DOE/EM-0004

Report to Congress

Status of Environmental Management Initiatives
to Accelerate the Reduction of Environmental Risks and Challenges Posed by the Legacy of the Cold War

January 2009

Office of Environmental Management

Submitted Pursuant to Section 3130 of the
National Defense Authorization Act for Fiscal Year 2008

U.S. DEPARTMENT OF
ENERGY

On the cover:

Fernald Site, near Cincinnati, Ohio, 1987 *(top image)*
The Fernald Closure Project (called the Fernald Site) is a former uranium processing facility.

Fernald Preserve, 2006 *(lower image)*
Cleanup was successfully completed in 2006.

EXECUTIVE SUMMARY

Fifty years of nuclear weapons production and energy research in the United States during the Cold War generated large amounts of radioactive wastes, spent nuclear fuel (SNF), excess plutonium and uranium, thousands of contaminated facilities, and contaminated soil and groundwater. During most of that half century, the Nation did not have the environmental regulatory structure or nuclear waste cleanup technologies that exist today. The result was a legacy of nuclear waste that was stored and disposed of in ways now considered unacceptable. Cleaning up and ultimately disposing of these wastes is the responsibility of the U.S. Department of Energy (DOE).

In 1989, DOE established the Office of Environmental Management (EM) to solve the large scale and technically challenging risks posed by the world's largest nuclear cleanup. This required EM to build a new nuclear cleanup infrastructure, assemble and train a technically specialized workforce, and develop the technologies and tools required to safely decontaminate, disassemble, stabilize, disposition, and remediate unique radiation hazards.

The sites where nuclear activities produced legacy waste and contamination include the original Manhattan Project sites – Los Alamos, New Mexico; Hanford, Washington; and Oak Ridge, Tennessee – as well as major Cold War sites, such as Savannah River Site, South Carolina; the Idaho National Laboratory, Idaho; Rocky Flats Plant, Colorado; and Fernald, Ohio. Today EM has responsibility for nuclear cleanup activities at 21 sites covering more than two million acres in 13 states, and employs more than 30,000 Federal and contractor employees, including scientists, engineers and hazardous waste technicians. This cleanup poses unique, technically complex problems, which must be solved under the most hazardous of conditions, and which will require billions of dollars a year for several more decades.

The EM program focus during its first 10 years was on managing the most urgent risks and maintaining safety at each site while negotiating state and Federal environmental compliance agreements. The program also concentrated on characterizing waste and nuclear materials and assessing the magnitude and extent of environmental contamination. By the late 1990s, EM had made significant progress in identifying and characterizing the extent of contamination and cleanup required and began transitioning from primarily a characterization and stabilization program to an active cleanup and closure program.

During that time, EM formulated multi-year cleanup and closure plans, which contributed to cleanup progress; however, reducing the overall environmental risk associated with the cleanup program remained a challenge. In response, the Secretary of Energy directed a review of the EM program be undertaken. The resulting "Top-to-

Bottom Review" re-directed the program focus from managing risks to accelerating the reduction of these risks.

PROGRESS

Taking a broader look at cleanup results across the program, EM has made substantial progress in nearly every area of nuclear waste cleanup, including stabilizing and consolidating special nuclear material (SNM). Progress also includes the near completion of transferring SNF from wet to dry storage and disposition of large quantities of transuranic (TRU) waste, low-level waste (LLW), and mixed low-level waste (MLLW). Much work remains but demonstrable progress has been made, specifically:

- Stabilizing and consolidating SNM (plutonium and uranium) resulting in significant reduction of environmental, safety, and security risks. EM has eliminated all but two highly secure nuclear material storage locations and the associated costly security requirements;
- Transferring nearly all of EM's SNF inventory from wet to dry storage, a safer configuration for the long term. Previously, much of the SNF was stored in aging water pools. At Idaho National Laboratory, these pools were located over an important groundwater aquifer; Hanford's pools were located within a quarter-mile of the Columbia River;
- Stabilizing radioactive wastes stored in large, aging and leaking underground tanks. This was accomplished by transferring the radioactive liquid tank waste from single-shell tanks to more durable double-shelled tanks at Hanford and pursuing tank cleanout and closures at Hanford, Savannah River Site, and Idaho;
- Disposing of both remote-handled (RH) and contact-handled (CH) TRU waste, LLW and MLLW – using safe and compliant processes, large volumes of waste have been disposed of successfully;
- Remediating soil and groundwater contamination, thereby mitigating the further spread of these contaminants;
- Deactivating and decommissioning (D&D) radioactively contaminated facilities at sites such as Rocky Flats, and replicating the skills learned there to D&D facilities at other EM sites.

However, the biggest challenges EM faces are those that have few precedents and fewer off-the-shelf technologies and processes to address them. EM continues to move forward and clear hurdles in finalizing design, constructing, and operating three unique and complex tank waste processing plants to treat approximately 88 million gallons of radioactive tank waste for ultimate disposal. With a total cost estimate of $14.3 billion to construct, these plants require extensive engineering, technology development and testing; vast quantities of concrete, steel, and other commodities; and a highly trained and specialized workforce. EM also faces the challenge of selecting and implementing disposition options needed to prepare certain types of SNM and SNF for ultimate disposal. Compounding the technical complexities are regulatory and national policy issues, which also must be resolved.

While maintaining the momentum to develop and build these capabilities, EM will continue to seek ways to maximize reduction of environment, safety, and health risks in a safe, secure, compliant, and cost-effective manner. The current EM life-cycle cost estimate range, which covers the period of 1997 through completion, is $274 to $330 billion. This includes $69 billion in actual costs from 1997 through 2007, and an additional estimate of $205 to $260 billion to complete EM's remaining mission. EM is analyzing its cost and schedule project baselines to further optimize the program. This strategic planning effort will concentrate on the technical, programmatic, and performance challenges facing the cleanup projects. It is focused on footprint reduction and near-term completions to reduce monitoring and maintenance costs and on alternative approaches to dispositioning tank waste, excess SNM and SNF.

The EM life-cycle cost estimate does not include the Department's additional environmental liabilities primarily for the D&D of hundreds of excess (surplus) facilities, as well as the management of waste and materials from other DOE mission programs (i.e., National Nuclear Security Administration, Office of Science, and Office of Nuclear Energy). The liabilities for other mission programs amount to $3.7 to $9.2 billion to address the 340 excess facilities and materials.

STRATEGIES

EM's overall goal is straightforward – to complete its cleanup mission in a safe, secure, and compliant manner and to do so within prescribed costs and schedules. However, because of the size, complexity, and uniqueness of this program, EM continues to develop and enhance management systems and cleanup and waste disposition approaches and technologies to build on the progress of the past 20 years. The following describe the strategies EM is taking and planning to take in its continuous pursuit to improve program effectiveness and build on past successes.

ACQUISITION MANAGEMENT

More than 90 percent of EM's work is accomplished through 40 prime contracts having a total value of more than $40 billion. To ensure high-quality procurements, EM established a new Deputy Assistant Secretary for Acquisition and Project Management to standardize the acquisition process; integrate acquisition, contract and project management; and achieve sustainable process improvement. EM continues to transition from management and operating (M&O) contracts to performance-based contracts or, as appropriate, other contract types focused on discrete scopes of work. This approach provides enhanced flexibility, enables greater competition and allows more opportunities for small business.

PROJECT MANAGEMENT

DOE Order 413.3A, *Program and Project Management for the Acquisition of Capital Assets*, mandates a disciplined process be applied to the management of the Department's construction projects. EM is also applying those same principles to its cleanup projects, which involve operational rather than construction activities. Currently, EM manages 14 construction projects and 62 cleanup projects, many of which will require more than a decade to complete. Invoking the best practices of industry in project management ensures projects remain on schedule and within cost. A "technology readiness assessment and maturity plan" methodology is being incorporated into projects at various stages, along with DOE Standard 1189, which requires that safety be integrated early in the design phases of projects. EM has partnered with the U.S. Army Corps of Engineers to identify the necessary enhancements in personnel capabilities and systems to further transform EM into a "best-in-class" project management organization. EM is also developing and implementing processes and procedures for improving quality assurance and for identifying and managing project risks.

REGULATORY MILESTONES AND COMMITMENTS

Most of EM's cleanup is performed under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) through Federal Facility Agreements (FFAs) and under the Resource Conservation and Recovery Act (RCRA) through various consent and compliance orders. EM's overall record of meeting regulatory milestones exceeds 90 percent. However, at a number of sites, EM has missed or anticipates missing some enforceable milestones in the near future, due to continuing program challenges such as safety, contract administration, project management, regulatory, legal, technical, and economic influences. EM is committed to meeting its regulatory obligations and is taking a number of steps to expand and improve the tools used to monitor and track regulatory compliance.

TANK WASTE

DOE and its predecessor agencies generated radioactive waste as a by-product of processing SNF for the production of nuclear weapons. EM has taken actions to ensure safety in the storage of 88 million gallons of this tank waste in 230 underground tanks at Hanford, Savannah River Site (SRS) and Idaho National Laboratory (INL). Tank waste, by far, is DOE's most significant environmental, safety and health threat, having significant regulatory, technical and policy issues. It also is EM's largest cost element, with life-cycle costs estimated between $87 billion and $117 billion, which represent 36 to 39 percent of the total program cost. During the next decade, projected costs to complete construction of three one-of-a-kind plants for processing this tank waste into stable, long-lasting glass or other solid waste forms for ultimate disposal are projected at $14.3 billion. Many tanks, particularly at Hanford, have exceeded their design lives and require significant annual costs for monitoring and maintenance. At Hanford and SRS, combined annual tank monitoring and maintenance costs alone are $500 million. Innovative technologies and processing options are being identified and developed to retrieve and more efficiently treat tank waste.

SPENT NUCLEAR FUEL

SNF was generated from research associated with nuclear power and production of nuclear materials for use in nuclear weapons, scientific research, and medicine. EM manages about 2,400 metric tons heavy metal (MTHM) of SNF. EM has solved many of the major technological challenges of moving SNF from aging wet storage pools into dry storage. Nearly all of EM's SNF will be safely managed in dry storage containers by the end of Fiscal Year (FY) 2009, awaiting ultimate disposition in a deep geologic repository. While SNF can be stored in this configuration for at least 50 years, availability and capacity of Yucca Mountain could jeopardize compliance milestones and require the construction of additional on-site storage facilities.

SURPLUS SPECIAL NUCLEAR MATERIALS

Storing surplus SNM, mainly isotopes of plutonium and uranium, requires extensive and expensive measures to reduce safety, health, and security risks. Sound management requires this material be consolidated into fewer locations. There were nine locations where SNM was stored. EM has eliminated all but two of these highly secure nuclear material storage locations, one at SRS and one at Hanford. The plutonium stored at Hanford will be consolidated at SRS by the end of FY 2009, thus reducing storage costs and enabling D&D of the plutonium processing complex at Hanford to proceed. Although current and planned facilities could accommodate the storage and disposition of surplus plutonium and uranium at SRS, EM continues to evaluate the most cost-effective means to ultimately disposition these materials.

TRANSURANIC WASTE, LOW-LEVEL WASTE AND MIXED LOW-LEVEL WASTE

EM is now routinely disposing of RH and CH TRU waste in the world's only operating deep geologic repository for radioactive waste—the Waste Isolation Pilot Plant (WIPP) near Carlsbad, New Mexico. In addition, EM routinely disposes of large quantities of LLW and MLLW at a combination of DOE and commercial facilities.

EM also has in its inventory LLW and MLLW that does not have readily available disposal options. One of these waste streams is Greater-Than-Class C (GTCC) LLW. DOE is currently preparing an Environmental Impact Statement (EIS) to evaluate disposal options for GTCC LLW.

Cleanup Completion, Closure, and Transfer of Environmental Remediation Sites

EM is responsible for cleanup at 107 sites, with acreage equaling the areas of Delaware and Rhode Island combined. By the end of FY 2008, EM had projected completion of cleanup at 89 of these sites but completed 86. EM is implementing a planning approach that is national in scale and uses risk reduction as a major prioritization factor. Based on successes at Rocky Flats, Fernald, and Mound, EM continues to apply lessons learned at these sites, as it pursues small sites closures and the completion of discrete areas of larger sites.

Achievements and Innovation in Technology and Engineering

EM's advancements in engineering and technology led to the design and operation of first-of-a-kind technologies to solve many problems that once seemed unsolvable. Significant challenges remain in some EM program areas such as, waste processing, SNF, and challenging materials. The EM Engineering and Technology program will address these risks and use applied research and engineering to improve technologies and processes at DOE sites across the Nation.

Conclusion

The EM program has solved environmental cleanup problems that at one time seemed unsolvable. EM will continue to make significant progress in solving the complex challenges still facing the program. EM is committed to pursuing solutions that enable it to meet its environmental stewardship responsibilities, while judiciously using the resources entrusted by the American people.

Table of Contents

List of Figures

List of Tables

This page intentionally left blank.

1 EM PROGRESS

This Report to Congress is prepared pursuant to section 3130 of the National Defense Authorization Act for Fiscal Year (FY) 2008 (NDAA), and summarizes the Department of Energy's (DOE's or the Department's) Office of Environmental Management (EM) initiatives to accelerate the reduction of environmental risks and challenges posed by the legacy of the Cold War.

1.1 OVERVIEW

The EM program was established in 1989 to address the Nation's Cold War environmental legacy resulting from five decades of nuclear weapons production and government-sponsored nuclear energy research. While pursuing this mission, EM is committed to sound safety principles and will continue to maintain and demand the highest safety performance to protect workers and communities where EM cleanup activities occur. Through focused contract and project management, EM is remediating sites and reducing risks to current and future generations.

This report, developed in accordance with section 3130 of the FY 2008 NDAA, addresses the following:

- **Section 1** delineates EM's cleanup progress and discusses the status of initiatives undertaken to accelerate risk reduction after the 2002 *Review of the Environmental Management Program,* (commonly referred to as the *Top-to-Bottom Review*), a 2007 report by the National Academy of Public Administration entitled *Office of Environmental Management: Managing America's Defense Nuclear Waste* and other evaluations and reviews. Section 1 also discusses the progress, strategy and challenges in the following areas:
  - Acquisition, Contract and Project Management;
  - Regulatory Agreements;
  - Interim Storage and Final Disposition of Waste and Spent Nuclear Fuel;
  - Consolidation and Disposition of Surplus Special Nuclear Materials and Safeguards and Security Impacts;
  - Closure and Transfer of Environmental Remediation Sites; and
  - Achievements and Innovation by Contractors in Accelerated Risk Reduction and Cleanup.
- **Section 2** describes EM's current regulatory framework and site-specific commitments
- **Section 3** discusses EM's life-cycle cost estimate

- **Section 4** provides an overview of excess facilities and cleanup scope expected to be transferred to EM.

The report also includes the following appendices:

- **Appendix A: List of Enforceable Milestones**
- **Appendix B: Life-cycle Costs by Project Baseline Summary**
- **Appendix C: Facilities Proposed for Transition to EM**
- **Appendix D: List of Acronyms**
- **Appendix E: List of References**

1.2 The Environmental Management Program Background

Fifty years of nuclear weapons production and energy research generated millions of gallons of liquid radioactive waste, millions of cubic meters of solid radioactive wastes, thousands of metric tons (MT) of spent nuclear fuel (SNF) and special nuclear material, thousands of contaminated facilities and huge quantities of contaminated soil and water. The EM program was established in 1989 to clean up this Cold War legacy.

The Cleanup Challenge

EM Cleanup Scope included the remediation and processing of about:

- 13 MT of plutonium
- 108 MT of plutonium and uranium residues
- 88 million gallons of radioactive liquid tank waste
- 2,400 MTHM of spent nuclear fuel
- 158,000 cubic meters of transuranic waste
- 1.4 million cubic meters of low-level waste and mixed low-level waste
- 450 nuclear facilities, 3,600 industrial facilities, and 900 radiological facilities

At the inception of the EM program the extent of contamination and associated risks were largely unknown; and many of the technologies and processes necessary to reduce these risks had not been developed. The EM program focus during its first ten years was on managing the most urgent risks while developing the technology and tools necessary to execute the world's largest environmental cleanup. Initially the program focused on characterizing waste, assessing the magnitude of contamination, stabilizing material, and achieving compliance. Developing a cleanup program of unprecedented scope and complexity presented an enormous challenge, with many of the wastes and facilities requiring "first-of-a-kind" solutions. By 1995, EM had transitioned from primarily a characterization and stabilization program to a cleanup and closure program.

During its early years, EM developed a series of documents to inform the public about the history of the nuclear weapons complex and the resulting required cleanup. These included:

- *Baseline Environmental Management Report* (BEMR), the Department's first top-down life-cycle estimate on the full scope and cost of the "Cold War Mortgage" (1995 & 1996);
- *Environmental Management Taking Stock: A Look at the Opportunities and Challenges Posed by Inventories of the Cold War Era*, a report on the Materials in Inventory Initiative (1995);
- *Closing the Circle on the Splitting of the Atom* (1996); and
- *Linking Legacies Connecting the Cold War Nuclear Weapons Production Processes to their Environmental Consequences* (1997).

Following the BEMR efforts, EM sites continued developing life-cycle cost and schedule estimates, which were eventually published in site *Ten Year Plans*. Sites were challenged to identify ways in which most of the cleanup could be completed within the subsequent ten years. These plans established near-term objectives for greatly accelerating the pace and reducing the cost of cleanup over previous projections. This planning process established the foundation for the successful acceleration of cleanup and closure of three former weapons production sites: Rocky Flats; Mound; and Fernald.

In 1998, EM developed *Accelerating Cleanup: Paths to Closure*, a "projectized" approach to cleanup, which more fully defined the life-cycle scope and cost of the EM program. The report outlined the evolving EM cleanup program based on site-developed, project-by-project forecasts of the scope, schedule, and cost to complete cleanup.

As a follow up to *Paths to Closure*, at the direction of the Secretary, the Assistant Secretary for EM conducted a *Top-to-Bottom Review* of the EM program and its management systems, with the goal of quickly and markedly improving program performance. The review, published in 2002, concluded EM's focus was on managing worker, public and environmental risks, rather than actually reducing or eliminating those risks. The four major findings of the *Top-to-Bottom Review* were:

- The manner in which EM developed, solicited, selected, and managed many contracts was not focused on accelerating risk reduction and applying innovative approaches to doing the work;
- EM's cleanup strategy was not based on comprehensive, coherent, technically supported risk prioritization;
- EM's internal business processes were not structured to support accelerated risk reduction or to address its current challenge of uncontrolled cost and schedule growth. DOE's financial liability (estimated at the time of the report to be about $220 billion) would continue to grow in cost and schedule if significant changes to the program are not made; and

- The current scope (at that time) of the EM program included activities not focused on, or supportive of, an accelerated, risk-based cleanup and closure mission.

The *Top-to-Bottom Review* report provided a series of recommendations for improving performance. In 2002, EM launched a major initiative to implement those recommendations, focused on four major courses of action:

- Improve DOE's contract management;
- Move EM to an accelerated, risk-based cleanup strategy;
- Align DOE's internal processes to support an accelerated, risk-based cleanup approach; and
- Realign the EM program so its scope is consistent with an accelerated, risk-based cleanup and closure mission.

Following the recommendations of the *Top-to-Bottom Review,* EM committed itself to extensive management reforms and re-focused programmatic objectives. Since that time, EM has continued to pursue many of the recommendations of the *Top-to-Bottom Review* and it has been the primary focus of EM leadership to build a Best-in-Class capability in EM for contract and project management.

The aggressive innovations of EM leadership for improving EM's performance were in initial stages of implementation when, in FY 2006, the House and Senate Appropriations Committees requested in the FY 2006 appropriations bill that the National Academy of Public Administration (NAPA) conduct a management review of the EM program. In April 2006, NAPA began this review, focusing on four areas:

- Organization and Management;
- Acquisition;
- Project Management; and
- Human Capital.

Over 19 months, NAPA conducted its review in a highly interactive manner. During the course of the review, recommendations and proposals for improvement NAPA provided were consistent with the strategies and initiatives the Assistant Secretary was already undertaking to address contract and project management performance. NAPA identified the need to:

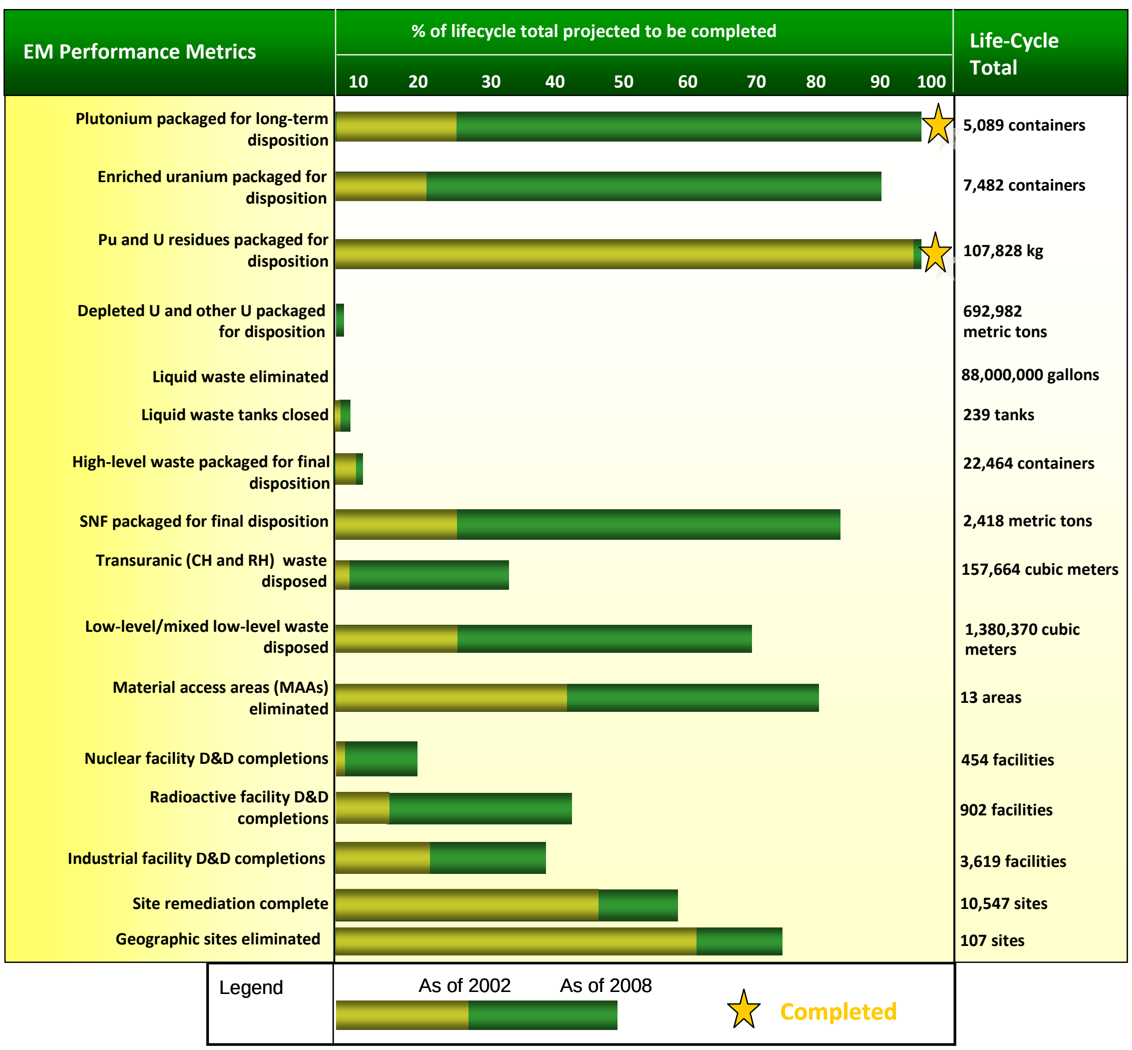
- Focus management priority on human capital, budget and acquisition functions;
- Advance the ongoing Deputy Assistant Secretary for Acquisition and Project Management's change management initiatives; and

- Further advance project management capabilities and improve tools for managing and overseeing project performance.

