines. Significant areas of uncertainty remain program-wide in key areas, e.g., D&D, orphan waste/materials, and end-state definition.

PHASE II ACTIVITIES (2005 AND BEYOND)

The principal goal of EM's Office of Environmental Cleanup and Acceleration in FY 2005 is to complete the transition of TDD activities in to a fully projectized implementation. We will focus on establishing technology awareness and needs through site closure. The challenge to federal and contractor staff is to look beyond current contracts and technical baselines to identify opportunities for accelerating cleanup through projected site closure dates. To meet the challenge, staff will be asked to identify technical alternatives that have potential to significantly reduce technical risks that are known or can be anticipated with additional analyses of projected baselines that extend beyond current contract goals.

Based on the results of Phase I, EM staff is concentrating on those sites and problem areas that offer the highest potential for cost savings and schedule acceleration. Approximately 75% of the technology needs identified in Phase I were related to remediation and disposal goals for HLW, GW/S, and the areas of uncertainty that are mentioned above – D&D, orphan wastes/materials, and end-state definition. These major problem areas contain common themes: uncertainties over current retrieval and remediation methods; needs for cheaper, effective and faster-acting

technologies; similarities in multi-site needs; and regulatory uncertainties. Equally challenging, but less ubiquitous, are technical needs to support transuranic waste retrieval, treatment and shipment.

In FY 2005, we have begun Phase II work with sites to identify technologies that will support and strengthen the underlying technical bases for their cleanup schedules through their projected closure dates. Beginning with Savannah River, we will meet with site federal and contractor staff on technical baseline obstacles and to discuss technical alternatives that would optimize their opportunities for long-term success. Following each site visit, a report will be prepared that summarizes and ranks TDD opportunities based on their potential for cost savings, technical risk reduction, and/or schedule acceleration.

Close collaboration will continue with other DOE offices and federal agencies to insure the best use of limited science and technology resources for cleanup applications. Continued advances in science and the technology are essential to the long term success of the cleanup effort, which will last for at least another two decades. The continued direct engagement by the DOE's Office of Science research community with problems and the problem holders at DOE sites is essential to ensure that science continues to have a positive, significant impact on schedule acceleration and risk reduction. Continued collaboration with the USEPA and DoD is needed to share experiences with technology deployments in site environments that are similar to EM's. Much has been accomplished in the international community on problems that are equally common to EM sites. Cooperation will continue on shared problems, particularly on HLW retrieval, treatment, and immobilization technologies. Thus far, the benefits of international collaboration have provided significant tangible benefits to EM's cleanup program, and further benefits will be realized.

SUMMARY

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