EM leadership strongly supported the proposals NAPA provided throughout the review and immediately began implementing them. EM has now implemented almost all of the panel recommendations and is aggressively working to complete the remaining few NAPA recommendations in early 2009.

The performance of the EM program is measured against baselines of the scope, schedule and cost of each of the projects in the program. Sixteen corporate performance metrics are also used to assess and communicate the annual and life-cycle progress of the EM cleanup. Each metric is tracked against the projected life-cycle quantities necessary to complete cleanup at each site. Together, the baselines and the performance metrics clearly establish agreed-upon performance expectations. Both baselines and performance metrics are under configuration control. Figure 1.1 compares the status of the performance metrics in FY 2002 with the current status (as of the end FY 2008).

Figure 1.1 Corporate Metric Life-cycle Completion Chart



Since 2002, EM has focused on and made substantial progress in stabilizing and consolidating special nuclear material, resulting in significant reduction of risk posed by these materials. As a result, EM has eliminated all but two Material Access Areas (MAAs), which has dramatically reduced not only risk, but costly compliance with security requirements. Progress also includes the near completion of transferring SNF from wet to dry storage and disposition of large quantities of transuranic (TRU) waste, low-level waste (LLW), and mixed-low level waste (MLLW). However, while the major portion of EM's current budget is being devoted to building the capability for tank waste treatment and disposition, large investments are still needed to complete building the needed facilities and process the tank waste, which is one of the primary risk and cost drivers in the program. While much work remains, demonstrable progress has been made since 2002 to support EM's overall objective of risk reduction and cleanup.

For budget formulation, the EM program ranks cleanup activities with the greatest risk reduction benefit per radioactive content and overlays its regulatory-compliance commitments and best business practices to maximize cleanup progress.

An important element of this process is the evaluation of options for completing cleanup work at small sites or in specific areas of larger sites, in order to reduce the ongoing costs of safety, surveillance, and maintenance. This approach has allowed the EM program to continue to reduce risk and also make significant progress in reducing the "footprint" of the EM program.

EM Priorities

- Essential activities to maintain a safe and secure posture in the EM complex
- Radioactive tank waste stabilization, treatment, and disposal
- Spent nuclear fuel storage, receipt and disposition
- Special nuclear material consolidation, processing, and disposition
- High priority groundwater remediation
- Transuranic and mixed/low level waste disposition
- Soil and groundwater remediation
- Excess facilities Deactivation & Decommissioning

The cleanup and closure of the Rocky Flats site in Colorado in 2005, and the Fernald site in Ohio in 2006, are two clear examples of the benefit of balancing EM priorities. Work at both of these sites initially focused on the cleanup of high-risk nuclear materials, and then focused on the completion of lower-risk activities to enable the sites to be closed and re-dedicated to other beneficial use. By pursuing an early closure of the sites rather than maintaining them in a state that would have required continued surveillance and upkeep, EM estimates that nearly $21 billion was saved, as summarized in Table 1.1.

Table 1.1 Cost and Schedule Savings of Accelerated Cleanup and Closure

Closure Site	Original Baseline Cost and Completion Date	Actual Cost and Completion Date	Savings/Schedule Acceleration
Rocky Flats	$27 Billion, 2055	$6.5 Billion, 2005	$20.5 Billion, 50 Years
Fernald	$3.4 Billion, 2030	$3.2 Billion, 2006	$ 0.2 Billion, 23 Years

EM currently has 12 small sites and several area closures that are candidates for completion by 2015, and will continue to evaluate opportunities to pursue near-term completion and footprint reduction cleanup activities that would accelerate cleanup, ultimately reducing the life-cycle cost of the cleanup program. A discussion of related strategic planning is provided in Section 3.

As well as being responsible for the cleanup of its current work scope, the Department has designated EM as the cleanup agent for excess facilities and materials currently owned by other Program Secretarial Offices (PSOs). However since 2001, EM has not accepted any new cleanup scope from other programs. This has created a backlog of excess facilities and materials requiring cleanup. In August 2006, the DOE Deputy Secretary directed EM to address these additional environmental liabilities, to execute the work, and to incorporate these liabilities into its program plans commensurate with the risk such activities posed. The additional liability identified to address the 340 excess facilities and materials is in the range of $3.7 to $9.2 billion, which is discussed in detail in Section 4.

1.3 Acquisition, Contract and Project Management

More than 90 percent of EM's work in reducing risk and completing cleanup is accomplished through the use of contracts. Currently, EM activities are being conducted through more than 40 prime contracts with a total value of more than $40 billion. These prime contracts generally are held by a limited liability company formed by individual companies and usually procure equipment and services from numerous subcontractors. The suite of contractors involves both large and small businesses with varying degrees of experience in DOE operations. Thus, one of the major focuses of the EM Federal workforce is to carry out an effective and efficient process for acquiring services for construction, deactivation and decommissioning (D&D), waste management, and environmental cleanup. In addition, EM must ensure contracts and project work scope are delivered to specifications within the negotiated costs and schedules. In order to facilitate this, EM established a new Deputy Assistant Secretary for Acquisition and Project Management.

1.3.1 Acquisition Management

The 2002 Top-to-Bottom Review of the EM Program, recognizing the importance of the acquisition process to EM's success, highlighted the need for improvements in this vital business process. It specifically noted that the "manner in which EM develops, solicits, selects, and manages many contracts is not focused on accelerating risk reduction and applying innovative approaches to doing the work."

The Review provided numerous recommendations to address these findings. They included restructuring EM's acquisition strategy to integrate project management, financial management, contract management, and oversight processes; improve the solicitation process to attract broader contractor participation; improve risk identification and management; and develop a more streamlined and predictable process for procurement and contract administration. In two subsequent reports, (Report to Congress Top-to-Bottom Review of the Environmental Management Program: Status of Implementation, October 2003, and Closure Planning Guidance, June 2004), progress in taking the corrective actions necessary to address the Review recommendations and guidance on further corrective actions were described.

The NAPA study, which began in April 2006, included acquisition as one of its focus areas. The NAPA Panel noted that its study was taking place coincident with significant ongoing acquisitions and in the wake of program modifications to the acquisition process. It provided additional proposals in these areas to further improve performance, all of which were accepted and are being implemented by EM.

PROGRESS

Ongoing acquisition management activities have been refined and enhanced while new ones have been developed and implemented. These initiatives include:

- Transitioning to Performance-Based Contracts;
- Projectizing Contracts;
- Contracting with Small Businesses;
- Standardizing the Acquisition Process; and
- Enhancing Personnel Capabilities.

Acquisition and Contract Management Strategy

- ❖ Acquisitions focused on accelerated risk reduction through performance-based contracts with well defined performance objectives
- ❖ Centralized business processes and procedures
- ❖ Single point of accountability for acquisition and contract management
- ❖ Acquisitions aligned and integrated into project baselines

Transitioning to Performance-Based Contracts

In 2002, EM had performance-based cost plus incentive fee contracts at three former nuclear weapons production sites that had no future DOE mission – Rocky Flats, Fernald, and Mound. With these "closure" contracts, the contractors agreed to a target cost and completion date; if the contractor was able to reduce the cost and accelerate the completion, additional fee would be earned. In each of these three contracts, the scope was completed ahead of the target schedules and below the target costs. Key success factors associated with these closure contracts were: the relatively short cleanup timeframe (e.g., 10 years); the pre-determined end-state and land use; identified off-site storage and disposal locations for special nuclear materials and radioactive waste, respectively; agreements with the regulators and communities as to the allowable amount of residual contamination remaining on site; and the use of earned value measures on the cleanup baseline to measure progress in lieu of numerous regulatory milestones.

In the months subsequent to the *Top-to-Bottom Review*, the performance-based incentives (PBIs) for all contracts were reviewed to determine their effectiveness in targeting contractor fee incentives to risk-reducing cleanup activities. In response, many PBIs were restructured. In addition, the transition from the traditional large, single site-wide management and operating (M&O) contracts to more aggressive, performance-based task oriented contracts was further emphasized. The goal was to structure contracts around defined performance objectives (scope, cost and schedule) and related at-risk financial incentives as a means to improve contractor performance, increase competition, and improve contractor cost efficiency. Where the key success factors noted above exist, contracts continue to be developed along these lines with enhancements incorporated from operating experience and recommendations of subsequent reviews such as those from the NAPA study.

For other sites, particularly the larger cleanup sites, the approach has been to evaluate the work to be conducted during the base period of the contract, identify work scope to be accomplished within this timeframe, and establish appropriate PBIs to accomplish the specified work within cost and schedule. This approach is similar to the performance-based objectives and incentives included in the three major closure contracts. However, at the larger sites, key success factors are not always present, demonstrating the need for other flexible contracting strategies to support achievement of risk reduction and cleanup progress.

Projectizing Contracts

One key strategy to drive mission success has been to re-procure historically large, site M&O contracts by breaking the work into discrete but still substantial projects. While performance-based contracts are preferred, the final procurement type is determined based on a range of factors such as the overall complexity of the work; extent of knowledge of existing conditions, such as type and amount of waste; and amount of project risk that can be borne by the contractor versus DOE. This strategy enables DOE to hire contractors having specific expertise to perform discrete scopes of work. It also focuses the contractor effort on accomplishing the work scope by using clear metrics and incentivizing attainment of the end results within cost and schedule.

There are several examples where this strategy has been implemented and has demonstrated success. At the Hanford Site in eastern Washington State, remediation of contamination along the Columbia River was procured separately as the River Corridor Project. Remediation along the 50-mile stretch of this major Pacific Northwest river was of particular importance to the local and regional stakeholders. At the Idaho National Laboratory (INL), cleanup of the site was procured separately from laboratory operations to enable contractors with the relevant experience to carry out these two highly disparate scopes. This strategy is continuing with the procurements at Savannah River Site (SRS) for the liquid waste system and one at the Portsmouth Gaseous Diffusion Plant. With the former, scope to manage and treat the radioactive liquid waste stored in large underground tanks is to be performed via a separate contract than the rest of site operations. At Portsmouth, a separate contract from those addressing site infrastructure and environmental remediation will be used to decontaminate, demolish, and dispose of the extremely large buildings and vast amounts of equipment used to enrich uranium for nuclear weapons purposes.

Contracting to Small Businesses

Another advantage of contract projectizing is that it has allowed EM to define more discrete scopes of work for which small businesses are well qualified. Not only does this contribute to the growth of small businesses but it also further expands the pool of contractors with experience working at DOE sites. This is an important credential since EM's work involves unique hazards associated with nuclear materials and radioactive contamination that are not encountered in other cleanup work. As a result, EM has become a leader within the DOE in identifying and awarding small business set-aside contracts. EM has provided more than $600 million directly to small businesses in FY 2007 and FY 2008, accounting for nearly 25 percent of the Department's total small business prime contractor funding. EM also encourages large businesses to involve small businesses in their contracts in a mentor-protégé relationship, which further provides small businesses with important experience in addressing DOE hazards.

EM has made extensive use of complex-wide multiple award contracts, in which firms have been selected to compete on tasks in such areas as environmental remediation, waste management, and facility deactivation and decommissioning. Because the companies are pre-qualified, the acquisition is much faster than traditional procurements. In 2004, EM awarded these contracts, known as indefinite delivery/indefinite quantity (IDIQ) contracts to 22 companies, 14 of which are small businesses. IDIQ task orders have been used 17 times at 10 sites for a total dollar value of more than $400 million. These awards have been used for such projects as remediation of an uranium milling site near Moab, Utah; facility demolition and removal and soil and groundwater remediation at the Knolls Atomic Power Laboratory Separation Process Research Unit near Albany, New York; environmental remediation and closure of a former uranium processing facility in Ashtabula, Ohio; and soil and groundwater remediation at the Stanford Linear Accelerator Center in Menlo Park, California.

Standardizing the Acquisition Process

EM has now built and is beginning to implement a standardized acquisition planning process to enable future cleanup acquisitions and contract transitions to flow more quickly and efficiently. This new EM Acquisition Center is co-located at DOE Headquarters in Washington, DC, and the EM Consolidated Business Center (EMCBC) in Cincinnati, Ohio. The EMCBC was opened in early 2005 to provide business services to certain EM sites that, because of their small size, could not support such functions as procurement, contract management, finance, and legal services. In addition, EMCBC's capabilities enable it to supplement these activities at larger sites throughout the EM complex.

The primary objectives of the EM Acquisition Center are to establish and maintain:

- A cadre of skilled, experienced acquisition professionals to support managers in the field, on a recurring basis, for major EM acquisition planning and procurement activities;
- A central repository of DOE and EM-specific acquisition procedures, policies and templates and other information promoting common practices and work flows;
- A well-defined system of governance, with clearly defined roles and responsibilities throughout the acquisition process; and
- An integrated, centralized acquisition system supporting field offices in managing their major EM acquisitions efficiently and effectively through standardized and repeatable business processes.

This is being accomplished through a standardized process with clearer delineation of roles and responsibilities, more focused contracting resources and expertise, clearer expectations, and improved guidance throughout the EM Program. EM continues to focus on reducing the time required for major procurements through better planning, integration, communication, tracking, and by having the necessary resources and expertise available when required. EM has developed metrics that provide for performance measurement and a long-range planning schedule for future programs enabling earlier requirements definition and resource planning. Such a streamlined process is expected to increase the number of bidders because of reduced bid and proposal costs.

EM's integration of its near-term contract cleanup scope with the longer-term cleanup missions is a continuous and complex process. In 2007, EM awarded seven new performance-based contracts, ranging from $25 million to $100 million. In 2008, four major performance-based contracts and one major M&O contract were solicited and awarded (Table 1.2).

Table 1.2 Major Procurements in 2008

Contract	Period of Performance	Value
Hanford Mission Support	5-year base, plus 5-year option	$3B
Hanford Plateau Remediation	5-year base, plus 5-year option	$4.5B
Hanford Tank Operations	5-year base with two options (3-year and 2-year)	$7B
Savannah River Liquid Waste	6-year base, plus 2-year option	$2.5B
Savannah River M&O	5-year base, plus 5-year option	$4B

A key responsibility in standardizing acquisitions is to ensure the process is carried out under a single authority in accordance with Government rules and regulations and DOE policy governing procurements. EM sought and received from DOE delegation of "Head of Contracting Activity" (HCA) for its Deputy Assistant Secretary for Acquisition and Project Management. As EM's senior contracting official, this position has ultimate responsibility for ensuring that contract awards and administration are fully compliant and for further ensuring the efficacy and integrity of the procurement process. This single line of authority within EM enhances consistency, standardization, and accountability.

- Progress -
Acquisition and Contract Management

Status in FY 2002	Progress Since FY 2002
◆ Decentralized individual site contract acquisition processes ◆ Large, site-wide performance-based contracts ◆ 2.1% of dollars obligated to contracts awarded were small business contracts	◆ Standardized complex-wide business practices ◆ Smaller, performance-based contracts Multiple contract strategies ◆ Consolidated Business Center and EM Acquisition Center ◆ 6.1% of dollars obligated to contracts awarded in FY 2008 were small business contracts

Enhancing Personnel Capabilities

EM has focused on professional certification of acquisition personnel through the Acquisition and Career Management Program (ACMP). The ACMP is a career management program established to provide a formal, structured approach to career development for DOE's acquisition workforce positions. The ACMP is designed to increase the proficiency of the acquisition workforce through competency-based training, education, experience, and Federal Acquisition Certification. EM is working to ensure all acquisition professionals, including formal designated contracting officers, receive the appropriate training and required certification under their appropriate career fields through the ACMP and the Office of Procurement and Assistance Management.

Addressing Challenges

EM must address the challenge of awarding contracts in a complex technical, regulatory and economic environment. This is further compounded by the shortage of highly skilled contracting professionals currently impacting the Federal Government.

Challenges

- Managing performance-based contracts
- Reducing acquisition lead time
- 15-20 major procurement actions in next three years

EM has established an objective to reduce acquisition lead times (currently upward of two years), achieve sustainable process improvement, and recruit and develop a highly qualified acquisition staff. As EM continues to move away from the M&O contract model to discrete performance-based contracts, both the number of planned acquisitions and the associated complexity will continue to increase. EM forecasts approximately 15 to 20 major procurement actions over the next three years, more than double the number in 2002, and anticipates the same level through FY 2018. With the establishment of the EM Acquisition Center, continuous process improvement, particularly from lessons learned, and continued recruitment and training, EM is poised to address these challenges as it moves towards implementing a centralized and standardized acquisition process.

1.3.2 Project Management

In FY 1999, DOE was directed by Congress to have an independent review conducted of its structure and process for managing projects. In response, DOE engaged the National Research Council. The resulting report identified several key weaknesses: lack of up-front planning; lack of a structure to manage projects; inconsistent planning and execution processes; and lack of a systematic program for recruiting and training professional project managers. The Department created the Office of Engineering and Construction Management (OECM), among other tasks, to address the weaknesses identified by the National Research Council. Over the next three years, National Research Council annually reviewed DOE's progress in addressing these deficiencies and identified that DOE had made substantial improvements.

In 2002, the *Top-to-Bottom Review* recognized that "without higher performance standards and breakthrough business processes, cost growth and schedule delays will continue to obstruct cleanup, and the risk to workers, the public, and the environment will not be reduced." The Review went on to recommend that to raise performance standards, EM should apply project management principles presented in DOE Order 413.3, *Program and Project Management for the Acquisition of Capital Assets,* to "all of its core work areas." The principles of DOE Order 413.3 had applied only to construction projects. The *Top-to-Bottom Review* suggested that EM apply those same principles to its "cleanup" projects, the majority of which were operational (e.g., treating waste, stabilizing nuclear materials, installing and operating groundwater treatment systems) rather than construction oriented in nature.

One of the four study areas in NAPA's review was devoted to project management. The NAPA Panel recommended project management improvements including standardization and integration of project performance management tools across the complex, implementation of "Best-In-Class" project management standards, use of project-specific success metrics, evaluation of the existing project contingency policy, and use of case studies as a training tool.

PROGRESS

Stemming from the observations and recommendations provided in the reviews noted above as well as the greater EM management emphasis on project management, the following activities have been undertaken:

- "Projectizing" the EM Portfolio;
- Applying Project Management Principles;
- Monitoring Project Performance;
- Integrating Contract Management with Project Management;
- Attaining "Best-in-Class" Capabilities;
- Enhancing Management Capabilities; and
- Managing Risk.

- Progress - Project Management	
Status in FY 2002	**Progress Since FY 2002**
◆ Insufficient number of qualified project specialists ◆ DOE Order 413.3 applied only to construction projects ◆ No independently reviewed baselines ◆ Lack of Earned Value Management System (EVMS) certified contractors	◆ Increased number of qualified Federal and contractor project specialists ◆ Application of DOE Order 413.3A to cleanup projects ◆ External review of baselines ◆ External certification of contractor EVMS systems

"Projectizing" the EM Portfolio

EM set out to apply the project management principles and processes outlined in the DOE Order 413.3 (revised in July 2006 as DOE Order 413.3A) to both construction and operating "cleanup" projects. This resulted in EM "projectizing" its work scope and establishing a project structure and control system. In essence, EM scope was organized into approximately 100 discrete projects by site and activity, for example the construction of the Hanford Waste Treatment and Immobilization Plant or the remediation of soil and water at Fernald. The former is a construction project while the latter was a cleanup project since it entails operation of equipment to move material and waste and to treat contaminated water. There are currently a total of 76 construction and cleanup projects. These projects serve as the basis for EM's management system; i.e., life-cycle project planning, multi-year budgeting, and execution are being done for each project, and site-wide and complex-wide integration is being done for the entire EM scope.

Applying Project Management Principles

With the development of the project structure, EM began the process of defining cost and schedule baselines for each project. This entailed identifying the detailed activities needed to accomplish the end-point of the project (for example remediation of waste sites in the Melton Valley area of the Oak Ridge Reservation in accordance with regulatory agreements), determining the costs of each of the activities, and laying out a logical schedule to carry out the work. These initial baselines were a first step in bringing project management principles to the EM program's cleanup project. A more intense effort was begun in late 2005 to infuse greater discipline and rigor into the project management system. EM, working with OECM, developed and published a new protocol for reviewing EM project cost and schedule baselines consistent with DOE Order 413.3. This protocol, now in place, requires application of advanced project management methodologies and processes to the planning and execution of EM cleanup activities. The methodologies include a thorough analysis of alternatives in determining the appropriate project approach, identification of project risks associated with the selected approach and strategies for managing those risks, and incorporation of cost contingency in case some of the risks come to pass.

Project Management Strategy

- Independently reviewed project baselines
- Certification contractors' Earned Value Management System
- Certified Federal Project Directors
- Integrated Project Teams
- Quarterly project reviews with Headquarters senior management

EM's project portfolio currently consists of 14 construction projects and 62 cleanup projects. Many of the latter cleanup projects are very large and complex, requiring many years to complete. Accordingly, cleanup project life-cycle baselines are divided into three parts: 1) prior actual costs; 2) near-term "performance" baselines, generally a five-year period or the term of the incumbent contractor, whichever is longer; and 3) long-term planning estimate ranges for projects extending beyond the performance baseline schedule through project completion.

For EM cleanup projects that extend many years beyond the performance baseline, the long-term cost and schedule estimates have a larger degree of uncertainty than shorter term projects. This technical and programmatic uncertainty is defined to the extent possible and reflected in a somewhat wide estimate range of cost and schedule. As these projects progress, the near-term baselines and long-term planning estimate ranges against which cost and schedule performance are measured are updated as appropriate, generally every five years. On the other hand, construction projects generally have a lesser degree of uncertainty and thus their full scope can be defined by a performance baseline.

To ensure the credibility of project costs and schedules, performance baselines for EM construction projects and the near-term performance baseline portion of cleanup projects are independently reviewed by OECM or EM's Office of Project Management Oversight. The long-term planning estimate ranges for the cleanup projects are reviewed for "reasonableness" since the scope, cost, and schedule are not defined to the same level of detail as the near-term performance measurement baselines.

In 2008, as part of an effort to implement project management reforms at a Departmental level, a detailed analysis of the root causes contributing to less than satisfactory project performance was conducted. From this effort, DOE developed a Corrective Action Plan (CAP). EM was an active participant in the CAP and is now developing and implementing corrective actions.

EM EVMS Certified Contractors

- Bechtel Jacobs Company LLC
- Bechtel National, Inc.
- Boeing
- B&W Pantex
- Brookhaven Science Associates
- CH2M Hill
- CH2M-WG Idaho
- Fluor Hanford
- LATA/Parallax Portsmouth, LLC (LPP)
- Lockheed Martin
- NSTec-National Security Technologies
- Parsons Infrastructure and Technology Group
- Stanford University
- Stoller Navarro NV
- Washington Closure Group
- Washington Savannah River Company

Monitoring Project Performance

EM uses an industry standard system known as Earned Value Management System (EVMS) to compare actual project scope, cost, and schedule performance against planned performance as depicted in the baseline. In parallel, OECM independently certifies the EVMS of the Department's contractors according to a nationwide industry consensus standard for EVMS, American National Standards Institute/Electronic Industries Alliance Standard-748-1998, to ensure a standardized and adequate EVMS is being used in the management of EM projects.

Furthermore, the Federal Project Directors (FPDs), who are EM's on-site project managers, continuously monitor the contractors' EVMS reports. They use this information to ensure their projects are on track and, if not or if trends are in a negative direction, to develop and implement corrective actions. Monthly status reports are provided by the FPDs to Headquarters for each ongoing project. Specific cost and schedule EVMS information is included in the monthly reports. Headquarters staff monitors and analyzes those reports and assists the FPDs on issue resolution. Additionally, EM's senior-most executives review each project in face-to-face meetings with the FPDs on a quarterly basis. Typically, the senior official at the site (the Site Manager), the FPD, and other supporting staff present the performance of their projects in a standardized format to the EM Assistant Secretary and other Headquarters senior managers. The purpose of the review is to present performance, discuss safety and risks, and to identify and work jointly to resolve issues as needed.

Integrating Contract Management with Project Management

Once a contract is placed, effective contract transition is critical to successful contract execution and the ability to appropriately manage the projects within the contracted scope of work. Effective contract transition for site contracts requires careful planning, integration, and coordination within DOE, with the incumbent contractor(s), and with the new contractor(s). To address this challenge, EM has developed guidance on contract management practices by implementing a system of measures to monitor and improve contract transition performance.

Several steps are being taken to assure contract and project scope, cost, and schedule are aligned. The formal industry-standard process for requesting and implementing changes to baselines is being enhanced to create a closer tie between changes in the baseline and changes in the contracts. In addition, reporting systems have been established to monitor field contract execution against established project baselines. Comprehensive reviews of contract performance, fee payments, labor issues, small business performance, and pending or anticipated contract modifications are conducted quarterly to address progress and identify any needed corrective actions.

Attaining "Best-in-Class" Capabilities

A central theme in the National Research Council and NAPA reviews was the need for the Department to enhance its human capital capabilities in project and contract management. Toward this end, EM partnered with the U.S. Army Corps of Engineers to identify the necessary enhancements to transform the EM organization into a "best-in-class" project and contract management organization. Capabilities at each EM site, the EMCBC, and Headquarters were assessed to identify the systems and human resources (both numbers and skill mix) needed to achieve a best-in-class project and contract management organization. The assessment included project and contract execution and management functions and roles and responsibilities. Gaps in critical areas such as

Best in Class

- Assessed Human Capital needed to meet Best in Class project and contract management
  - Acquisition Strategy
  - Configuration Control
  - Contract Administration
  - Cost Estimation
  - Project Controls
  - Schedule Management
- Corporate Implementation Plan developed

project controls, baseline management, cost estimation, change control, and schedule management were highlighted.

During 2007, EM and the U.S. Army Corps of Engineers developed a Corporate Implementation Plan as a roadmap to address the gaps in pursuit of best-in-class goals. The successful completion of the implementation plan will result in increased Federal ownership of EM projects, standardization of EM processes, clear communication of requirements and policy to EM personnel, and the identification and institutionalization of best practices across the EM complex.

EM has undertaken an aggressive program of recruiting and retaining highly skilled individuals at its major sites, the EMCBC, and at Headquarters. Currently 30 percent of the personnel gaps identified have been filled by Federal employees, and plans are underway to recruit and hire the remaining personnel. In the meantime, EM is using contractors to bridge the gap identified by the skills analysis while Federal staff are being hired.

Enhancing Management Capabilities

EM has a cadre of certified FPDs to manage EM projects. The FPDs are responsible for providing technical and programmatic oversight of the contractors performing the work and are the day-to-day governmental interface and manager for their respective projects. They serve on procurement evaluation teams, monitor contractors' performance, analyze performance trends in cost and schedule, and take necessary contract actions to keep projects on cost and on schedule. A DOE-wide Project Management Career Development Program establishes competencies for FPD certification, as required by DOE Order 361.1B, *Acquisition Career Development Program,* and OECM's Certification and Equivalency Guidelines. The competencies combine industry standard requirements, project management experience, and some of the Executive Core Qualifications required for members of the Federal Senior Executive Service.

EM uses Integrated Project Teams (IPTs) to provide the necessary resources for successful implementation of its projects and to serve as a "pipeline" for the development of future FPDs. The FPDs lead the IPTs, which are the core unit responsible for project management implementation. The IPTs consist of Federal and contractor staff with project knowledge and subject matter expertise essential to the successful planning and execution of the project. They include such technical and management disciplines as safety, risk management, engineering, quality assurance, contracts administration, and project controls. EM has initiated a number of activities designed to improve the functioning of the IPTs. These include both self and independent assessments of IPT capabilities, improved training, and workshops targeted to lessons learned and best-in-class IPT models.

EM uses "lessons learned" to share experiences in all aspects of project planning and execution. The use of case studies has proven to be a valuable method in training EM managers. Case studies covering project, technical, and legal risks using EM projects as the examples are in use. These studies of actual project situations demonstrate the complex challenges and dilemmas often confronting EM projects. In addition, EM is partnering with the Defense Acquisition University (DAU) at Fort Belvoir, Virginia, which is the U.S. Department of Defense's education center for, among other disciplines, project management. The DAU faculty trains EM managers using case studies in project and contract management problem solving.

Managing Risk

In another project management initiative, EM is incorporating a "technology readiness assessment and maturity plan" methodology into its projects at various stages. This tool was developed by the U.S. Department of Defense and the National Aeronautics and Space Administration. Given the unique technologies needed to solve DOE's cleanup challenges, it is important that technology assessments occur early in project planning and design. EM recently has adopted a standard tool to define technology maturity. It is proving useful in understanding and evaluating technology options, assessing vendor claims, and making appropriate decisions on which technologies to use.

In addition to technology maturity, EM identifies and manages other risks including uncertainties regarding availability of nuclear material and waste disposition facilities, and future regulatory policies and requirements. In that regard, risk management plans are developed for every project. These plans use a prescribed process for identifying and mitigating risks, assigning roles and responsibilities for managing the risks, and determining contingency funds in the event the risks cannot be mitigated. The clear intent is to manage risks and to avoid or overcome them whenever possible. Nevertheless, standard industry practice dictates that cost and schedule contingency be developed because project risks cannot always be mitigated.

ADDRESSING CHALLENGES

The ultimate goal for EM is to ensure that its projects routinely are completed within baseline cost and schedule. To attain this goal, EM must continue to develop and implement all the project and contract management tools at its disposal and ensure its workforce is appropriately sized and trained.
The Government Accountability Office

Challenges

- Management of ongoing and future construction projects
- Development of a more refined contingency policy
- Incorporation of safety and quality throughout a project's life cycle

similarly identified such challenges in its September 2008 report on EM project management.

Lessons learned analyses have identified additional reasons for cost and schedule growth. The first is that not all requirements, including those related to safety, are defined sufficiently early in project design. EM is now aggressively implementing DOE Standard 1189, which requires safety-related documents and reviews be completed in the initial stages of the design process. EM expects that integrating safety analyses up front in project design will avoid costly changes later in the project.

Second, numerous global factors have led to recent cost escalation in construction projects. Among these factors are fluctuating commodity prices due to worldwide demand for such consumables as steel; competition for nuclear-qualified workers and contractors; limited availability of materials; and insufficient domestic manufacturing infrastructure. The relative proportion of commodity usage in EM construction and cleanup projects strongly impacts the cost of a project. Historical cost indices and forecasted escalation indices will need to be continually evaluated to document and forecast changing costs.

Third, EM currently funds its cleanup projects at the 50 percent probability of success level. This means that, based on statistical analysis and modeling, half of the projects in EM's portfolio should be completed within the baseline cost and 50 percent should be completed at a higher cost than the baseline (EM construction projects are funded at the 80 percent confidence level). When cleanup project risks cannot be mitigated by reallocating resources or adjusting priorities, EM's only option is to delay work scope in order to conduct the work associated with the realized risk. EM also determines the costs and schedules associated with completing cleanup projects at an 80 percent probability of success. The potential costs associated with this greater confidence level are clearly higher. However, EM does not currently request in the budget process the funds required to support the higher confidence level. EM along with the Department at large is considering various options for determining the most applicable way of budgeting for and funding project risks.

Finally, EM has found it beneficial to conduct some characterization to first identify site conditions or waste composition, thereby reducing project uncertainty, and then to begin remediation work as early as possible to immediately reduce environment, safety, and health risks. This "bias for action" is a more aggressive approach than spending significant time up front characterizing in order to reduce most uncertainties before field work is started. As cleanup work is conducted, emerging risks are addressed by initiating activities to mitigate them. The challenge is to balance up-front characterization with environment, safety, and health risk reduction. EM has been successful in implementing this strategy at sites like Rocky Flats and looks to apply it elsewhere as appropriate.

1.4 Regulatory Agreements

EM's cleanup work at most sites is governed by one or more regulatory agreements or orders. These regulatory agreements and orders establish the scope of work to be performed at a given site and the dates by which specific cleanup milestones must be achieved. Compliance with these agreements and orders is the major cost driver for the EM program.

Regulatory Strategy

- Work with states and regulators to ensure agreements reflect the greatest opportunity to accelerate risk reduction and reduce life-cycle costs
- Keep state governors informed regarding the effect of issues on state equity
- Maintain close monitoring and tracking of regulatory compliance

A majority of EM sites are on the Environmental Protection Agency's (U.S. EPA) National Priorities List, where work is being performed under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). EM has entered into Federal Facility Agreements (FFAs) with its regulators pursuant to this law and its implementing regulations. Portions of the cleanup work also are subject to the Resource Conservation and Recovery Act (RCRA), and performed pursuant to agreements negotiated as part of implementing the Federal Facility Compliance Act (FFCAct) Site Treatment Plans (STP). A number of smaller sites operate under alternative regulatory scenarios, such as Nuclear Regulatory Commission (U.S. NRC) regulations, and state and local regulatory agency authority.

When the states, DOE, and U.S. EPA entered into agreements to cleanup and close many DOE sites, the intent was to set target dates for future cleanup actions with the understanding that preliminary work was needed to characterize the extent of contamination. EM began to review potential cleanup options based on that information. Also, many of the waste and material management activities at DOE require close inter-site coordination; however, milestones developed at the sites did not always consider the effect of the schedules on other sites. Finally, some of the negotiated milestones assumed the technological challenges would be solved to support achievement of the milestone. In many cases, the technological challenges were significantly greater than thought, so DOE has a number of milestones at risk due to technological difficulties (see Section 2).

As EM cleanup progressed and further characterization was completed, it became clear a cleanup prioritization solely focused on achieving compliance milestones would not necessarily support the greatest reduction of risk and the acceleration of cleanup in a cost-effective manner. In many cases, specific cleanup actions can be re-sequenced to reduce risk more quickly. Therefore, EM has been reviewing its cleanup agreements with its regulators to identify actions that can accelerate risk reduction.

DOE reviews cleanup agreements with all affected parties, assessing the opportunities to accelerate risk reduction and reduce the life-cycle costs of the following elements:

- Agreement milestones;
- RCRA permit requirements ; and
- CERCLA Records of Decision.

EM has successfully developed a close working relationship with Tribal Nations, state regulators and local citizens. EM has the largest Federal Advisory Committee Act chartered citizen advisory board in the Federal Government with boards at eight EM cleanup sites. EM also supports working groups with the National Governors' Association, the National Conference of State Legislators, and the Energy Communities Alliance, which represents local government at EM sites, and the State and Tribal Government Working Groups. These cooperative relationships have paid great benefits in terms of conflict avoidance and a better understanding of issues and concerns on the part of all parties.

In addition, independent oversight is provided by the Defense Nuclear Facilities Safety Board ("Board") in the areas of nuclear safety for former weapons sites, facilities and materials, pursuant to its enabling legislation. The Board also is required to review the design of new defense nuclear facilities before construction begins, as well as modifications to older facilities, and to recommend changes necessary to protect health and safety. Review and advisory responsibilities of the Board continue throughout the full life-cycle of facilities, including shutdown and decommissioning phases. EM, with its priority on safety, maintains close and open communication with the Board to address all safety concerns in a timely and comprehensive manner.

EM is committed to meeting its regulatory obligations and is taking a number of steps to expand and improve the tools used to monitor and track regulatory compliance. EM has entered all enforceable agreement commitments into its centralized database, allowing both Field sites and Headquarters offices to track commitments and to identify and report potential compliance issues as far in advance as possible. EM continuously monitors Field sites progress toward meeting the enforceable agreement commitments and provides regular status reports to EM senior managers. In addition, EM has renewed guidance requiring Field sites to notify and coordinate with EM Headquarters before entering into negotiations with regulators regarding new or modified enforceable commitments.

An example of successful coordination with regulators is EM's recent resolution of a long-standing disagreement with the State of Idaho over the amount of buried transuranic (TRU) waste that must be retrieved and shipped out of state under the terms of a 1995 settlement agreement. EM and its regulators successfully negotiated an agreement to exhume about six acres of the 97-acre Subsurface Disposal Area.

ADDRESSING CHALLENGES

> **Challenges**
>
> - Ensuring agreements help accelerate the reduction of risk and reduce costs
> - Establishing program priorities that reduce risk and achieve compliance
> - Ensuring agreements are based on realistic assumptions

At a number of sites, EM has missed enforceable milestones or forecasts a risk of missing enforceable milestones in the near future for a number of program performance reasons, including safety, contract administration, project management, regulatory, legal, technical, and economic influences. To establish program priorities, EM ranks activities with the greatest risk reduction benefit per radioactive content and overlays its compliance commitments and best business practices to maximize cleanup progress.

In some instances EM must re-prioritize cleanup actions, thereby delaying the accomplishment of enforceable milestones. More information on enforceable milestones is provided in Section 2. Also, strategic planning efforts are underway to evaluate alternatives for accelerating and re-sequencing work to achieve the greatest net benefits in terms of risk reduction, efficiency and compliance. More information on strategic planning is provided in Section 3.

Moreover, EM has developed a Technology Roadmap to address significant, long-term technological gaps that may place upcoming milestones at risk. More information about the Technology Roadmap is provided in Section 1.8. EM will continue to work with Federal and state regulators to ensure enforceable milestones reflect an achievable, risk-based path forward.

1.5 INTERIM STORAGE AND FINAL DISPOSITION OF RADIOACTIVE WASTE AND SPENT NUCLEAR FUEL

1.5.1 TANK WASTE

DOE and its predecessor agencies generated radioactive waste as a by-product of processing SNF for the production of nuclear weapons. These wastes were stored in large underground tanks at the Hanford Site (Hanford) in Washington State, SRS in South Carolina, INL in Idaho, and the West Valley Demonstration Project (WVDP) in New York State. EM is now safely storing 88 million gallons of "tank waste" in 230 underground tanks at three sites:

- Hanford – 54 million gallons in 177 tanks

- SRS – 33.1 million gallons in 49 tanks
- INL – 0.9 million gallons in 4 tanks

The tank waste at WVDP has been converted into a stable glass form, which is stored on-site.

Tank waste is by far DOE's most significant environmental, safety, and health threat. It is also the largest cost element of the cleanup program, with a life-cycle cost range estimated between $87 billion and $117 billion, which represents between 36 percent and 39 percent of the program's total cost. Many of these underground tanks, particularly at Hanford, have exceeded their design lives. EM expends significant resources and attention in monitoring and maintaining the tanks to ensure their integrity is sound, they are not leaking, and that workers can safely perform the necessary tank maintenance and ongoing remediation activities. At Hanford and SRS, the combined annual tank monitoring and maintenance expenditures are approximately $500 million. Because of the unique and hazardous nature of this radioactive waste, innovative technologies for waste retrieval and disposition must be developed. This includes constructing treatment plants to convert liquid waste into a stable, long-lasting waste form such as glass, until it may be safely disposed in a geologic repository. These plants house highly complex chemical and physical treatment processes and must be very robust to operate safely over many years and to protect workers from radiation fields and contamination. Thus, they are expensive to construct and operate and require advanced engineering and technologies.

Tank Waste Strategy

- Minimize volume of high-activity waste to be solidified
- Store glass canisters on site until Federal repository is ready for permanent disposal
- Solidify low activity fraction and dispose on site
- Develop approaches to manage/treat/ dispose of some tank wastes as other than high-activity waste
- Continue emptying and closing tanks per compliance agreements
- Implement requirements of section 3116 in closing tanks at SRS and INL

PROGRESS

Tank Waste Retrieval

The first step in mitigating the risks posed by the tanks is to remove the waste, particularly focusing on the older single-shell tanks (as opposed to an inner and outer double-shell tank with space in between for containing and monitoring any leakage). This was already accomplished at Hanford where nearly 3 million gallons of liquids that could physically and cost-effectively be removed from single-shell tanks were retrieved and moved into double-shell tanks. At other sites, tanks have been emptied to the maximum extent practicable and then backfilled with concrete or grout to stabilize the small amount of contamination remaining in the tanks. Since 2002, seven 300,000-gallon underground storage tanks and four smaller 30,000-gallon ancillary tanks at the

INL have been emptied, cleaned, and filled with concrete. In addition, two 1.3 million-gallon SRS tanks were closed and grouted in 1997.

- Progress - Tank Waste Activities	
Status in FY 2002	**Progress Since FY 2002**
◆ 1,125 canisters of solidified tank waste produced at SRS ◆ Two tanks at SRS operationally closed and grouted ◆ Solidification of tank waste at West Valley complete (275 canisters) ◆ Stabilization of INL tank waste complete, except sodium bearing	◆ More than 1,400 canisters of solidified tank waste produced at SRS ◆ Safely storing more than 2,800 canisters at SRS and WVDP ◆ Grouted and closed 7 of 11 underground tanks at INL ◆ Safely storing 88 million gallons of tank waste in 230 underground tanks ◆ Design and construction of WTP at Hanford is about 50% complete ◆ Interim Salt Waste processing initiated at SRS in 2008 ◆ Design of the Salt Waste Processing Facility at SRS is 90% complete ◆ SBW treatment facility at INL is 48% complete

Tank Waste Treatment

Once retrieved to the maximum extent practicable, EM's strategy is to chemically and physically separate the waste into two fractions, the much higher volume portion that contains shorter-lived, less radioactive elements ("low-activity" waste or LAW) and a much smaller fraction that contains longer-lived, radioactive elements ("high-activity" waste). The two fractions are then separately treated into stable, solid forms. The LAW is proposed to be disposed on-site, and the high-activity waste is proposed to be disposed off-site in a geologic repository.

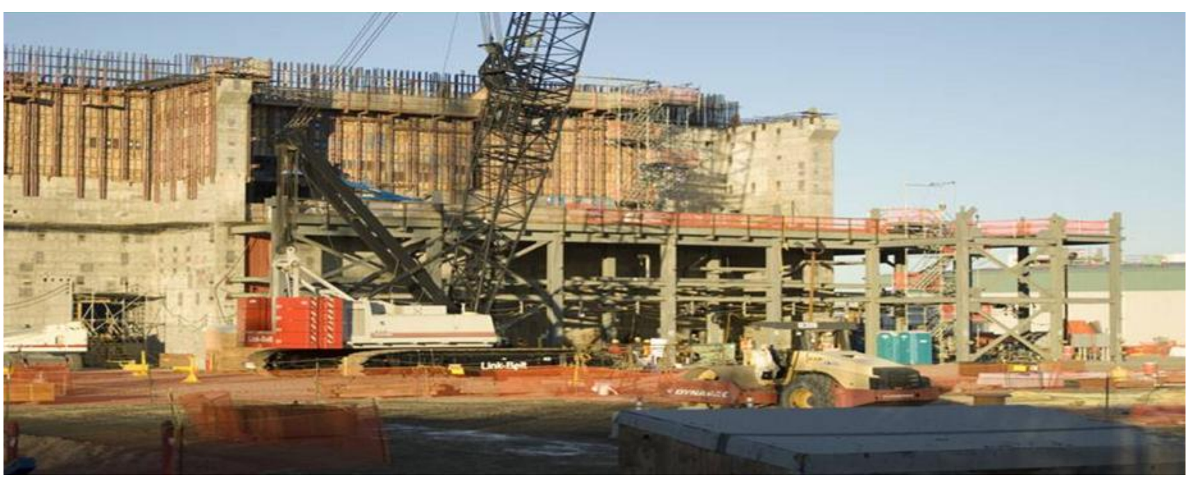
The Salt Waste Processing Facility (SWPF) and the Waste Treatment and Immobilization Plant (WTP) are being constructed at SRS and Hanford, respectively, to treat and immobilize radioactive tank waste. After solving several major technical challenges, SRS is completing the design and construction of the SWPF (initially estimated at $900 million with a current estimate of $1.3 billion with contingency at the 80% confidence level), and scheduled to begin operations in FY 2014. The SWPF (Figure 1.2) will separate the LAW and high-activity waste fractions, with the former being solidified in a grout form in the existing Saltstone facility and disposed on-site in large vaults. The high-activity waste fraction will be sent to the Defense Waste Processing Facility (DWPF), which has been in operation since 1996, where it will be converted to a stable glass form in a process known as vitrification. DWPF (construction cost of $4 billion) has vitrified high-activity waste into more than 2,600 canisters. The canisters are stored on-site in special purpose facilities awaiting ultimate disposal in a geologic repository.

Figure 1.2 SWPF Construction Progress and Conceptual Model

In advance of the startup of SWPF, to maintain the compliance-driven schedule for closing SRS tanks and to address risk more quickly, SRS began operating two interim tank waste processing facilities (the Actinide Removal Process and the Modular Caustic Side Solvent Extraction Unit) to separate out LAW for on-site disposal. EM continues to pursue strategies to optimize the capacity of these facilities to complete treatment of the tank waste in a cost-effective manner.

The WTP now under construction (estimated construction cost of $12.3 billion), (Figure 1.3), will separate the LAW and high-activity waste fractions of the Hanford tank waste. It will then vitrify the two waste fractions with the LAW disposed on-site and the high-activity waste disposed in a geologic repository. Operation of the WTP facility is scheduled to begin in 2019.

Figure 1.3 Waste Treatment Plant Construction Progress



There are 0.9 million gallons of tank waste remaining at INL, which is stored in four underground tanks. This waste will be treated at the Sodium Bearing Waste Facility, which is currently under construction (initial estimated cost of $462 million with operations beginning in FY 2010) (Figure 1.4). Currently, the cost estimate is $551 million (with contingency at the 80% confidence level), and operations scheduled to begin in 2011. At West Valley, a vitrification plant (cost of construction of $430 million) was constructed and has converted the radioactive tank waste into 275 canisters of glass.

Figure 1.4 Sodium Bearing Waste Facility Construction Progress

Tank Waste Disposal

As noted above, until the geologic repository at Yucca Mountain, Nevada, is available, EM will store canisters of solidified high-activity tank waste on-site. The stabilized product of LAW treatment at WTP and at Saltstone (Figure 1.5) will be disposed on-site at Hanford and SRS, respectively. These wastes contain only 1 to 10 percent of the radioactivity present in the tank waste.

Figure 1.5 SRS Saltstone Facility

Tanks at INL and several tanks at Hanford contain liquid wastes that are not radioactive wastes generated from the reprocessing of SNF. EM plans to pursue alternate but safe, compliant, and more cost-effective disposal paths for these wastes on a case-by-case basis. For example, some of the waste may meet the criteria for disposal at DOE's Waste Isolation Pilot Plant (WIPP) in New Mexico.

The classification of tank waste and the manner in which it is managed and disposed is defined in the Nuclear Waste Policy Act of 1982. Because of some ambiguity in the definition of tank waste in the law, DOE worked with the Congress to provide better clarity. The result was section 3116 of the Ronald W. Reagan National Defense Authorization Act for Fiscal Year 2005. Section 3116 allows EM to close tanks, after removing highly-radioactive radionuclides to the maximum extent practical, meeting U.S. NRC low-level waste performance objectives and other requirements, then filling the entire tank volume with grout. Section 3116 sets out requirements for the Secretary of Energy, in consultation with the U.S. NRC, to determine that the provisions of section 3116 are met and the waste is not high-level waste, so that such waste may be disposed of as low-level waste. EM is actively working with the U.S. NRC to disposition residual waste that cannot be practicably retrieved (e.g., internal equipment and the tank shells) in accordance with the requirements of section 3116. These efforts will allow EM to meet the tank closure requirements and schedules of its compliance agreements at SRS and INL in a risk-commensurate and cost-effective manner.

ADDRESSING CHALLENGES

Source-Based Definition of High-Level Waste. Tank waste is defined essentially as the radioactive waste resulting from reprocessing SNF that contains radioactive elements in high enough concentrations to require permanent isolation. If EM were to use a risk-based approach in managing some of its tank wastes, the volume of tank waste requiring treatment and geologic disposal could be reduced, thereby reducing overall cost of disposal without compromising public health and the environment.

Challenges

- Source-based vs. risk-based definitions
- Tank liquid management
- LAW treatment capacity at Hanford
- Tank closure at Hanford and West Valley
- Federal repository capacity
- Federal repository availability
- Timely processing capability

Tank Waste Management. Tank waste management activities keep the tanks in a safe operating mode and require significant resources, but do not contribute directly to the ultimate treatment and stabilization of the wastes. EM is continuously evaluating alternative methods of safely managing tank liquids to reduce operations and maintenance costs. The sooner these tanks are emptied and closed, the sooner these resources can be used to treat wastes or transfer waste from single-shell to double-shell tanks.

LAW Treatment Capacity at Hanford. WTP is designed to treat (vitrify) about half the total volume of the LAW. For the remaining LAW, the strategy has been to evaluate alternative treatment approaches. In August 2008, an independent review team evaluated the options for providing additional LAW treatment capacity. The review team concluded that, based on the WTP construction and start-up schedule, selection of an alternate technical approach is not expected to be needed until the 2015 to 2017 timeframe. However, the review team determined that a second LAW treatment facility would provide the greatest flexibility, depending on the capabilities designed into the facility. The review team also recommended a number of priority actions to reduce program risk.

Tank Closure at Hanford. Section 3116 currently only applies to the states of South Carolina and Idaho (i.e., SRS and INL). Therefore, EM plans to apply similar provisions in DOE Order 435.1 for dispositioning tank heels, internal equipment, and the tank shells at Hanford. Without additional clarification at Hanford, EM would potentially have to remove all equipment and piping inside the tanks as well as the tank shells. This hardware would have to be prepared and treated for disposal at the geologic repository. The potential impacts of this include a major increase in the total volume of material requiring disposal at the Federal repository as well as the need to develop new technical processes and regulations for acceptable repository waste forms.

Federal Repository Capacity. DOE has been allocated by legislation 7,000 metric tons heavy metal (MTHM) of the Federal repository's total capacity of 70,000 MTHM for both its SNF (Section 1.5.2) and tank waste; this is equivalent to approximately 9,200 canisters. EM has about 2,400 MTHM of SNF and between 8,000 and 17,000 MTHM of tank waste. If more capacity does not become available, DOE will be required to store the balance. As repository planning and development progresses, DOE will continue to evaluate long-term disposition options:

- Maintaining long-term storage for any high-activity tank waste canisters produced in excess of 9,200 units;
- Working to raise the current allocation in the Federal repository; or
- Seeking to build a second repository.

Federal Repository Availability. EM has been producing high-activity waste glass canisters since 1996 and storing them on an interim basis. Based on the date the Federal repository is scheduled to open (2020) and its acceptance schedule, compliance agreements to remove all high-activity waste are in jeopardy. DOE could eventually be required to build additional on-site interim storage facilities while awaiting Federal repository availability and acceptance.

1.5.2 Spent Nuclear Fuel

DOE manages a diverse and significant inventory of SNF generated since the beginning of the nuclear era. Spent fuel is the by-product of research associated with nuclear power and production of nuclear materials for use in nuclear weapons, scientific research, and medicine. In all, EM manages about 2,400 MTHM of SNF. Additional quantities continue to be generated from domestic research reactors (DRRs) and foreign research reactors (FRRs). DOE provided the feed fuel for these reactors to support research associated with peaceful uses of the atom. It is responsible for taking back the spent fuel and storing it. Ultimately, all DOE SNF will be disposed of in a geologic repository.

SNF Strategy

- Consolidate and process aluminum-clad SNF at SRS/H-Canyon Facility
- Support DOE's non-proliferation mission through receipt, storage, and processing of FRR and DRR SNF
- EM is safely storing SNF at Hanford and INL and can continue to do so for at least 50 years
- Design, construct, and operate a facility to repackage Idaho SNF for transportation to and disposal in the Federal repository when the repository's design is finalized

Prior to 2002, nearly all of EM's SNF, approximately 2,200 MTHM of the 2,400 MTHM total, was being stored in large, aging water-filled pools. Water provided shielding for the radioactivity and cooling for the heat of the fuel. At Hanford much of its 2,100 MTHM of fuel was stored in K-East and K-West Basins which are located approximately ¼-mile from the Columbia River, a major natural resource of the Pacific Northwest. At INL, the pools are located directly above the Snake River Plain Aquifer, a major drinking and irrigation water source for south-central Idaho. The possibility of these pools leaking and contaminated water seeping into ground and surface waters, as well as the fuel being exposed directly to the air were risks needed to be mitigated as quickly as possible.

Progress

The facilities and equipment to safely store SNF in a dry configuration for up to 50 years were readily constructed or procured by EM. However, the real challenge for the program was to safely retrieve the fuel from the pools and package it for transfer to the safer dry storage facilities. SNF had been stored in the pools for, in some cases, decades and had begun to corrode. In addition, fuel of suspect integrity had also been placed in the pools. With the development of safe retrieval processes, treatment units, and robust storage canisters, the EM program has moved all Hanford SNF to dry storage on a plateau away from the Columbia River.

In addition to the fuel, sludge (corrosion products and sand) and debris (i.e., storage racks) had collected over the years in the bottom of the 25-foot deep K-East and K-West pools. Retrieval of this material was a major technical challenge that also required the development of specialized processes and equipment. All sludge, debris, and water have been removed from the K-East Basin, significantly reducing the potential environmental and human health risks. Removal of concrete has been initiated to open the soil underneath K-East for remediation. At the remaining operating basin, K-West, the sludge from both basins is containerized and the debris is currently being removed. The remaining technical challenges to be solved reside with the sludge, then the water can be removed and the remaining basin can be removed. Transfer techniques are being examined as the sludge tends to consolidate over time becoming difficult to mobilize and stage in a uniform treatment feed. Also EM is evaluating alternatives for treatment of K-Basin sludge that may be needed for acceptance at WIPP.

In addition to environmental risks, SNF can also present nuclear proliferation threats if it falls into unauthorized hands. For example, unlike other fuels which are self-protecting with the radiation fields they emit, fuel from the Hanford Fast Flux Test Facility (FFTF), does not have this characteristic. The fuel from this reactor, which is being deactivated and decommissioned, has been transported to INL for appropriate storage and treatment. Removal of the fuel has reduced the safeguards risk.

- Progress - Spent Nuclear Fuel Activities	
Status in FY 2002 ◆ Less than 10% of SNF in dry storage (209 of ~2,400 MTHM) ◆ Hanford's K-Basins are known to be leaking rad-contaminated water to the vadose zone ◆ EM preparing for transition of all SNF management activities to DOE Office of Civilian Radioactive Waste Management (OCRWM)	**Progress Since FY 2002** ◆ All SNF (except for SRS SNF) will be in dry storage by end of FY 2009 ◆ All of Hanford SNF (over 2,100 MTHM) removed from K-Basins, and packaged for long-term dry storage ◆ EM now prepared to safely manage and store SNF for 50 years ◆ All sodium-bonded fuel from the Hanford FFTF transported to INL ◆ Suite of standard canisters designed and tested for interim storage, transportation, and disposal at the Federal repository ◆ SNF consolidated at four sites: Hanford, SRS, Idaho and Ft. St. Vrain ◆ Continued receipt of SNF from domestic and foreign research reactors

Nearly all the EM SNF managed by INL, located at the site and at Fort St. Vrain, Colorado, has been placed in dry storage. The remaining fuel in wet storage is in the process of being placed in dry storage. Transfer of all the SNF at INL to dry storage is expected to be completed in FY 2009. Eventually, the Department must construct and operate a packaging and storage facility in Idaho to place SNF into standard canisters to ensure they can be safely transported to and emplaced within the geologic repository.

SRS currently has 30 MTHM SNF stored in water-filled pools. One major element of EM's SNF strategy is to consolidate all aluminum-clad SNF (currently located at both

INL and SRS) at SRS. This approach is being considered because SRS has the capability in the H-Canyon facility to manage this type of fuel in a manner that affords a more certain disposition path, results in recycling of material for use in commercial fuel, and preserves EM's allotted capacity in the planned geologic repository. H-Canyon is a large chemical processing plant that can remove uranium from the SNF and convert it to a fuel that would then be used to generate commercial nuclear energy. This strategy allows the Department to end SNF storage at SRS by about 2020. Alternatively, EM is also evaluating moving the SNF into interim dry storage for ultimate disposal in the geologic repository. A cost-benefit analysis of these two options is underway.

ADDRESSING CHALLENGES

The major challenges of packaging all SNF into dry storage have been solved. Nearly 2,400 MTHM of EM's SNF will be safely managed in dry storage containers by the end of FY 2009, and can be maintained in these storage configurations for at least 50 years. However, disposition of the sludge in the Hanford Basins remains a challenge (discussed in Section 1.5.3).

Challenges

- Uncertainty of license application acceptance and final waste form requirements
- Storage capacity may be insufficient, pending availability of Federal repository
- Timing of SNF disposition is subject to compliance agreement and is not solely in the control of EM

The ultimate disposal of EM's SNF is dependent upon acceptance at the Federal repository or recycling by means of a processing alternative. DOE submitted a license application for the Yucca Mountain Federal repository for U.S. NRC review in June 2008. EM will assist in supporting a timely licensing process.

While SNF can be stored for at least 50 years with no adverse environmental risk, DOE has a regulatory commitment to remove SNF from the State of Idaho by 2035. Additionally, SNF stored at Hanford must be removed prior to final site cleanup completion activities in accordance with its regulatory agreement.

1.5.3 Transuranic Waste

Transuranic (TRU) waste is a type of radioactive waste that contains elements with atomic numbers greater than uranium in the Periodic Table of Elements. For the most part this waste consists of clothing, tools, rags, residues, soil, debris, and other materials contaminated with plutonium. TRU waste may also be mixed with hazardous chemicals. There are two categories of TRU waste. Contact-handled (CH) TRU waste can be handled by workers under very controlled conditions with no shielding for radioactivity other than the container itself. Remote-handled (RH) TRU waste emits more penetrating radiation and thus must be handled and transported in lead-shielded containers and casks. CH TRU represents 96 percent of the total volume of TRU waste to be disposed of at WIPP, while RH TRU makes up the remaining 4 percent.

> **TRU Strategy**
>
> - Characterize small quantity sites' waste in Idaho for shipment to WIPP
> - Expand use of Central Characterization Project
> - Expert teams facilitate shipping sites in certifying waste for acceptance at WIPP
> - Expand number of sites certified for RH shipping
> - Deployment of Shielded Containers for shipping of RH TRU
> - Continue certification of TRUPACT-III

Twenty-eight DOE sites were storing TRU waste in a variety of configurations, primarily below-grade to contain the radioactive elements while also being retrievable for eventual disposal in a geologic repository. In 1999, after nearly 20 years of testing, scientific research, engineering and design, and regulatory permitting, DOE's WIPP began receiving CH TRU waste. The repository is located near Carlsbad, New Mexico, 2,150 feet below ground in a 250 million-year old salt formation. It is the world's only operating deep geologic repository. An estimated 150,000 cubic meters of CH TRU and 7,000 cubic meters of RH TRU resulting from the Cold War legacy will ultimately be disposed at WIPP.

Progress

In FY 2001, WIPP was receiving and disposing an average of seven shipments per week of CH TRU. Between FY 2002 and FY 2007, the TRU waste program accelerated shipments from the generator sites to a maximum of more than 30 per week. During the nearly 10 years of WIPP operations, experience has been gained and the regulatory framework has been streamlined. As a result, with each passing year, operations have become more efficient and routine.

- Progress (as of 9-30-2008) **-** TRU Waste Activities	
Status in FY 2002	**Progress Since FY 2002**
• 304 shipments / 2,254 m^3 of TRU waste disposed at WIPP • Seven WIPP shipments/week (max) • 28 Sites storing TRU waste • Two certified shipping sites (Rocky Flats & INL)	• An additional 6,600 shipments / 54,450 m^3 TRU waste disposed at WIPP since 2002 (6,903 Total shipments and 56,793 total m^3 disposed at WIPP from March 1999 through September 2008) • 30 WIPP Shipments/week (max) • 14 Sites storing TRU waste • Seven certified shipping sites • Initiated RH Disposal at WIPP (177 RH Shipments through September 2008) • Excellent transportation safety record since 1999 (over 8 million loaded miles)

To date, EM has safely removed more than 56,000 cubic meters of CH TRUand RH TRU from generator sites throughout the country and disposed of the waste at WIPP, greatly reducing the environmental risk of continued long-term storage at the generator sites. More than one-third of the legacy inventory of TRU waste has been safely disposed of at WIPP. As a result: 1) INL and SRS have met compliance agreement milestones with the States of Idaho and South Carolina, respectively; 2) the accelerated closure schedule for the Rocky Flats site in Colorado was attained; and 3) and a significant amount of high-radioactive content TRU waste was removed from the area at Los Alamos National Laboratory (LANL) where TRU waste is stored (Area G).

In 2003 and 2004, Congress directed DOE to work with the state regulator to streamline the regulatory framework for characterizing waste to be disposed of at WIPP.
In response to these statutes, DOE submitted a regulatory permit modification request to the New Mexico Environment Department to streamline waste characterization processes. After extensive negotiations with the state and stakeholders, a final permit was issued authorizing disposal of RH TRU waste and implementing a streamlined but still fully protective regimen of pre-shipment characterization requirements for both CH and RH TRU waste. While difficult to quantify, it is estimated these streamlined requirements will save nearly $100 million over the life of disposal operations at WIPP. More importantly, these changes streamlined processes that resulted in the elimination of serious radiation exposure hazard to DOE workers.

Between FY 2002 and FY 2008, EM de-inventoried all legacy TRU waste at 14 sites, thereby eliminating the cost of managing TRU waste at these sites and eliminating the environment, safety, and health risks. EM also removed TRU waste from the Nevada Test Site (NTS), Lawrence Livermore National Laboratory (LLNL), and Argonne National Laboratory-East (ANL) to de-inventory facilities within those sites to support ongoing programmatic missions.

14 De-Inventoried Sites

- Rocky Flats
- Fernald
- Missouri Univ. Research Reactor
- Energy Technology Engineering Center
- Lovelace Respiratory Research Inst.
- Mound
- Battelle Columbus
- Brookhaven
- Teledyne-Brown
- Knolls Atomic Power Laboratory-NFS
- USAMC
- Arco Medical Products
- Lawrence Berkeley Laboratory
- Framatome (Areva)

In 2006, WIPP received final authorization to begin accepting RH TRU and the first shipment, from INL, arrived in January 2007. As of October 1, 2008, 177 RH TRU shipments have been completed from INL and ANL. All RH TRU currently in the EM inventory at INL will be removed from the site and disposed of in WIPP in FY 2009.

EM has a clear strategy for building on past success to meet its TRU risk reduction goals. This strategy includes expanding the number of sites certified for RH TRU shipping. In FY 2009, RH TRU shipments are scheduled to start from Oak Ridge National Laboratory (ORNL), Tennessee; General Electric–Vallecitos Nuclear Center, California; SRS, South Carolina; and LANL, New Mexico pending required regulatory approvals.

To support and enhance this strategy, EM continues to develop shielded containers for RH TRU. These lead-lined drums would allow RH TRU waste to be handled, shipped, and potentially disposed of in a manner similar to CH TRU waste. Today, RH TRU waste is emplaced in boreholes along the walls of the WIPP repository and CH TRU waste is placed on the floors. Therefore, significant coordination is required for optimal and efficient emplacement of RH TRU and CH TRU waste. For the portion of RH TRU suitable for use of shielded containers, there would be no need to coordinate RH TRU and CH TRU disposal schedules since RH TRU and CH TRU could be placed on the floor together. EM is actively pursuing the necessary regulatory approvals needed to move forward with shipping and disposing of RH TRU waste in shielded containers at WIPP.

Another key strategy in TRU waste risk reduction is the characterization of small quantity sites' TRU waste in Idaho for shipment to WIPP. A Record of Decision (ROD) was approved in February 2008 allowing waste from small quantity sites to be sent to INL for treatment, characterization, and shipment to WIPP, assuming the waste meets INL's waste acceptance criteria. This avoids the need to construct TRU waste treatment facilities at sites with small quantities of TRU waste, thereby avoiding significant costs. It also results in faster removal of TRU from these sites and a greater economy of scale for the TRU waste facility at INL.

EM is also expanding the use of the Central Characterization Project (CCP) at large sites. The project uses a modular waste characterization system consisting of full disposal characterization equipment for both CH TRU and RH TRU waste and a mobile loading system used to place drums of TRU waste into shipping containers for transport to WIPP. CCP has proven successful in characterizing waste more cost effectively through the use of a standard suite of procedures, quality assurance documents, and equipment.

Another strategy includes the use of TRU waste expert teams for assisting the generator sites in certification and characterization planning for more difficult waste streams, such as those requiring additional documentation, treatment, or packaging. These teams help to ensure all TRU waste gets characterized, shipped and disposed at WIPP.

EM has designed a new cask, TRUPACT-III, for TRU waste packaged in large boxes that cannot be shipped in currently available transportation casks due to their size. Testing to meet U.S. NRC's permitting requirements is ongoing. Current plans call for this testing to be complete in the spring 2009, with license approval estimated by the end of 2009. The strategy to ship and dispose of large size containers at WIPP also requires the development, deployment, and regulatory approval of equipment needed to determine the contents of large size containers. With this knowledge, the potentially dangerous and costly task of size reducing the large containers before shipment and disposal at WIPP can be avoided. These cutting-edge technologies are mobile, have been deployed, and are undergoing final testing. They will first be used at SRS and then, by the end of 2010, at Hanford.

ADDRESSING CHALLENGES

Although TRU waste characterization, packaging, shipping, and disposal have become routine, one major challenge is to continue optimizing TRU waste disposition. Priorities at large sites such as Hanford and SRS may not result in legacy TRU waste shipment rates that take full advantage of WIPP's current throughput capacity. This imbalance will become pronounced once the majority of the legacy TRU waste is disposed at WIPP. However, the DOE complex will continue to generate TRU waste through at least 2050 from ongoing missions as well as from deactivation and decommissioning of radioactive waste

Challenges

- Balancing generator site priorities with optimization of WIPP operations
- Post FY 2020 TRU waste generated from deactivation of treatment facilities
- Treatment of K-Basin sludge
- WIPP defense origin limitations

treatment facilities. EM is evaluating alternative strategies to sustain the most efficient operation of WIPP as TRU legacy waste disposal winds down after 2020.

Sludges containerized at the Hanford K-Basin will need to be treated prior to disposal at WIPP. The challenge is how EM will stabilize the sludge for acceptance at WIPP. Currently, EM is evaluating alternatives for treatment of K-Basin sludge.

In accordance with the legal requirements for WIPP operations, the Department cannot dispose of TRU wastes at WIPP unless it has been documented to be of "defense origin." The Department estimates that there are up to 2,700 cubic meters of TRU waste that were generated by non-defense funded activities that have no disposition path. Also, the Department's Off-Site Source Recovery Program collects sealed radioactive sources containing TRU isotopes that potentially pose a proliferation risk. The sources that are not of defense origin do not have a disposition path.

1.5.4 Low-Level and Mixed Low-Level Waste

Low-Level Waste (LLW) is radioactively contaminated material that is not high-level waste (HLW), SNF, TRU, by-product material, or naturally occurring radioactive material. Under the Atomic Energy Act, DOE is self-regulating with regard to LLW. Mixed low-level waste (MLLW) is LLW that also contains a hazardous chemical and is, therefore, subject to a dual regulatory framework, under the Atomic Energy Act, including DOE Order 435.1, *Radioactive Waste Management*, as well as Federal or state hazardous waste requirements promulgated under RCRA.

LLW and MLLW Strategy

- Continue to utilize combination of DOE on-site, DOE regional and commercial disposal facilities
- Conduct EIS for commercial GTCC waste and issue ROD for GTCC disposal facility
- Reuse/disposition of contaminated nickel
- New on-site CERCLA cells
- Continue to pursue treatment alternatives for wastes currently incinerated at TSCAI
- Continue to develop disposition plans for remaining legacy MLLW and LLW, eliminating waste acceptance and/or transportation barriers

DOE produced the *Final Waste Management Programmatic Environmental Impact Statement (EIS) for Management, Treatment, Storage, and Disposal of Hazardous Waste* in 1997. The associated complex-wide decisions for treatment and disposal of LLW and MLLW were issued in 2000. These documents described the approach EM would use to eliminate the inventory of legacy LLW and MLLW, the latter in accordance with the applicable regulatory agreements.

DOE has an estimated 1.4 million cubic meters of Cold War legacy LLW and MLLW, an amount that would cover a football field to a height of approximately 1,000 feet.

PROGRESS

DOE currently employs a combination of DOE and commercial facilities for disposal of LLW and MLLW. LLW and MLLW disposal facilities include:

- On-site LLW disposal at INL, SRS, Oak Ridge Reservation (ORR), and LANL;
- Regional LLW and MLLW disposal at two DOE sites, Hanford and NTS; and
- Commercial LLW and MLLW disposal facilities. DOE waste is also treated and disposed at commercial LLW and MLLW facilities when it is cost effective and in the best interest of the Federal Government.

EM has disposed of about one million cubic meters of legacy process– and production-related LLW and MLLW in disposal facilities at NTS, Hanford, INL, LANL, ORR, and SRS. Three-quarters of all EM's stored legacy waste has been disposed, leaving only the more difficult waste remaining in storage while disposition solutions are developed. An additional 400,000 cubic meters of LLW and MLLW are projected to be generated as part of EM's life-cycle cleanup mission at Hanford, INL, ORR, SRS, Paducah, and West Valley.

- Progress - Low Level and Mixed Low Level Waste Activities	
Status in FY 2002	**Progress Since FY 2002**
◆ Operating CERCLA (on site) disposal cells at Hanford (Environmental Restoration Disposal Facility) and Fernald ◆ ~190,000 m^3 of LLW and ~40,000 m^3 of MLLW disposed from non-CERCLA activities as of September 2001	◆ Disposed of about 9 million m^3 of LLW and MLLW from CERCLA activities ◆ Disposed of an additional 770,000 m^3 of MLLW and LLW disposed from non-CERCLA activities ◆ Life-cycle projections of non-CERCLA MLLW and LLW have decreased from 2.35 million to 1.4 million m^3 due to successful waste minimization efforts ◆ Approved path forward for disposal of Fernald silo material ◆ Technology was developed to treat/ decontaminate equipment sufficiently to allow the equipment to be disposed as MLLW or LLW (rather than as TRU waste)

In addition, EM has disposed of approximately 9 million cubic meters of LLW and MLLW associated with environmental restoration cleanup activities for CERCLA site remediation including:

- 6 million cubic meters of waste at Fernald, Hanford, INL, and ORR in on-site DOE CERCLA cells specifically constructed for remediation waste; and
- 3 million cubic meters at NTS and an off-site commercial facility.

While most LLW and MLLW treatment and disposal is now routine, EM also has in its inventory LLW and MLLW that have not had readily available disposition options. The program is focusing on developing pathways for this waste. One category of waste for which a disposal solution has been solved is referred to as "Silo Material" that was generated at the Fernald site in Ohio. This waste was a by-product of uranium processing and emitted large amounts of radon from the radium it contained. As a result, it was stored in heavily shielded concrete silos. Because of the nature of this material and the regulatory framework surrounding it, it required a specialized license. EM worked closely with a commercial disposal vendor in Texas and the Texas state regulators to allow storage of the Fernald Silo Material at a commercial facility in Texas. Removal of the silo material allowed DOE to close the Fernald Site on schedule in 2006 and greatly reduce the environmental risk of continued storage of the material at the Fernald site. The storage vendor subsequently applied for a disposal license for this type of material and received the requested permit from Texas regulators in 2008. The disposition path for the Fernald silo material is now finalized and approved.

To complete Rocky Flats cleanup, EM supported technology development to decontaminate the 1,500 gloveboxes sufficiently to allow the equipment to be disposed of as MLLW or LLW. Gloveboxes are sealed chambers in which workers handled plutonium using long rubber gloves that extend through portholes. They range in size and can be as large as a car or bus. Previous disposition plans called for the gloveboxes to be size reduced (cut into smaller pieces) and packaged, characterized, and certified for disposal at WIPP. This revised approach significantly reduced work exposure to contamination and workplace hazards and saved considerable funds.

EM is the lead DOE office for developing the EIS for Disposal of Greater-Than-Class C (GTCC) Low-Level Radioactive Waste. GTCC waste is LLW resulting from U.S. NRC-licensed activities with radionuclides that would be dangerous to humans beyond 500 years. This waste stream is comprised of materials such as radioactive sources that are commonly used to sterilize medical products, detect flaws and failures in pipelines and metal welds, and other industrial and medical purposes. They were generated, owned, or managed by commercial entities rather than DOE. However, the Low Level Radioactive Waste Policy Amendments Act of 1985 assigned the Federal Government responsibility for the disposal of certain GTCC radioactive waste resulting from U.S. NRC-licensed activities.

GTCC waste is the highest radiological activity waste with no planned disposition path. DOE is preparing an EIS to evaluate disposal options for commercial GTCC LLW as well as LLW similar in character to GTCC generated by DOE. DOE issued a Notice of Intent to prepare the EIS in July 2007 and expects the process to take about 2 years. By law, before DOE makes a final decision on the disposal alternative(s) to be implemented, the agency must submit a report to Congress on the disposal alternatives and await Congressional action before making a final disposal decision.

Contaminated nickel from the shutdown of gaseous diffusion plants (GDPs) is a potentially valuable asset. EM is evaluating the viability of recovering the nickel for potential sale to an end user rather than disposing of it as LLW.

The Toxic Substances Control Act (TSCA) Incinerator (TSCAI) at Oak Ridge is DOE's only Federal treatment alternative for radioactively contaminated polychlorinated biphenyl (PCB) waste. It enables other DOE sites to meet their STP and FFCAct milestones. This facility is scheduled to close in 2009.

Addressing Challenges

Off-Site LLW and MLLW Disposal at Hanford. As a result of a 2004 State of Washington challenge to the Hanford Solid Waste EIS, DOE voluntarily suspended all off-site waste shipments to Hanford. This suspension was later formalized by the U.S. District Court, and a Settlement Agreement was reached to resolve this case in January 2006. Under the Settlement Agreement, DOE agreed to not ship LLW, MLLW, or TRU waste off-site to Hanford until a new EIS containing comprehensive groundwater analysis related to tank closures and waste disposal operations is completed. This EIS is expected to be completed in 2009.

Challenges

- Disposal of off-site wastes at Hanford
- NTS Land Withdrawal
- Future MLLW disposal
- TSCA Incinerator

Nevada Test Site Land Withdrawal. The Nevada Attorney General sent a letter to DOE in August 2008 asserting that DOE's proposed use of NTS for the disposal of certain radioactive waste would not comply with the law, or a prior settlement agreement. The Attorney General mentioned several other issues, including an alleged need for a site-wide EIS to be done at NTS. DOE is working with Nevada to address these issues. If not resolved, these issues could halt disposal of higher activity MLLW at NTS. This would seriously impact ongoing cleanup operations at several sites.

Future MLLW Disposal Capacity. DOE has limited disposal capacity for higher activity MLLW disposal since it suspended off-site waste shipments to Hanford. DOE's only other mixed waste disposal facility, the NTS Mixed Waste Disposal Unit, must close by December 2010, in accordance with its permit. If Hanford disposal facilities remain unavailable to off-site waste generators, alternatives for post-2010 disposal include the construction of a new RCRA-compliant facility at NTS or another DOE site or the proposed Federal Waste Disposal Facility planned by a commercial entity in Texas. Also, there are no other facilities, Federal or commercial that can accept higher activity DOE MLLW (affecting human health after more than 100 years).

Continued Operation of the TSCA Incinerator. DOE had previously planned to close the TSCA Incinerator as early as the end of FY 2006. However, due to the continuing generation of MLLW requiring treatment at TSCAI and the cleanup schedule at ORR, operations have continued and are now planned through FY2009. EM is working cooperatively with industry to access commercial capability to treat PCB wastes after the TSCA Incinerator is decommissioned.

1.6 Consolidation and Disposition of Surplus Special Nuclear Materials and Safeguards and Security Impacts

1.6.1 Surplus Plutonium

For many years, DOE facilities were operated to recover strategic isotopes such as plutonium-239 in support of the Nation's defense programs. In 1994, 52.5 MT of plutonium was declared excess to national defense needs, and in 2007 an additional 9 MT of plutonium was also declared to be surplus by the Department. EM is responsible for disposition of about 13 MT of the surplus non-pit plutonium (that which comes from sources other than the triggers or pits of nuclear weapons), a weight comparable to eight automobiles. Excess plutonium in particular was stored at various EM sites: Rocky Flats, Hanford, and SRS. Because of its threats in terms of health and nuclear materials proliferation, plutonium requires expensive storage facilities and safeguards. As a result, this material needed to be consolidated into fewer locations.

Progress

EM initiated consolidation of surplus non-pit plutonium in 2002, when the Department first physically transferred plutonium from Rocky Flats to SRS. Removal and transfer of the plutonium from the site, was essential to acceleration of deactivation and decommissioning (D&D) of the plutonium facilities located on site at Rocky Flats and was critical to the successful cleanup and closure of the site in 2005.

- Progress - Surplus Plutonium Activities	
Status in FY 2002	**Progress Since FY 2002**
◆ Plutonium (Pu) stabilization proceeded at pace to support Rocky Flats closure and reduce the Pu Safeguards and Security (S&S) footprint ◆ 1,350 canisters of Pu metals and oxides stabilized and packaged (estimated life-cycle total in FY 2002 = 2,250 canisters) ◆ 89 MT of Pu residues packaged for disposition (estimated life-cycle total in FY 2002=112 MT)	◆ K-Area Materials Storage at SRS being upgraded to allow for storage of all surplus non-pit plutonium in the complex ◆ 100% (5,089) canisters of Pu metals and oxides stabilized and packaged ◆ 100% of Pu residues packaged for disposition ◆ All Rocky Flats plutonium stabilized, packaged, and consolidated at SRS ◆ All Hanford Pu stabilized and packaged, shipments to SRS initiated in FY 2008 ◆ Shipments of LLNL Pu to SRS initiated

In 2006, the Department identified consolidation of surplus plutonium as one of the most important issues concerning nuclear materials consolidation across the complex. The Department evaluated the alternatives and prepared a Supplement Analysis and an Amended ROD supporting the decision to ship surplus plutonium from Hanford to SRS. The amended ROD also supported shipment of surplus plutonium from LANL to SRS. The Supplement Analysis and amended ROD were both signed in September 2007.

Transfer of surplus plutonium from Hanford to SRS for interim storage and disposition incrementally decreases security demand at the Hanford Site and avoids the expenditure of about $200 million for upgrades that would have been required at the Plutonium Finishing Plant (PFP) to comply with enhanced security requirements as well as tens of millions of dollars more each year for security and monitoring to continue storing the material at Hanford. Once the plutonium has been de-inventoried from the PFP the remainder of the PFP complex can be decommissioned and demolished, reducing the risk and saving the surveillance and maintenance costs associated with the facility.

The Department is currently consolidating storage of 13 MT of surplus, non-pit, weapons-usable plutonium from Hanford, LLNL, and LANL at SRS. More than 90 percent will come from Hanford; those shipments are to be completed by September 2009. DOE will also transfer to SRS surplus plutonium in the form of unirradiated fuel assemblies and pins previously intended for the FFTF at Hanford. Shipments from LANL are expected in the foreseeable future. If adequate storage space is available, DOE will transfer other, lower-priority plutonium from LLNL and LANL to SRS. This would be done to provide operational flexibility at the laboratories in supporting ongoing nuclear weapons research.

Surplus Pu Strategy

- Continue consolidation of Pu at SRS, reducing the S&S footprint
- Two-prong strategy to disposition Pu
  - Convert maximum technically achievable to Mixed Oxide (MOX) fuel for use in commercial reactors
  - Process remaining Pu in H-Canyon Complex for ultimate solidification in HLW canisters for disposal in the Federal repository

EM's current disposition strategy for the 13 MT of surplus non-pit plutonium is to process the majority of this material through the Mixed Oxide (MOX) Fuel Fabrication Facility (MFFF), currently under construction, and the balance through the existing H-Canyon facility. The maximum amount of non-pit plutonium that can technically be converted to MOX fuel for use in commercial reactors will be processed through MFFF. Proceeds from the sale of the MOX fuel will benefit the U.S. Treasury. EM is planning to develop capabilities to prepare and treat the plutonium so that it meets the feed specifications of the MFFF. The remaining plutonium that is not suitable as feed material will be processed in the H-Canyon prior to vitrification at DWPF for disposal in the geologic repository.

EM will continue to evaluate disposition alternatives and coordinate with DOE's National Nuclear Security Administration (NNSA) to ensure the most cost-effective approach for meeting Departmental plutonium disposition objectives.

ADDRESSING CHALLENGES

One of the major challenges to date has been the amount of surplus plutonium EM is required to disposition. The current approach assumes the timely start up of MFFF and that no additional declarations of surplus plutonium are made. EM will continue to evaluate alternatives for disposition of excess plutonium.

Plutonium storage capacity at the SRS K-Area Material Storage (KAMS) facility may not be sufficient for all currently declared surplus non-pit plutonium. Storage capacity at KAMS may be increased; if not, some plutonium could be dispositioned through H-Canyon or MFFF before all the surplus plutonium at LANL and LLNL can be consolidated at SRS.

Challenges

- Potential increases in amounts of surplus Pu requiring disposition by EM
- KAMS plutonium storage capacity

1.6.2 SURPLUS URANIUM MATERIALS

For decades, DOE facilities have been operated to provide and recover strategic isotopes, such as uranium-235, in support of the Nation's defense programs and the commercial nuclear power industry. Uranium-235 is a fissionable isotope and, therefore, is used as nuclear power fuel and in nuclear weapons. In 1995, about 174 MT highly enriched uranium (HEU) produced in the United States was declared surplus to defense needs, and in 2005, an additional 61 MT of HEU was declared surplus. EM is responsible for the disposition of about 21 MT of that HEU, which is comparable to the weight of 14 automobiles.

PROGRESS

A significant objective of EM's surplus HEU strategy is the consolidation of HEU at SRS and down-blending of HEU to low enriched uranium (LEU) (less than 20 percent uranium-235) in H-Canyon. HEU is currently being processed in H-Canyon. Continued processing will enable additional consolidation that is critical to reducing the costs and security and health risks of maintaining the storage facilities and safeguarding the material. It also supports the NNSA Complex Transformation—a more modern, smaller and more efficient weapons complex. The currently planned on-site consolidation of nuclear material at the Oak Ridge Y-12 complex in two new facilities will not be able to occur without movement of some of the excess materials to SRS as part of the consolidation.

- Progress - Surplus Uranium Activities	
Status in FY 2002	**Progress Since FY 2002**
• Majority of unprocessed HEU contained in SNF assemblies • Undefined EM mission for HEU disposition • Contract Award for design and construction of two DUF_6 conversion facilities	• 98% of Enriched Uranium containers packaged for long-term storage (7,300 of 7,500 containers) • Processing plans for recovery or disposition of HEU have been approved and are being implemented • Some HEU from Y-12 has already been shipped to SRS and is being processed in H-Canyon • Ownership of U-233 at ORNL transferred to EM – facility for down-blending for disposition is in design phase • 40 of 41 U-233 items from INL were disposed as LLW at NTS in 2008 • DUF_6 Project 85% complete

The scope of the HEU disposition project at SRS consists of down-blending the 21 MT of surplus HEU materials in H-Canyon by 2019. This includes about 13.5 MT contained in 19,500 aluminum-clad HEU spent fuel assemblies, primarily stored at SRS and INL, and about 7.5 MT of HEU materials, currently stored at the Oak Ridge Y-12 complex, LANL, LLNL, Sandia, INL, the Knolls Atomic Power Laboratory, and SRS. The uranium from processing the SNF and surplus HEU materials is planned to be blended down to LEU and sold to an end user, providing revenue for the U.S. Treasury. The strategy for processing SNF through H-Canyon is currently under review to evaluate other disposition alternatives.

Uranium-233 is another type of surplus uranium managed by the Department. The majority of DOE's uranium-233, which is not naturally occurring, is currently stored in building 3019 at ORNL. This surplus material will be down-blended with other uranium isotopes to remove safeguard and criticality concerns so that it can be safely disposed. Building 3019 will be modified for the down-blending operations, which are planned to start in 2012 and continue through 2015. Forty of 41 of the Department's surplus uranium-233 items, which had been stored at INL, have been disposed as LLW at NTS.

Another significant activity in the execution of EM's surplus uranium strategy is the Depleted Uranium Hexafluoride (DUF_6) Conversion Project. DUF_6 is a by-product of the enrichment of uranium that was conducted over several decades at the Portsmouth, Ohio, Paducah, Kentucky, and Oak Ridge, Tennessee Gaseous Diffusion Plants. This project provides for the design, construction, and operation of two DUF_6 treatment facilities, one in Portsmouth, Ohio and one in Paducah, Kentucky (See Figure 1.6).

Surplus Uranium Strategy

- Consolidate HEU at SRS to reduce S&S cost and support the NNSA Complex Transformation initiative
- Downblend surplus HEU materials in H-Canyon during the period 2008–2019 and sell to an end user
- Downblend U-233 in Building 3019 at Oak Ridge National Laboratory with depleted uranium
- DUF_6 Conversion Project
- Uranium sales

The project objective is to chemically process approximately 600,000 MT of DUF_6 that is not economically viable for sale, conversion or down-blending. The Portsmouth DUF_6 inventory, which includes the Oak Ridge material, is expected to be processed in approximately 18 years and Paducah's larger inventory within 25 years. Construction and operation of these treatment plants was mandated by Congress. The initial total project cost for construction and commissioning of the plants was $430 million and is now estimated at $577 million with contingency at the 80% confidence level. Commissioning activities at Portsmouth are currently projected to be complete in October 2010, with Paducah projected for February 2011.

Figure 1.6 Paducah DUF_6 Conversion Facility

EM is also responsible for about 4,461 MT of LEU, depleted uranium, and natural uranium in various forms originating from past DOE programs at Hanford, Fernald, and universities. This "off specification" uranium requires considerable processing and, therefore, is not readily available for use as commercial nuclear power reactor fuel. In August 2008, EM issued a request for proposals (RFP) to sell and dispose of these uranium materials, which are presently stored at the Portsmouth Gaseous Diffusion Plant in Ohio. EM is also considering the direct sale of DUF_6 or a contract to re-enrich it to natural uranium or LEU to realize the best value for the Government. The Department is currently performing National Environmental Policy Act (NEPA) analyses before proceeding with a RFP for the DUF_6 materials.

ADDRESSING CHALLENGES

H-Canyon has been in operation for over 50 years, and EM's entire HEU disposition strategy relies on its continued operations through 2019 to process approximately 21 MT of surplus HEU, including the HEU contained in the aluminum-clad SNF. The Department has no other current facilities capable of dispositioning some of the HEU materials. EM will continue to evaluate alternative approaches for disposition of surplus HEU.

Challenges

- Lack of other alternatives to process HEU (except H Canyon)
- Commissioning of DUF_6 conversion plants
- Uranium sales

Another major challenge is the contractor performance on the construction and commissioning of the two conversion plants. Performance to date has resulted in delays in design and construction and increased costs. The contractor has implemented management actions and personnel changes to respond to EM's performance concerns.

1.6.3 SAFEGUARDS AND SECURITY

As noted in the prior two sections, the Department is maintaining an inventory of nuclear materials it no longer needs at several locations. These materials are highly desirable from a nuclear proliferation and threat perspective. Therefore, safeguarding these materials requires costly security measures to protect them.

EM's strategy is to reduce the number of sites and locations that must meet the costly security requirements associated with storage of this type of material. This is achieved through consolidation of materials to a smaller number of locations. By removing these materials, more cleanup work can be performed under an industrial security approach, which requires substantially less security and monitoring than under a nuclear materials approach. This reduction in security also allows the cleanup to be performed by uncleared workers, thereby avoiding another significant cost. Through consolidation, EM is also reducing the risk that these materials pose to the public and the environment.

PROGRESS

EM's plan is to consolidate much of this material at SRS, which as noted previously has the capabilities to further process and disposition the nuclear materials. Substantial security upgrades have been completed at SRS to implement DOE's 2005 safeguards and security (design basis threat or DBT) requirements. These include enhancements to protective force response capabilities, facility hardening, and extended detection and exclusion zones.

- Progress - Safeguards and Security Activities	
Status in FY 2002	**Progress Since FY 2002**
• Six Material Access Areas (MAAs) eliminated • Initiated transfer of plutonium from Rocky Flats Environmental Technology Site to Savannah River Site	• An additional five MAAs eliminated (11 total of 13 MAAs eliminated) • Completing stabilization and packaging for all plutonium residues, metals, and oxides • Consolidation of materials at the Savannah River Site on-going

Relocation of surplus plutonium from Hanford to SRS is expected to be complete by September 2009. As a result, DOE approved an exception to avoid fully implementing the 2005 DBT at Hanford. In the interim, some limited security enhancements at Hanford have been implemented to support the DBT exception and consolidation actions. These actions will avoid the expenditure of about $200 million for security upgrades and tens of millions of dollars more each year for security operations. As a result of the August 2008 Graded Security Protection policy, DOE will be re-evaluating the security measures for protecting SNM at SRS and Hanford.

Safeguards and Security Strategy

- Consolidation of surplus plutonium and special nuclear materials at SRS
- Minimize security requirements for environmental cleanup work

The safeguards and security program is currently reviewing several major Departmental security policies designed to protect DOE's assets and information during cleanup operations. In addition to the issuance of the new Graded Security Protection policy which replaces the Design Basis Threat, DOE is reviewing the Graded Safeguards Table.

ADDRESSING CHALLENGES

Implementation of the Graded Security Protection policy will alter the analytical process used to evaluate safeguards and security systems and design concepts. The objective is for the analyses to be more comprehensive and uniform across the DOE complex.

Challenges

- Uncertain impacts from changes in security requirements

1.7 Cleanup Completion, Closure, and Transfer of Environmental Remediation Sites

EM is responsible for cleanup of 107 geographic sites. These are either entire DOE sites with no future missions; DOE operating sites with legacy radioactive waste, surplus nuclear materials, or contaminated facilities and environmental media; or privately owned sites on which former DOE activities resulted in legacy radioactive waste or contaminated media. In total these sites equal the combined area of the states of Delaware and Rhode Island.

Since FY 2002, EM has completed cleanup and closure of 12 geographic sites, including three former weapons production sites: Rocky Flats, Mound and Fernald. By the end of FY 2008, EM projected to have completed cleanup at 89 of the 107 geographic sites; however, 86 sites were completed. EM's cleanup responsibilities for a geographic site are considered finished when active remediation has been completed in accordance with the terms and conditions of regulatory compliance agreements.

EM Geographic Site Cleanup and Closure Since 2002

Transferred to DOE Office of Legacy Management (LM)
- Fernald
- Mound
- Rocky Flats
- Maxey Flats
- Salmon
- Amchitka

Transferred to Other DOE Offices
- Kansas City Plant
- Lawrence Berkeley National Laboratory
- Laboratory for Energy Related Health
- Lawrence Livermore National Laboratory–Main Site

Transferred to Private Entities
- Ashtabula
- Battelle Columbus

In accordance with regulatory cleanup decisions, environmental monitoring and maintenance and operations of remediation facilities, such as groundwater treatment systems, must be conducted after the completion of active remediation. Once EM has completed cleanup and the site has no future DOE mission, it is transferred to the DOE Office of Legacy Management (LM), which performs monitoring and maintenance. For sites that are operating entities of other DOE programs or privately owned, the owners perform the monitoring and maintenance.

EM's approach to environmental remediation is driven predominantly by two environmental statutes: CERCLA and RCRA. In general, the U.S. EPA is the lead regulator for CERCLA cleanup and the state environmental regulators are the lead for RCRA cleanup. At several sites, both laws apply. In these cases, three-party agreements between DOE, U.S. EPA, and the state are developed that define the roles and responsibilities of each party, applicable cleanup requirements, dispute resolution processes, and milestones to attain compliance.

Using these requirements, EM has developed programmatic approaches to cleanup based on the size and complexity of the cleanup mission and the future use at each site. The *Top-to-Bottom Review* noted that the program had not been integrated but rather was a loose association of individual sites resulting in assignments of priorities on a local rather than national basis. The Review went on to recommend that the approach to closure should be based on the type of site being closed, considering such factors as the length of time required for completing cleanup and whether there were to be future DOE missions. EM has since developed a planning approach that is national in scale and uses risk reduction as a major prioritization factor. Thus differing approaches from a planning perspective have been taken for closure sites, small sites, and large sites. They are described in the following sections.

1.7.1 Closure Projects

In 1996, Congress took a bold step that fundamentally altered the course of the DOE cleanup program when it supported the accelerated closure of Rocky Flats. This was at a time when there was little reason and no demonstrated track record to believe that the Department could deliver on a challenge of this magnitude. Congress took further steps in 1999 when it created the Defense Facilities Closure Projects appropriation and challenged the Department of Energy to close five nuclear production sites with no future DOE mission by 2006. Rocky Flats, Fernald, and Mound were owned by DOE. Two were privately owned: Reactive Metals Incorporated, also known as Ashtabula, and Battelle Columbus, both in Ohio. This standalone appropriation was established to ensure these five sites would receive predictable funding throughout the entire cleanup. With predictable budgets and appropriate incentive fees, contractors were willing to assume more risk to accelerate cleanup. The vision and support that Congress provided planted the seeds of success in the cleanup program.

Accelerated Cleanup Strategy

- Completion and closure managed as a finite project
- Performance-based contractor incentives
- Regulator and community buy in
- Stakeholder involvement in project planning
- Worker participation in work planning
- Timely delivery of Government furnished services and items

As the *Top-to-Bottom Review* noted, a risk-based approach with a clear mission, a sense of urgency, and performance-based contracts, as was the case with Rocky Flats, could result in site cleanup well ahead of schedule and significantly under cost. It recommended that the near-term closure sites with no future mission be given priority in accelerating cleanup to a predetermined end state in accordance with regulatory agreements.

Progress

Closure activities were completed at Rocky Flats in 2005 and at Fernald in 2006. EM completed the scheduled active remediation at the Mound site in 2006.

At the direction of Congress, EM performed additional work at the Mound site at an on-site landfill (referred to as Operable Unit-1 or OU-1) beyond that required in the compliance agreement.

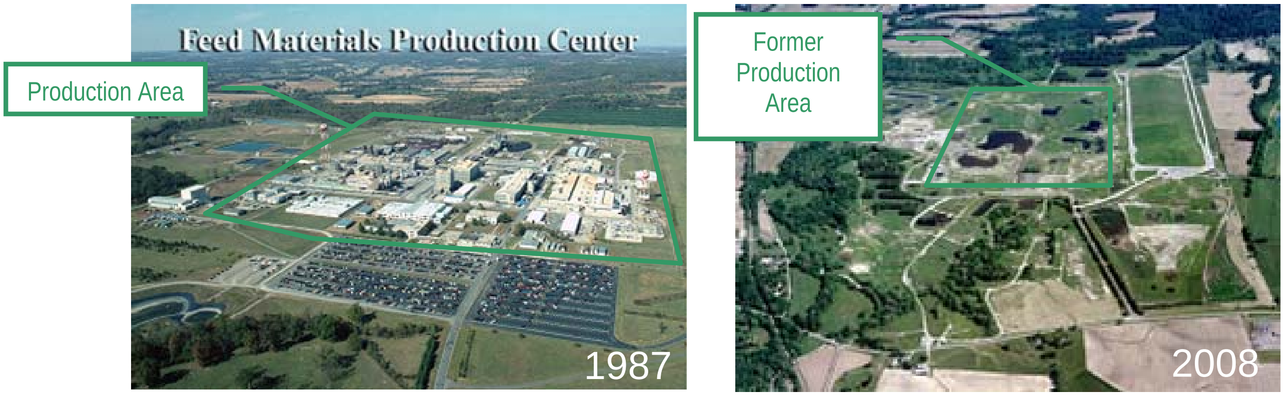
The Rocky Flats cleanup was completed nearly 50 years earlier and for $20.5 billion less than original estimates. During this cleanup more than 800 structures, including six contaminated plutonium processing facilities, were decontaminated and demolished, more than 360 contaminated areas were cleaned up, and 6,505 cubic meters of TRU waste and nearly 255,000 cubic meters of LLW were removed from the site.

This resulted in the removal of 25,413 acres of Rocky Flats from the U.S. EPA's National Priorities List (NPL), a list of the major environmentally contaminated sites throughout the United States and its territories. There are 1,308 acres remaining on the NPL, which are under the control of DOE LM for long-term monitoring and maintenance. Much of the Rocky Flats site served as an undeveloped buffer area and thus is a unique habitat within the suburbanized Front Range of the Rocky Mountains. As a result the land has been transferred to the U.S. Fish and Wildlife Service and is now a national wildlife refuge. Figure 1.7 shows photos of Rocky Flats before and after cleanup completion.

Figure 1.7 Rocky Flats Before and After Cleanup Completion

The Fernald cleanup was completed 23 years earlier and for $200 million less than original estimates. During this cleanup, more than 178 structures were decontaminated and demolished, 10 contaminated areas were cleaned up, and 168,250 cubic meters of LLW were removed from the site. Of the 1,050 acres comprising the site, all were certified as achieving the established cleanup standards, and 904 acres have been designated a nature preserve. The remaining 146 acres comprise an on-site engineered landfill in which remediation and demolition debris was disposed. Figure 1.8 shows photos of Fernald before and after cleanup.

Figure 1.8 Fernald Before and After Cleanup Completion



As a result of the Mound cleanup, 164 facilities have been decontaminated and demolished. To date, of the 306 acres comprising the site, all but a small area associated with the OU-1 has been remediated. Final waste volumes, cost savings and acceleration will not be calculated until all cleanup activities have been completed.

At the 42-acre Ashtabula site, EM decontaminated and demolished facilities and remediated groundwater and soil. The cleanup was completed in 2006, and the privately owned site is now available for unrestricted use. More than 1.1 million MT of LLW, MLLW, and chemically hazardous waste were removed and disposed off site. EM also completed cleanup at another privately owned site in 2006, a 31-acre portion of Battelle Memorial Institute's Columbus facility. Several radioactively contaminated buildings were demolished and approximately 1.7 million MT of LLW and MLLW were shipped off site for disposal.

As a result of these successes, the Rocky Flats and Fernald Closure Projects were awarded the Project Management Institute's Project of the Year in 2006 and 2007, respectively. The award represents the highest recognition given by this renowned world-wide organization of project management professionals.

ADDRESSING CHALLENGES

Institutionalizing a closure paradigm at larger sites is challenging given the long-term cleanup mission at these sites. In some instances, more focus on the ongoing management and operation of the site rather than completing actual cleanup has been observed. EM must continue to implement acquisition and contracting strategies that provide the necessary incentives to focus resources on risk-reduction rather than management and operations. Where possible, EM is awarding multiple contracts at sites, with each designed to appropriately address the identified scopes of work.

Challenges

- Retain focus on completion and closure

1.7.2 Small Site Cleanup

Success at small sites in the EM program remained elusive prior to 2002. Year after year, it continued to take longer and cost more to complete the cleanup. The *Top-to-Bottom Review* noted that if a consolidated management focus was placed on small sites, notably those at which remaining costs to complete were in the tens of million dollars or less, the risks they posed would be reduced more quickly and management attention and resources could be applied to longer-term cleanup.

Small Sites

- Argonne National Laboratory-East
- Brookhaven National Laboratory
- Energy Technology Engineering Center
- General Electric – Vallecitos Nuclear Center
- Inhalation Toxicology Laboratory
- Lawrence Livermore National Laboratory
- Los Alamos National Laboratory
- Moab
- Nevada Test Site
- Pantex
- Sandia National Laboratory
- Separation Process Research Unit
- Stanford Linear Accelerator Center
- West Valley Demonstration Project

Progress

To more fully focus on small site cleanup, EM streamlined management to support its small site cleanup efforts. This has included the establishment of a small sites closure cadre, many members of which had worked at closure sites and thus, could apply lessons learned to the small sites. In addition, management of these sites, which were formerly under the auspices of several EM offices, was brought together under one EM office. Program planning for the small sites is also now integrated with all other EM sites. The development of independently reviewed project scope, schedule and cost baselines provides a sound basis for evaluating cleanup alternatives. The projects can then be factored into EM planning decisions.

Small Site Strategy

- Streamlined management construct
- Approved project baselines

Addressing Challenges

Accelerating completion of the small sites would reduce EM's footprint and costs associated with these sites. As has been mentioned earlier, the greatest risk reduction benefit is associated with tank waste management which is located at the largest three sites in EM. Thus, the small sites tend to not be as high a priority in EM's complex-wide planning.

Challenges

- Investment in small sites strategy

1.7.3 Large Site Cleanup

Large Sites

- Hanford
- Idaho National Laboratory
- Oak Ridge Reservation
- Savannah River
- Paducah
- Portsmouth
- Waste Isolation Pilot Plant

EM's large sites are classified as such because of the nature and extent of the contamination and the costs and time that will be required to clean them up. For example, at Hanford approximately 450 billion gallons of contaminated water was discharged to the ground. Much of the water was used to cool the nine reactors that were used to produce plutonium. This has resulted in approximately 80 square miles of groundwater being contaminated with radionuclides, metals, and organic chemicals above Government standards for drinking water. Some of the groundwater plumes are discharging to the Columbia River. SRS had a similar mission as Hanford to produce plutonium and other nuclear materials. Operations resulted in more than 500 areas where the surface or groundwater became contaminated and more than 1,000 surplus radioactively contaminated facilities.

The GDPs at Oak Ridge, Paducah and Portsmouth were constructed to separate out uranium-235 for use in nuclear weapons, U.S. Navy ship reactors, and commercial nuclear power plants. The Oak Ridge and Portsmouth plants are no longer in use and are in the process of being decontaminated and ultimately demolished. These two plants are vast in size, occupying more than 200 acres under roof. They contained hundreds of thousands of tons of equipment that were used in the separation process.

More than 50 nuclear reactors operated at INL as part of its nuclear energy research and development mission. Only one of these reactors is operating. Left behind were not only the reactors and their support facilities but also surface contamination and contamination of the aquifer underlying the site. INL also operated a waste disposal facility that processed not only its own radioactive waste, but also that from other sites, notably Rocky Flats. Much of this waste was TRU and also contained chemical waste. It resides in approximately 35 acres of unlined pits and trenches at the 97-acre subsurface disposal area.

While much has been accomplished as noted below, the remaining soil and groundwater remediation and facility deactivation and decommissioning (D&D) scope at these six large sites is significant.

Progress

EM has had many successes in soil and groundwater remediation and facility D&D using new and proven technologies within a well-defined regulatory framework. Under this rubric, EM has been able to demonstrate, particularly in the D&D arena, that efficiencies can be realized through economies of scale, allowing completion of additional work at the same or lower cost. Ultimately, completion of these cleanup activities will reduce the surveillance and maintenance cost associated with managing large tracks of land by consolidating and reducing the infrastructure necessary to maintain active cleanup at a site.

Large Site Strategy

- Legacy waste disposition
- Soil and groundwater
- Deactivation & Decommissioning

The Idaho Cleanup Project has deactivated and decommissioned 112 buildings and structures for a total footprint reduction of more than 1.3 million square feet since May 2005. Cleanup of four reactor areas—Test Area North (TAN), the Engineering Test Reactor complex, the Loss of Fluid Test reactor complex, and the Power Burst Facility—are complete. D&D of the Materials Test Reactor complex will also be completed in FY 2010. All of these projects were completed within cost and ahead of schedule. This is a result of efficiencies gained through the continual process improvements implemented by the work crews conducting the cleanup. The value of the D&D work conducted at Idaho translates into $1.60 of work being completed for every dollar spent. The acceleration of these D&D projects will save the surveillance and maintenance costs and escalation for these projects.

In 2003, SRS signed an agreement with its regulators for an innovative process that integrates soil and groundwater cleanup with D&D activities to close entire areas of the site. In 2006, SRS closed T-Area, the first of 14 major areas identified under the Area Completion initiative (Figure 1.9). This Area Completion resulted in cost savings of more than $37 million and the cleanup was completed two years ahead of schedule. Other Area Completions at M-, P-, R- and D-Areas are presently underway and are expected to yield similar cost savings.

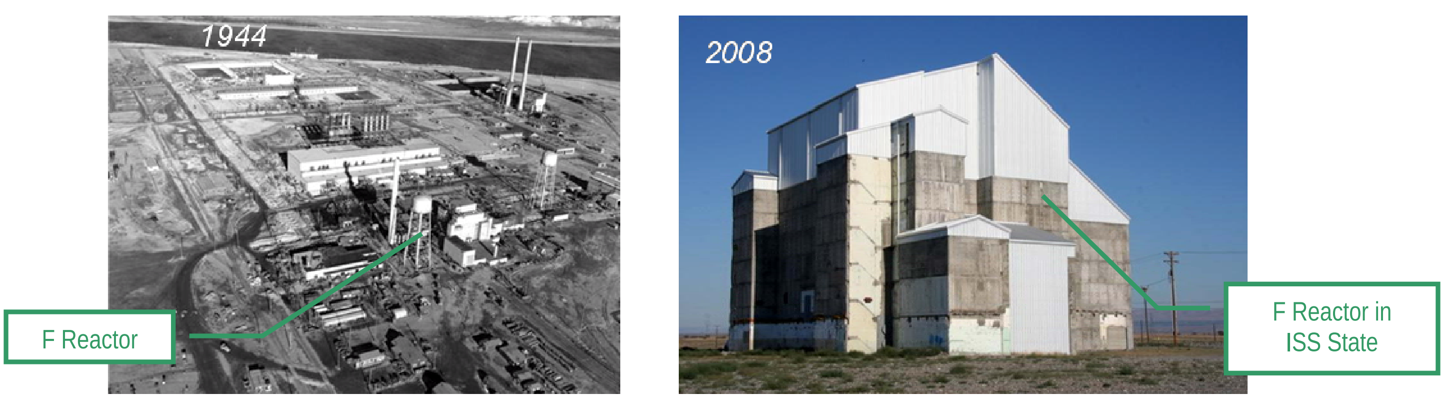
Figure 1.9 Savannah River T Area Before and After Cleanup Completion

One of the primary cleanup objectives at Hanford is cleanup of the River Corridor. This area is being given priority relative to other areas of contamination because it borders the Columbia River. EM projects that the River Corridor cleanup can be completed 20 years earlier and nearly $1 billion less than original estimates. By achieving this, Hanford will shrink its cleanup footprint from 586 square miles to 75 square miles. Figure 1.10 illustrates the cleanup progress made at the 300 Area.

Figure 1.10 Hanford 300 Area Cleanup Progress Between 2005 and 2008

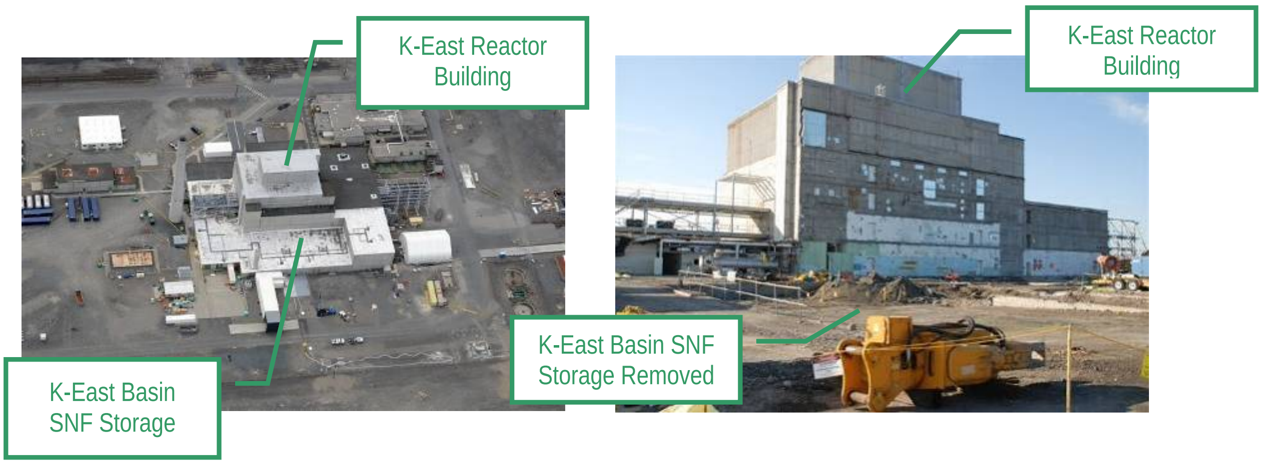
To date, the River Corridor project has deactivated, decommissioned and demolished three nuclear facilities, 29 radiological facilities, and 79 industrial facilities. In addition, five of the nine reactors were placed into interim safe storage (ISS). The reactor support facilities have been demolished and the reactor blocks are being "cocooned" for interim storage. The cocooning process involves removing all of the reactor building except for the five-foot-thick shield walls surrounding the reactor core. Openings and penetrations are sealed with corrosion resistant materials and a 75-year roof is placed over the remaining structure. Nearly 4 billion gallons of contaminated groundwater have been treated and innovative technologies are being implemented to further reduce groundwater contamination. Figure 1.11 shows two photographs of the F Reactor, in 1944, and in 2008 after cocooning.

Figure 1.11 Hanford F Reactor Under Construction (1944) and Cocooned (2008)



Another example of cleanup progress in the River Corridor is the K-Basins project. As described in Section 1.3.2, all SNF was packaged and moved to dry storage in the center of the Hanford Site away from the Columbia River. Figure 1.12 illustrates the progress to date at the K-Basins project. The K-East superstructure removal was completed and substructure removal started. Following substructure removal, the next step will be to complete soil remediation under the K-East Basin.

Figure 1.12 Hanford K-Basin Before and Now



Oak Ridge cleanup has centered on D&D of the East Tennessee Technology Park (ETTP), formerly known as the Oak Ridge Gaseous Diffusion Plant. There were 160 areas of contamination spread over 2,200 acres that required remediation and 500 facilities that required deactivation and decommissioning. In 2004, one of the largest decommissioning projects ever undertaken by DOE was completed when the K-29 process building was demolished and the K-31 and K-33 process buildings were cleaned out and made ready for reuse. These three buildings had more than 100 acres of floor space and hundreds of tons of contaminated equipment. A little more than half of the facilities have now been decommissioned and half of the release sites have been remediated.

In 2006, Oak Ridge completed the cleanup of a diverse legacy of contaminated soils, inactive facilities, and waste disposal areas in the Melton Valley watershed (Figure 1.13). This project remediated more than 1,000 acres, demolished 14 facilities, stabilized six linear miles of liquid waste lines, cleaned and grouted eight tanks with a total of 90,000 gallons of capacity, removed more than 200 concrete casks of TRU waste from 22 trenches, and installed engineered barriers over more than 140 acres of waste disposal sites.

Figure 1.13 Oak Ridge Melton Valley Before and After Cleanup Completion

The Paducah Gaseous Diffusion Plant in Paducah, Kentucky, is the only operating uranium enrichment facility in the United States. Owned by DOE, it is leased and operated by the United States Enrichment Corporation. Although the gaseous diffusion plant is still operating, cleanup activities at Paducah have been, and will continue to be, focused on soil and groundwater remediation, D&D of inactive facilities, and cleanup of scrap metal and material storage areas. More than 30,500 tons of scrap metal, the largest collection of scrap metal in the DOE complex at the time, was shipped off site between FY 2004 and FY 2007, permanently removing the site's largest source of off-site surface waste contamination (Figure 1.14). More than 2 billion gallons of groundwater contaminated with trichloroethylene and technetium-99 have been treated since 1997. Several facilities have been decontaminated and demolished on an accelerated schedule.

The Portsmouth Gaseous Diffusion Plant located in Piketon, Ohio, is currently shutdown. Two process buildings were cleaned out, including disassembly and cleanout of designated waste and centrifuge equipment and disposition of waste oils and recyclable materials. Corrective measures have been implemented at the five groundwater plumes. One of the plumes is migrating off the southern reservation boundary onto private property. In FY 2007 alone, the groundwater treatment facilities treated more than 27.2 million gallons of groundwater and removed more than 731 pounds of trichloroethylene.

Figure 1.14 Paducah Scrap Metal and Material Storage Areas Before and After Cleanup Completion

DOE is proceeding with plans for the D&D of this facility. It is currently developing an acquisition strategy for the D&D contract work scope, and intends to issue the RFP in 2009.

ADDRESSING CHALLENGES

Challenges

- Deactivation and Decommissioning of deteriorating buildings

EM has had many successes in carrying out D&D activities as epitomized by the six plutonium facilities at Rocky Flats and the reactor complexes at INL. However, D&D projects can encounter unexpected problems. For example, the original D&D plan for ETTP did not adequately account for the unique size, complexity, contamination and condition of the buildings and equipment at the site. The rapid and extensive deterioration of buildings forced a significant change to the cleanup scope and cleanup approach, including to safety measures for protection of the workforce. All of these conditions have resulted in increased cost and schedule. EM is evaluating options to accelerate the demolition of the remaining large gaseous diffusion buildings (K-25 and K-27) and support facilities at the ETTP. This may be achieved through new procurement strategies focusing on achieving D&D efficiencies.

To improve performance, lessons learned from D&D projects are being shared between sites. Lessons from the former Oak Ridge Gaseous Diffusion Plant at ETTP are being used in the planning for the eventual D&D of the Portsmouth and Paducah Gaseous Diffusion Plants. This should result in significant cost savings when applied to these very large D&D projects.

1.8 ACHIEVEMENTS AND INNOVATION

1.8.1 ACHIEVEMENTS AND INNOVATION IN TECHNOLOGY AND ENGINEERING

In its early years, EM's internal business processes did not incentivize contractors to take innovative approaches to reducing risk. In fact, most contractors earned the majority of their fees by simply managing waste safely. Corporately, the EM Science and Technology program did not have a program-wide focus. Rather, science and technology was generally a collection of science research and technology projects rather than a single program designed to support the EM mission.

PROGRESS

EM's new strategies have driven numerous technology and engineering innovations. By employing contracting strategies to challenge its contractors, EM has encouraged contractors to identify, develop and implement innovative approaches to advance risk reduction, to minimize cleanup costs and to maintain the highest safety standards. Engineering and technology investments have provided the engineering foundation, technical assistance, novel approaches, and one-of-a-kind technologies that contribute to the realized significant risk reductions. Several examples of these technologies are highlighted on the following pages.

Figure 1.15 Engineering and Technology Innovation Highlights

- Engineering and Technology Innovation -

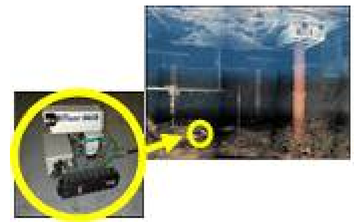
Example of Innovation in the Cleanup Process

Acceleration of Decontamination and Disposition. The contractor at Rocky Flats developed a process for decontaminating and disposing of gloveboxes that improved safety, accelerated cleanup and reduced costs. It was initially thought necessary to size reduce the gloveboxes, remove lead shielding, and prepare for shipping and disposal of the contaminated pieces as TRU waste. However, the contractor developed a process for decontaminating the boxes, using a series of chemical applications and wipe downs, such that the gloveboxes became LLW and could be shipped intact to LLW disposal cells and thereby reducing the time and cost to complete that phase of cleanup.

New Decontamination Process Minimizes TRU Waste

Example of Innovation in Reducing Worker Risk

Improving Worker Safety. The contractor at the Hanford Site reduced the risks to worker safety at an engineered trench by designing a robotic crawler to perform condition inspections. Concerns over the structural integrity of the roof of the Z-9 Crib, an engineered trench with an open area beneath a concrete slab, required investigation. To obviate the need for human entry, a fixed high-resolution camera and robotic crawler were deployed into the crib to perform an inspection of the roof and the interior space. The robotic crawler and camera produced still photos that were merged to produce a 360-degree, high-resolution inspection video, which enabled assessment of the interior condition of the Crib structure.



Z-9 Crib as Photographed by Robotic Crawler

Examples of Innovation in Cleanup Technology

Testing of Fractional Crystallization at the SRNL Pilot Test Facility

Reduction of HLW Volume Contractors at the Hanford Site and at the SRS have developed and tested a technology that will significantly reduce the volume of HLW to be solidified at WTP at the Hanford Site and the number of glass canisters to be disposed in an off-site HLW repository, accelerate WTP projected operations by 20 to 30 years and reduce life-cycle cost by more than $1 billion. Fractional crystallization has been demonstrated at laboratory and engineering-scale to effectively pre-treat HLW, removing large volumes of sodium nitrate salts as LAW, and thus helps to significantly reduce the quantity of HLW requiring treatment and disposal. The technology has been pilot tested in 2008 at the Savannah River National Laboratory (SRNL). The test involved a single-shell tank simulant to show effective crystallization of the major sodium salts in these tanks and when that was satisfied, non-radioactive cesium was added to the simulant to show effective separation of the cesium from the salt solutions.

Steam Reforming Pilot Testing at the Hazen Research Facility in Colorado

Acceleration of HLW Treatment. The contractor at Savannah River Site has developed the Fluidized Bed Steam (FBSR) technology, which destroys organics in HLW and will help to accelerate the treatment of HLW. HLW typically contains significant quantities of organic compounds (e.g., 240,000 gallons of HLW at SRS contain 22, 000 kilograms of organic compounds), which pose a flammability hazard to the treatment of HLW. After evaluating and testing several different technologies, FBSR was the only alternative to meet all test requirements for organic destruction. After more than 99.9% of the organics were destroyed during pilot testing, SRS selected FBSR as the baseline technology for destruction of organics in HLW. In addition, INL is currently constructing the Integrated Waste Treatment Unit based upon FBSR for treatment of their sodium-bearing waste. Hanford also is testing application of FBSR for supplemental treatment of LAW and the WTP recycle stream.

- Engineering and Technology Innovation (continued) -

Reduction of TRU Repackaging Needs. New Non-Destructive Assay (NDA) and Examination (NDE) Technologies developed by contractors have been developed and demonstrated to enable shipment of large TRU containers, primarily at Savannah River and Hanford, without repackaging, greatly reducing risks to the workers, saving $600 to $900 million in shipping costs, and shortening their disposal schedule by eight to 12 years. The NDA is comprised of two modules: (1) the Gamma Assay Module, which directly determines the mass of gamma-emitting contaminants as well as the complete isotopic composition of the waste itself, and (2) the Passive Neutron Assay Module, which directly determines mass of spontaneously fissioning isotopes and radiological quantities. The NDE system consists of a robotic-controlled heavy material handling system for the synchronized examination of the waste containers capable of identifying noncompliant articles such as the presence of liquid and non-punctured aerosol containers within the waste package.

Passive Neutron Assay Module at Savannah River Site

Immobilization of Strontium. At the 100-N Area at the DOE Hanford Site, an innovative technology is being demonstrated to treat radioactive strontium in the subsurface, both above and below the water table. A permeable reactive barrier containing the mineral apatite, which has the ability to immobilize strontium, was installed in the aquifer near the Columbia River to demonstrate its ability to prevent further migration of strontium to the river. Further testing of this innovative technology is currently underway to enable its use in the unsaturated soils above the water table, where the source of the strontium first released to the subsurface still resides. If this source can be treated, the amount of strontium transported to the groundwater in the future will be significantly reduced. Treatment of both the source and the groundwater will ensure the most effective and efficient cleanup at this location.

Hanford 100-N Area, Apatite Injection Demonstration Location

Another example affecting our most challenging waste type represents a major step forward. In 2002, in a joint effort between Savannah River National Laboratory and Pacific Northwest National Laboratory, HLW glass formulations and process control strategies were developed that increased waste loading 30 to 50 percent depending on the composition of the waste being processed. To date with this improvement, 400 fewer HLW canisters will be produced during the solidification of 2.6 million gallons of high level waste sludge. This improvement has already saved approximately $400 million in operating costs and continues to save both operating dollars and the numbers of canisters that require long term disposal (another savings of more than $400 million).

Complementing this breakthrough, EM has collaborated with other DOE programs, as well as other Federal agencies and international organizations, particularly regarding technologies with long-term and significant savings.

Innovation through Technology Partnerships

The contractor at the SRS currently is testing and designing a melter with new technology to accelerate solidification of HLW at the DWPF. The current melter, the Joule-heated melter, may not be able to solidify HLW to meet the STP completion date of 2028 because of higher volumes of sludge than originally predicted. The Cold Crucible Induction Melter (CCIM) has demonstrated that it can accommodate higher waste loading and throughput through testing completed on simulants representative of waste at Idaho, Hanford, and Savannah River. Working collaboratively with Russian scientists at the Radon Institute, SRS simulants have shown >50% waste loading, significantly higher than the 38% waste loading currently obtained at the DWPF. EM is also working with AREVA, based in France, on evaluating the potential benefits of the CCIM technology to treat radioactive waste at DOE sites. AREVA and CEA (France's Atomic Energy Commission) are co-developers of the French CCIM technology. Additional benefits of the CCIM include longer melter life and higher tolerance for noble metals. Because of these encouraging results, SRS has completed pre-conceptual design for a DWPF retrofit with a CCIM melter. Further testing and engineering are continuing, as the CCIM may result in life-cycle cost and schedule reduction while meeting regulatory agreements and closure dates. Pilot-scale tests will be conducted at the CCIM facility in Marcoule, France.

Cold Crucible Induction Melter technology demonstration platform at Marcoule, France

Continuing technology development and deployment is a key element of EM's strategy to reduce the technical risk and uncertainty of EM projects. EM will continue to work with scientists and engineers from DOE's national laboratories, private industry, and academia to exchange information and develop and demonstrate innovative technologies.

Engineering and Technology Strategy

- Reduce technical risk and uncertainty through Technology Development and Deployment, External Technical Reviews, and Technical Readiness Assessments
- Establish Best-In-Class Engineering and Technology Organization
- Collaborate with national laboratories, private sector, and universities for innovative technologies
- Conduct technical workshops and exchanges
- Improve identification, mitigation and communication of project technical risks
- Implement Engineering and Technology Roadmap Initiatives

EM is also conducting External Technical Reviews (ETR) to ensure the timely resolution of engineering and technology issues. ETRs provide independent reviews of issues such as technology development, systems integration, design, operations, maintenance, and nuclear safety. EM has completed several successful reviews over the last two years, and expects ETRs to become a mainstay of the EM program.

Furthermore, in response to comments from the Government Accountability Office and Congress, EM has conducted Technology Readiness Assessments (TRA) of EM projects. In FY 2007, EM conducted eight pilot TRAs, and will continue to conduct these assessments to evaluate the maturity of critical technologies prior to incorporating them into cleanup projects. A TRA is an evaluation of a given technology relative to its maturity in terms of development, demonstration, and implementation. It was originally developed by the National Aeronautics and Space Administration and has been also adopted by the Department of Defense.

EM is proactively pursuing a Best-in-Class Engineering and Technology Initiative, which capitalizes on EM's previous successes, builds on its existing engineering and technology capabilities and resources and provides the opportunity for EM to remain a world-class technological organization. The vision underlying the Best-in-Class Engineering and Technology Initiative is as follows:

> **Best in Class**
> - World class technology organization
> - Reduce project cost
> - Accelerate project completion
> - Enhance health and safety
> - Ensure technology readiness

The Environmental Management Program seeks to become a world-class technical organization—fully credible to and trusted by its customers and stakeholders—in order to reduce the technical risks and uncertainties of DOE's cleanup programs and projects. It effectively anticipates and identifies those risks and deploys premier capabilities and resources of the Department, its national laboratories, and academia to mitigate the risks and provide independent evaluation.

In an effort to realize this vision, EM will:

- Develop new technologies to reduce project costs, reduce the time of project completion, and provide enhanced health, safety, and technical performance capabilities;
- Ensure the technology readiness of EM cleanup technologies; and
- Assure current technologies being applied in projects are meeting or exceeding safety, cost, schedule, and technical objectives.

In March 2008, EM issued the Engineering and Technology Roadmap to guide the Engineering and Technology Program. The Roadmap identifies the technical risks and uncertainties that the program faces over the next ten years; the strategies EM will use to reduce those risks; and the planned outcomes of implementing those strategies.

Addressing Challenges

EM's advancements in engineering and technology have led to the design and operation of first-of-a-kind technologies to solve problems that once seemed unsolvable. However, significant challenges still remain. In February 2008, the National Research Council of the National Academy of Sciences issued an interim report on its review of the Engineering and Technology Roadmap, and stated that "existing knowledge and technologies are inadequate for EM to meet all of its cleanup responsibilities in a safe, timely, and cost-effective way. Meeting current and future EM challenges will require the results of a significant, ongoing research and development program."

Those challenges are identified in the Engineering and Technology Roadmap as technical risks and uncertainties that exist in six EM program areas: Waste Processing, Groundwater and Soil Remediation, D&D and Facility Engineering, Spent Nuclear Fuel, Challenging Materials, and Integration. The EM Engineering and Technology program will address these risks and will use applied research and engineering to improve technologies and processes at DOE sites across the Nation.

Challenges

- Improving tank waste storage and retrieval technologies
- Enhancing tank closure processes
- Developing next-generation pretreatment solutions and enhanced waste stabilization technologies
- Improving groundwater and soil sampling, characterization, prediction, and remediation methods
- Adapting technologies for facility deactivation and decommissioning
- Improving SNF storage, stabilization and disposal preparation
- Enhancing storage, monitoring and stabilization systems for challenging materials
- Enhancing long-term waste form performance and monitoring
- Improving transportation packaging for some materials

1.8.2 Achievement and Innovation in Safety

The EM workforce must perform highly technical work in a unique environment, not only facing hazards associated with a typical industrial work place (i.e., ladders, uneven working spaces/floors, dropped or falling objects, spilled liquids, material movement, heavy equipment, trucks, forklifts) but in addition dealing with hazardous chemicals (including asbestos, beryllium, lead, acids, and organics such as tetrachloroethylene and benzene), nuclear materials, and radioactive substances in a multitude of stable and unstable forms (i.e., solids, liquids and gases). A balanced, integrated approach in facility design, work planning, process controls, and equipment operability/reliability keeps the workers safe while efficiently completing work.

Progress

Even when striving for innovation and productivity, EM's highest priority is safety—underscored by an outstanding safety record. As depicted in Figures 1.16 and 1.17 below, DOE Total Recordable Case (TRC) and Days Away, Restricted or on Job Transfer (DART) (i.e. "lost time") case rates are significantly better than Department of Labor reported performance for the comparable industry (construction and waste disposal), despite the hazardous nature of EM program work. In fact, the figures demonstrate improved EM TRC and DART case rates about 35 percent from 2004 to 2008, a remarkable achievement for any construction and remediation program. While these rates remain

Safety Strategy

- ❖ Safety excellence and breakthrough
- ❖ Continuous improvement
- ❖ Management commitment and worker participation
- ❖ Increased safety oversight of new contractors

low, EM continues to look for innovative ideas to maintain an improving safety performance posture.

Figure 1.16 EM Safety Performance – Total Recordable Cases

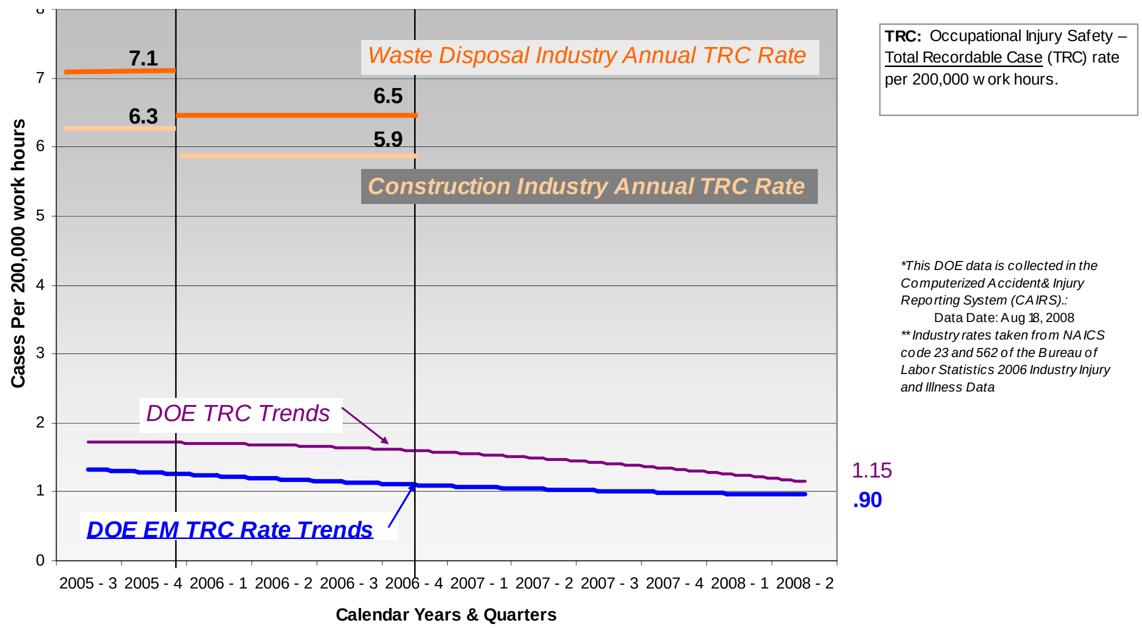
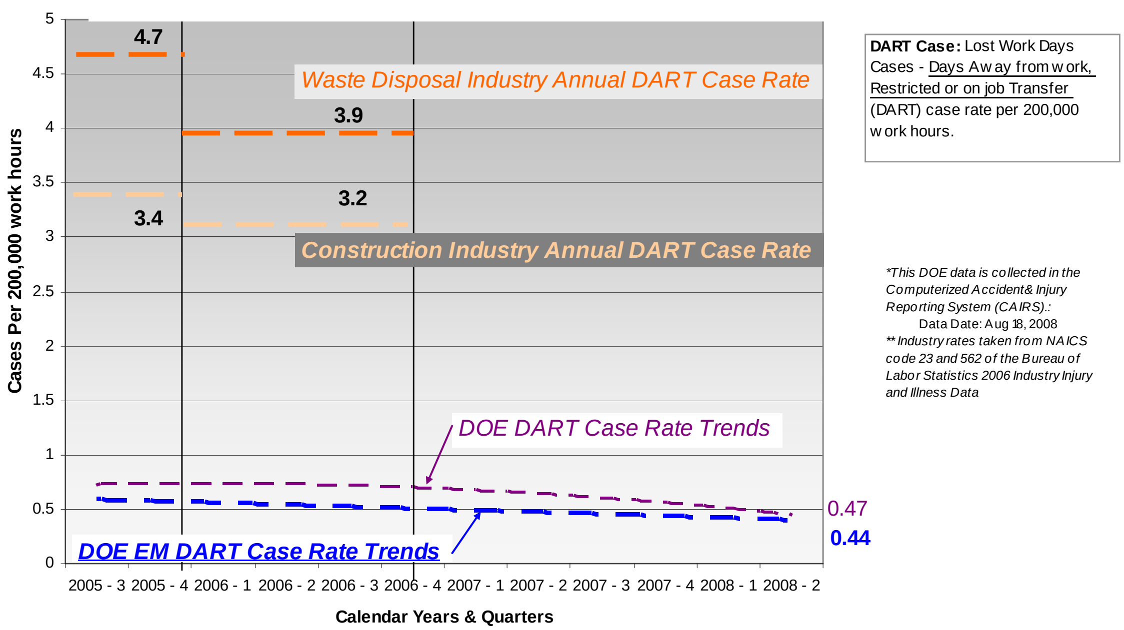


Figure 1.17 EM Safety Performance – Lost Work Days Cases



The EM complex has received 163 state, regional, or national level safety awards or recognition for sustained safety performance, excellence in safety program implementation, employee involvement in safety program activity, aviation safety, mine safety and rescue, and transportation safety since 2004. These awards include numerous prestigious recognitions from the National Safety Council, the Mine Safety and Health Administration, and state governments.

EM's safety culture is further exemplified by its transportation accomplishments. For example, EM has implemented a robust transportation and packaging program that has received recognition from industry groups for its efforts. In May 2007, the Secretary of Energy accepted the TransCAER (Transportation Community Awareness and Emergency Response) Chairman's Award on behalf of the DOE. The award cites the EM Office of Packaging and Transportation for its exemplary outreach efforts in working with communities along DOE's shipping routes in planning and preparing for possible transportation emergencies through its Transportation Emergency Preparedness Program.

In addition, in 2008, EM was awarded the U.S. Transport Council (USTC) Special Achievement Award during USTC's National Transport Summit in Washington, D.C. USTC is a nonprofit organization with members including the leading transportation companies, customers and associated industries. The Award recognizes success in shipments to the WIPP and the cleanup of major sites such as Rocky Flats and Fernald.

ADDRESSING CHALLENGES

EM's approach to safety is not limited to achieving good safety statistics. A totally integrated approach to safety is required. A key factor in achieving an excellent level of safety performance is to identify opportunities and take actions to continuously improve workplace safety. Opportunities such as elimination of electrical safety violations, lockout/tagout deficiencies, tripping hazards, ladder mishaps, and transportation incidents with radiological/hazardous materials are some areas contemplated. EM will expand the integrated safety management (ISM) approach to go from "good" to "great" safety performance. EM Headquarters, Field elements, and contractors have started initiatives to further improve human performance, implement effective work planning and control, and provide constructive feedback to enable timely, continuous improvement. Integrated review of work packages will provide the opportunity to eliminate unnecessary or unsafe work elements by making it possible to develop and implement new and better approaches. Continuous implementation of ISM to enhance human performance, effect work planning and control, utilize constructive feedback, and apply lessons learned will result in a better safety culture throughout the workplace and breakthrough safety improvements. EM will enhance safety oversight of new contractors as they transition into working at EM sites.

Challenges

- Integrated work planning and control
- Timely feedback and effective lessons learned
- Sustaining safety culture through multiple contract transitions

2 Regulatory Milestones and Commitments

The Department of Energy (DOE or the Department) strongly believes setting priorities to attain the greatest risk reduction is the most effective use of taxpayer funds and has the greatest benefit, at the earliest possible time, to the largest number of people. The Department works closely with Federal and state regulators and seeks cooperation with these and other stakeholders to evaluate needs and focus work on the highest environmental priorities based on current knowledge. The Office of Environmental Management (EM) makes every effort to comply with all applicable environmental legal obligations, while also maintaining essential functions to protect human health, the environment, and national security.

2.1 Enforceable Milestones

As described in Section 1.4, EM's cleanup work at most sites is governed by one or more regulatory agreements or orders. Table 2.1 describes the types of agreements, orders, and decrees in effect. Most EM cleanup is being performed under Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) through Federal Facility Agreements (FFAs), as well as under Resource Conservation and Recovery Act (RCRA) through various Consent Orders, Compliance Orders, and Site Treatment Plans (STPs). In addition, virtually all sites operate under various environmental permits (e.g., Clean Air Act, Clean Water Act), which contain both requirements and enforceability provisions.

Table 2.1 Types of Agreements and Orders

Agreement/ Order	Description
Federal Facility Agreement (FFA)	A legal agreement between DOE, the Enviromental Protection Agengy (U.S. EPA), and sometimes the State. It sets forth schedules and processes for site cleanup under CERCLA, including enforcement provisions for non-compliance. FFAs that include the state as a party often incorporates RCRA compliance requirements, as well as state hazardous waste law requirements that flow from RCRA. These agreements are typically called FFAs and COs. A few also incorporate Toxic Substances Control Act (TSCA) requirements.
Consent Order Or Consent Agreement Or Settlement Agreement	A legal agreement between DOE and U.S. EPA or the State, documenting the settlement of a cleanup issue outside of court. COs, consent agreements, and settlement agreements are legally binding, so compliance disputes may ultimately be taken to court. Most COs, consent agreements, and settlement agreements address RCRA issues or state hazardous waste issues that flow from RCRA, although they can also address CERCLA issues.
Consent Decree	A court-issued enforceable order, generally reflecting an agreement between DOE and U.S. EPA or the State. Consent decrees can cover either CERCLA or RCRA, as well as state hazardous waste laws.
Site Treatment Plan and Compliance Order	A legal agreement and plan developed under the Federal Facility Compliance Act (FFCAct) and RCRA for DOE facilities that generate or store mixed wastes, setting schedules to treat all of the facilities' mixed waste.

The list of agreements in place at DOE sites is provided in Table 2.2. For ease of listing the documents here, names of some specific agreements/orders have been modified to align with the above categories of documents (e.g., Los Alamos' 2005 "Compliance Order on Consent" is shown below as a RCRA Consent Order). EM's website (www.em.doe.gov/Pages/compagreements.aspx) provides each site's compliance documents by name.

The agreements and orders identify the specific cleanup actions and the associated milestone dates. There are two different types of milestones – enforceable milestones and "planned" milestones (also referred to as "rolling" or "target" milestones). An enforceable milestone has a fixed, mandatory due date. In some cases, the regulatory agreements or orders only establish enforceable milestones for the current fiscal year plus the next two fiscal years, meaning milestones due more than three years out remain subject to change before they "roll" over into enforceable milestones. Some regulatory agreements establish enforceable milestones for the entire lifecycle of the cleanup. The Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement), for example, establishes enforceable milestones for several decades out.

The number of major enforceable milestones due from September 1, 2008, forward for each site is listed in Table 2.2. The individual milestones for each site are listed in Appendix A, List of Enforceable Milestones. Not all sites where EM is conducting cleanup activities are listed in Table 2.2 and Appendix A, since the regulatory framework for some cleanup sites do not include enforceable cleanup milestones. For example, Moab, where EM is removing uranium mill tailings and remediating contaminated groundwater is not subject to enforceable milestones nor is the Waste Isolation Pilot Plant (WIPP), which is a disposal rather than a cleanup facility.

In addition, the milestone counts in Table 2.2 and the milestone list in Appendix A are not exhaustive. Both are intended to provide a high-level summary of the compliance picture at individual EM sites. Some sites, such as National Nuclear Security Administration (NNSA) sites, may have additional regulatory agreements and associated enforceable milestones that are not part of EM's work scope. Those agreements and milestones are not in this EM report. In addition, most routine, recurring and purely administrative enforceable milestones, which can number in the hundreds at some sites, have been omitted. Instead, EM has focused on those milestones that are related to making cleanup progress at our sites. (Examples of routine administrative milestones are those for monthly and quarterly progress and monitoring reports, which document the status of already in-place remedies, versus progress toward making cleanup decisions.)

Finally, many enforceable milestones at the Savannah River Site (SRS) have been "rolled up" into a smaller number of "aggregate" milestones for reporting purposes to reflect the site's area completion strategy. Under that strategy, SRS and its regulators have agreed that the site may submit one comprehensive remedial document, such as a corrective measures study or a work plan, to satisfy the requirements contained in multiple enforceable milestones related to a common area of the site. While this strategy allows SRS to realize substantial savings in terms of both cost and time, each of the "rolled up" milestones remains individually enforceable and potentially subject to separate fines and penalties if the comprehensive document is not submitted on time.

Table 2.2 List of Agreements, Orders, and the Number of Enforceable Milestones at Each Site

Site	Agreement Type/Title and Date	Number of Enforceable Milestones
Brookhaven National Laboratory	• Federal Facility Agreement – 1992	1
Energy Technology Engineering Center	• FFCAct Site Treatment Plan/Compliance Order – 1995 • RCRA Consent Order – 2007	14
Idaho	• Federal Facility Agreement – 1991 • RCRA Consent Orders – 1992, 1999, 2000 and 2001 • Batt Settlement Agreement – 1995 • FFCAct Site Treatment Plan/Consent Order – 1995	21
Los Alamos National Laboratory	• RCRA Consent Agreement – 1993 • FFCAct Site Treatment Plan/Compliance Order – 1995 • Federal Facility Compliance Agreement – 2005 • RCRA Consent Order – 2005	42
Nevada Test Site	• RCRA Consent/Settlement Agreements – 1992, 1994 • FFCAct Site Treatment Plan/Consent Order – 1996 • Federal Facility Agreement – 1996	25
Oak Ridge	• Federal Facility Agreement – 1992 • FFCAct Site Treatment Plan/Compliance Order – 1995 • TSCA Compliance Agreement – 1996	65
Paducah	• Federal Facility Agreement on TSCA - 1992 • FFCAct Site Treatment Plan/Compliance Order – 1997 • Federal Facility Agreement – 1998	10
Portsmouth	• RCRA/TSCA Consent Decree – 1989 • FFCAct Site Treatment Plan/Compliance Agreement – 1992, 1995 • RCRA/CERCLA Consent Order – 1997 • RCRA Compliance Order – 1998	7
Richland and River Protection	• Federal Facility Agreement (Tri-Party Agreement) – 1989 • Clean Air Act Compliance Agreement – 1994 • TSCA Compliance Agreement – 1996 • RCRA Consent Decree on Tank Interim Stabilization – 2000 • RCRA Consent Order on Tank Integrity – 2000 • Settlement Agreement on National Environmental Policy Act and Waste Disposal – 2006	116
Sandia National Laboratories	• RCRA Consent Order – 2004	2

Site	Agreement Type/Title and Date	Number of Enforceable Milestones
Savannah River	• RCRA Consent Orders – 1985, 1999 (2) • RCRA Settlement Agreements – 1987 (2), 1988, 1989, 1991 • Federal Facility Agreement - 1993 • FFCAct Site Treatment Plan/Consent Order – 1995 • Clean Water Act Consent Order – 1999	29
Stanford Linear Accelerator Center	• Compliance Order (Regional Water Quality Control Board) – 2005	13

2.2 Milestone Challenges

The Department has a history of meeting more than 90 percent of its milestones; however, EM recognizes that some enforceable milestones are potentially at risk. There are certain circumstances that explain the majority of at risk milestones. For some milestones, the associated agreements were negotiated many years ago, with incomplete knowledge by all of the parties regarding the technical complexity of meeting the milestones. Unexpected technical obstacles have often required additional work not anticipated at the time the agreements were established. For others, because of the dependencies between projects, the completion of milestones for a particular project may affect the scheduling and sequencing of other projects, each having their own enforceable milestones. On top of these occurrences, the full scope of the work to be completed was not necessarily known when agreements were originally established. Likewise, agreements were developed without the knowledge of the type and timing of contracts required to complete the work.

The cleanup program continues to be impacted by various safety, contract administration, project management, regulatory, legal, technical, and economic challenges. Table 2.3 provides a list of the enforceable milestones at risk based on the program's progress through 2008.

Table 2.3 Enforceable Milestones at Risk

Milestone Description	Commitment Date
Los Alamos National Laboratory New Mexico Environment Department Consent Order	
Submit Investigation Report for Upper Los Alamos Canyon Aggregate Area	5/31/2009
Submit Investigation Report for Canada del Buey Canyons	8/31/2009
Richland Operations Office Hanford Federal Facility Agreement and Consent Order ("TPA")	
Complete removal of the K Basins and their content	3/31/2009
Initiate soil remediation at K West Basin	04/30/2009
Complete treatment of K Basin Sludge	11/30/2009
Complete interim remedial actions at Areas 100-B and C	12/31/2009
Retrieve 12,200 cubic meters (cumulative) of contact handled retrievably stored waste	12/31/2009
Complete treatment of all contact handled mixed low level waste	12/31/2009
Treat 6,600 cubic meters of contact handled mixed TRU waste (cumulative)	12/31/2009
Submit a revised Feasibility Study Report and proposed plan for the Area 200 BC cribs and trenches for the new 200-BC-1 Operable Unit	4/30/2010
Submit 200-BP-5 Operable Unit Feasibility Study and proposed plan to U.S. EPA	10/31/2010
Submit revised Feasibility Study Report and revised proposed plan for 200-CW-1 Operable Unit	11/30/2010
Submit 200-UP-1 Operable Unit Combined Remedial Investigation/Feasibility Study Report and proposed plan	11/30/2010
Retrieve all contact handled retrievably stored waste within Burial Grounds 218-W-4C, 218-W-4B, 218-W3A and 218-E-12B	12/31/2010
Treat 7,600 cubic meters contact handled mixed TRU waste (cumulative)	12/31/2010
Submit a Feasibility Study Report and proposed plan for 200-SC-1 Operable Unit	12/31/2010
Submit the Feasibility Study Report and the revised recommended remedy(ies) for 200-PW-2 and 200-PW-4 Operable Units	12/31/2010
Initiate full-scale retrieval of remote handled retrievably stored waste	01/01/2011

Milestone Description	Commitment Date
Treat 300 cubic meters per year of remote handled mixed low level waste	6/30/2011
Complete interim safe storage for 105-K Basin East and 105-K Basin West reactor	09/30/2011
Complete the Combined Remedial Investigation/ Feasibility Study process for all Operable Units	12/31/2011
Complete all Area 200 Non-Tank Farm Operable Unit Site Investigations	12/31/2011
Complete the treatment or certification of contact handled mixed TRU waste regarding small containers of: (1) newly generated contact handled waste; (2) contact handled retrievably stored waste; and (3) contact handled waste currently in above-ground storage	12/31/2011
Treat 8,600 cubic meters of contact handled mixed TRU waste (cumulative)	12/31/2011
Submit Area 200 Chemical Laboratory Waste Operable Units Feasibility Study	12/31/2011
Submit a revised Feasibility Study Report and revised proposed plan for 200-TW-1 and 200-PW-5 Operable Units	12/31/2011
Submit a revised Feasibility Study Report and a revised recommended remedy(ies) for 200-TW-2 Operable Unit	12/31/2011
Complete acquisition of capabilities and/or facilities necessary for retrieval, designation, storage and treatment prior to disposal of post-1970 TRU/mixed TRU waste	06/30/2012
Treat 300 cubic meters per year of remote handled mixed low level waste	6/30/2012
Begin treating remote handled mixed TRU waste and large containers of contact handled mixed TRU waste	6/30/2012
Complete all interim response actions for Area 100	12/31/2012
Complete interim response actions for Area 100 K	12/31/2012
Complete disposition of Area 300 surplus facilities	09/30/2015
Complete all interim remedial actions for Area 300 including the 618-10 and 618-11 burial grounds	09/30/2018
Complete remedial actions for all Non-Tank Farm Operable Units	9/30/2024
Office of River Protection Hanford Federal Facility Agreement and Consent Order ("TPA")	
Start WTP cold commissioning (TPA and Washington Dangerous Waste Permit requirement)	2/28/2009

Milestone Description	Commitment Date
Complete startup and turnover activities for waste retrieval and mobilization systems for selected initial high level waste feed tank	3/31/2009
Complete hot commissioning of WTP Balance of Facilities	1/31/2011
Initiate negotiations of single shell tank waste retrieval and closure for remainder of the single shell tank program	10/31/2012
Negotiations for retrieval and closure of remaining single shell tanks shall be complete within 120 days	2/28/2013
Complete WTP pretreatment and vitrification of no less than 10% of tank waste by mass and 25% by activity	2/28/2018
Complete all work necessary in support of the acquisition and operation of high level waste treatment, storage and disposal facility	2/28/2018
Retrieve waste from all remaining single shell tanks	9/30/2018
Close all single shell tank farms	9/30/2024
Complete closure of all single shell tanks in accordance with approved closure/post closure plans	9/30/2024
Complete pre-treatment processing and vitrification of Hanford high level waste and low activity waste tank wastes	12/31/2028
Savannah River Site Memorandum of Agreement	
DOE must remove the Battelle remote handled-TRU waste from SRS	1/1/2009

While Table 2.3 identifies enforceable milestones potentially at risk, EM will continue to make every effort to comply with all applicable environmental legal obligations, while also maintaining essential functions to protect human health, the environment, and national security. Identifying milestones as potentially at risk prompts innovative work resequencing. Sometimes the resequencing involves renegotiating milestone schedules, with the engagement of our regulators, and other times by re-sequencing non-compliance-driven work scope to allow existing milestones to be met. Thus, while this listing is an accurate reflection of EM's understanding of anticipated successes and current challenges, EM will continually revise its projections of milestones at risk as the program makes cleanup progress, identifies new challenges, and implements mitigation measures—with a goal of meeting its regulatory commitments.

Milestone Compliance Strategy

- Work closely with regulators to align agreements and reduction of highest risks
- Central data base to track milestone performance

Because EM is committed to meeting its regulatory obligations, the program is working with Federal and state regulators to ensure enforceable milestones reflect an achievable, risk-based path forward. Where new regulatory agreements embody different priorities (i.e., sequencing of activities) other than those in EM's current baseline schedule, EM will make the appropriate baseline changes to reflect the shared vision and priorities that have been agreed to.

EM is expanding and improving the tools used to monitor and track regulatory compliance. All enforceable agreement commitments are tracked in a centralized database. The database is used to identify and report potential issues in advance so corrective actions to mitigate or resolve the issues can be taken.

3 EM Program Life Cycle Cost

Since the mid-1990s, the Office of Environmental Management (EM) life-cycle cost has undergone several evolutions due to a variety of factors. With each succeeding estimate, EM further refined its life-cycle cost estimating abilities.

3.1 Evolution of EM Program Life-Cycle Cost

The life-cycle cost of the EM program has been influenced by several factors, including:

- Better characterization of the contamination has clarified the scope of required cleanup;
- More fully defined end states through time have lead to more advanced cost estimates;
- Cost estimating tools continue to become more detailed and accurate, particularly as they incorporate the results of actual costs of previous cleanup efforts;
- The inventory of EM work has fluctuated over time as work scope was transferred in and out of the program.; and
- Optimistic cost-saving assumptions based on changes to the existing regulatory framework were not realized.

Life-Cycle Cost Strategy

- ❖ Identify and schedule all known scope and estimate life-cycle costs
- ❖ Conduct independent reviews to verify the reasonableness of the estimates
- ❖ Baselines are based on realistic planning and funding assumptions

The first comprehensive estimates of EM's projected scope, cost, and schedule were developed in the mid 1990s. These life-cycle cost estimates were based largely on program-wide estimates compiled at Headquarters using cost estimation models based on site-specific assumptions about future land use; treatment, storage, and disposal facility needs; regulatory requirements; and the technologies to be used at the site.

By 1998, EM sites were instructed to group all of their cleanup work scope into projects. Project Baseline Summaries (PBS) were developed as a construct to capture programmatic information associated with individual projects having similar attributes such as geographic location, activity type, or common end state. This information included life-cycle cost, schedule and scope required to complete specific cleanup projects.

In 2002, following publication of the *Top-to-Bottom Review*, sites began developing Performance Management Plans (PMPs) describing the work plans, priorities, and schedules for meeting the sites' cleanup objectives. At sites with long-term Department of Energy (DOE) missions requiring major cleanup, the PMPs described the plan, schedule and estimated cost for EM to complete the cleanup and return the land and/or facilities to the lead Program Secretarial Office (PSO) for future use or transfer to other entities. Over time, some key assumptions underlying the PMPs were not realized at sites, including new approaches to accomplishing cleanup, new regulatory strategies, and restructuring of the program to move work scope out of the EM program. As PMP assumptions regarding alternative cleanup approaches and regulatory strategies did not materialize, project baselines were increased to include additional work scope. For example, PMPs assumed that some radioactive liquid tanks waste (containing lower levels of radioactivity) could be managed as low-level waste (LLW) and disposed or treated in place at a significantly lower cost. When this assumption did not materialize, the additional work scope and increased cost needed to manage tank waste were incorporated into project baselines.

Table 3.1 shows the evolution of EM program life-cycle cost estimates and compares the key assumptions underlying each estimate.

Unrealized Assumptions

- Low activity tank waste could be managed as LLW and disposed or treated in-situ at a significantly lower cost
- H Canyon at Savannah River Site, which is the only nuclear chemical separations plant still in operation in the United States, would have completed EM work scope and would transfer to National Nuclear Security Administration in FY 2008
- Deactivation and decommissioning of the Portsmouth Gaseous Diffusion Plant and Paducah Gaseous Diffusion Plants was not the responsibility of EM
- Management of the Spent Fuel Program would be transferred out of EM
- No new scope would be accepted into the EM program. Instead, the following scope was added to the EM program:
    - More than 200 nuclear facilities and 5 million square feet of space at the Oak Ridge National Laboratory and the Y-12 nuclear weapons plant;
    - Treatment and disposal of U-233 in Building 3019 at Oak Ridge; and
    - Cleanup of the Moab Uranium Mill Tailings Remedial Action Project
- Safeguards and Security requirements would not increase (i.e., no enhanced Design Basis Threat requirements)

Table 3.1 Evolution of Life Cycle Cost Estimates

Life-Cycle Costs (in Billions of Dollars)			
Year	**Life-Cycle Total**	**Significant Events**	**Key Scope/Cost Assumptions**
2008	$274 to $330	Baseline realignment completed	♦ Additional increase in Hanford Waste Treatment and Immobilization Plant (WTP) cost due to scope refinement and changing requirements ♦ More robust design criteria for the Savannah River Site (SRS) Salt Waste Processing Facility ♦ Switch from *in situ* management to removal of Moab mill tailings pile ♦ Increased Los Alamos National Laboratory D&D scope resulting from Consent Order ♦ Includes Portsmouth & Paducah Gaseous Diffusion Plant (GDP) Deactivation and Decommissioning (D&D) ♦ Assumed new scope: ◇ Excess facilities from other mission programs ◇ Treatment and disposal of U-233 in Building 3019 at Oak Ridge ◇ Disposition of 13 metric tons (MT) of Surplus Plutonium (Pu) ◇ D&D of multiple smaller facilities ♦ Low activity tank waste removed from tanks and treated prior to disposition ♦ Spent Nuclear Fuel (SNF) program remains in EM ♦ Increased pension & benefit liabilities ♦ Extended Pu storage at Hanford ♦ Consolidation of Pu at SRS ♦ Continued H Canyon operations needed to support stabilization and disposition of surplus Pu ♦ Treatment of Idaho National Laboratory (INL) calcine waste
2007	$204 to $263	Baseline realignment initiated	
2003	$163	Development of *Performance Management Plans* (PMPs)	♦ Portsmouth & Paducah GDP D&D removed from scope ♦ Office of Future Liabilities responsible for any new scope ♦ Removal of Pu from Hanford ♦ Low activity tank waste treated/disposed *in situ* ♦ Transfer of spent fuel program to DOE Office of Civilian Radioactive Waste Management (OCRWM) ♦ Transfer of H canyon to National Nuclear Security Administration (NNSA) in FY2008 ♦ No treatment of INL calcine waste
2001	$286	*Top-to-Bottom Review (TTB) issued (2002)*	♦ *Top-to-Bottom Review* concludes EM program is focused on managing risk not reducing risk ♦ EM program should only focus on activities that directly result in cleanup ♦ Increase in Hanford WTP cost
1998	$269	*Paths to Closure issued (1998)*	♦ Stable funding ♦ No new scope ♦ Transfer of newly generated waste
1996	$354	*BEMR issued (1996)*	♦ One of the first life-cycle cost estimate of the EM program ♦ Top down estimate ♦ Unknown end states

Life-cycle cost (LCC) totals shown in Table 3-1 reflect the environmental liability life-cycle estimates for those years except for the 1996 Baseline Environmental Management Report (BEMR) estimate which was calculated prior to the requirement to report environmental liabilities as part of the Department's financial statement disclosure. LCC estimates reported in various documents (e.g. budget requests) for the years identified in Table 3.1 may vary due to reporting timeframes and pending scope changes.

3.2 CURRENT EM LIFE-CYCLE COST ESTIMATE

EM's project baselines were developed based on key programmatic assumptions and priorities. EM maintains a "Safety First" culture that integrates environment, safety and health requirements and controls into all work activities to ensure protection to the worker, public, and the environment.

The current LCC estimate range for the EM program (1997 through completion), as documented in the independently reviewed baselines, is $274 to $330 billion (see Table 3.1). This estimate includes about $69 billion in actual costs from 1997 through 2007, and an additional estimate of $205 to $260 billion to complete EM's remaining mission.

Given the uncertainty and risk inherent in the EM work scope, baselines have not been developed as single point estimates, but rather, costs and completion dates are presented as ranges, with a low estimate (generally at the 50 percent confidence level) and a high estimate (generally at the 80 percent confidence level). EM budgets cleanup projects at the 50 percent confidence level and construction projects at the 80 percent confidence level (or higher).

Unfunded Contingency Policy

- Long time frame for completion of cleanup projects
- Limit carrying over project funds from one year to the next
- Cost overruns within one part of a cleanup project offset by surpluses in another

Table 3-2 presents the estimated remaining LCC range (FY 2008 to completion) as detailed in the site baselines, along with each site's anticipated completion date range. Only sites where there is remaining work scope in 2008 and beyond are included in the table.

Table 3.2 Estimated Remaining Life-Cycle Costs and Completion Dates by Site

Site	FY08 and Remaining Cost (low range, millions)	FY08 and Remaining Cost (high range, millions)	Planned Completion Date/Date Range
Argonne National Laboratory-East	$14	$14	2009
Brookhaven National Laboratory	$128	$169	2020
Energy Technology Engineering Center	$106	$152	2018
Fernald	$358	$358	2006[1]
Hanford Site	$49,722	$52,496	2050-2062
Headquarters, TD, Completed Sites, Other	$11,342	$11,342	2048
Idaho National Laboratory	$20,617	$27,530	2037
Inhalation Toxicology Laboratory	<$0.5	<$0.5	2008
Lawrence Livermore National Laboratory Site 300	$9	$9	2008
Los Alamos National Laboratory	$1,635	$2,582	2015-2020
Miamisburg Environmental Management Project	$845	$845	2008
Moab	$939	$982	2028
Nevada Test Site	$1,616	$1,946	2027-2038
Oak Ridge Reservation	$4,835	$5,410	2021
Paducah Gaseous Diffusion Plant	$9,533	$16,432	2040
Pantex Plant	$26	$26	2008
Portsmouth Gaseous Diffusion Plant	$7,434	$14,428	2044
River Protection	$48,782	$66,713	2042 – 2050
Rocky Flats Environmental Technology Site	$2,632	$2,632	2006[1]
Sandia National Laboratory	$9	$9	2009
Savannah River Site	$38,852	$49,688	2039-2040
Separations Process Research Unit	$197	$197	2014
Stanford Linear Accelerator Center	$23	$39	2011
Waste Isolation Pilot Plant	$4,590	$5,184	2035
West Valley Demonstration Project	$1,187	$1,347	2012
	$205,432	**$260,532**	**2050-2062**

1 These costs are associated with contract closeout activities.

The life-cycle estimate does not include the Department's liabilities for D&D of hundreds of excess (surplus) facilities, as well as the management of waste and materials, from other DOE mission programs (i.e., National Nuclear Security Administration, the Office of Science, and the Office of Nuclear Energy). More information on the liabilities for other mission programs is provided in Section 4.

3.3 STRATEGIC PLANNING

EM is analyzing its baselines to develop recommendations to further "optimize" implementation of cleanup projects. This directed strategic planning effort will concentrate on the technical and programmatic challenges facing the cleanup projects. The objective is to identify innovative solutions to drive cleanup outcomes and reduce risk faster.

These strategic analyses, coupled with more rigorous baseline data, will provide a credible basis for:

- Budget formulation, execution and project management;
- Quantification of liabilities from other mission programs and;
- Department's multi-year planning initiatives.

EM's strategic planning and analyses are focused on four crucial areas:

- Footprint Reduction Opportunities and Near-Term completions;
- Alternative approaches to dispositioning tank waste;
- Alternative approaches to dispositioning excess nuclear materials and SNF; and
- Alternative management approaches.

3.3.1 Progress and Maintenance

EM has re-evaluated programmatic elements and priorities to support optimal resource allocation decisions. As part of this "re-evaluation," EM analyzed program costs to determine the percent spent to achieve progress in completing cleanup and risk reduction and the percent spent to maintain existing facility status (i.e., costs that are generally accepted as fixed costs). The ability to understand the relationship between progress and maintenance costs helps gain a better understanding of how much of the program's funding each year is focused on either maintaining a safe and secure posture or directed toward the actual completion of cleanup. Generally, the greater the resources directed at activities related to making cleanup progress, the shorter the duration of the costs associated with the related maintenance activities.

Cost Types

- Progress Costs: Encompasses activities that advance the mission, generally measured by an increase in one or more associated metrics. The application of additional funds to a project should generally result in additional progress, not in continued maintenance
- Maintenance Costs: Encompasses activities required to control existing material, waste, and facilities in a safe, stable condition; to maintain facilities in their current state of operational readiness; and to maintain site infrastructure and the overall current state of the site without advancing the mission

Based on historical budgets, maintenance costs are estimated to be a little over 50 percent of the total annual costs incurred by the program, which means that a little less than 50 percent of the spending support actual cleanup and risk reduction, an increase over previous years. At the time of the publication of the *Top-to-Bottom Review* in February, 2002, only about 33 percent of the EM program budget was going towards actual cleanup and risk reduction work. EM will continue to evaluate opportunities that maximize cleanup and risk reduction results while reducing maintenance costs.

EM also evaluates its cost in terms of the time horizon required to complete different types of cleanup activities because ultimately this is the most effective way to reduce the LCC of the program. EM determined that about half of its program resources (both maintenance and progress) are required for management of tank waste, surplus special nuclear material (SNM), and spent nuclear fuel (SNF). These activities are associated with the larger sites and are fraught with technical, regulatory, and political uncertainties. While EM is pursuing alternative approaches to reduce the enormous LCC associated with management of tank waste and surplus nuclear materials, EM is also proactively pursuing near-term completion and footprint reduction opportunities to optimize cleanup progress.

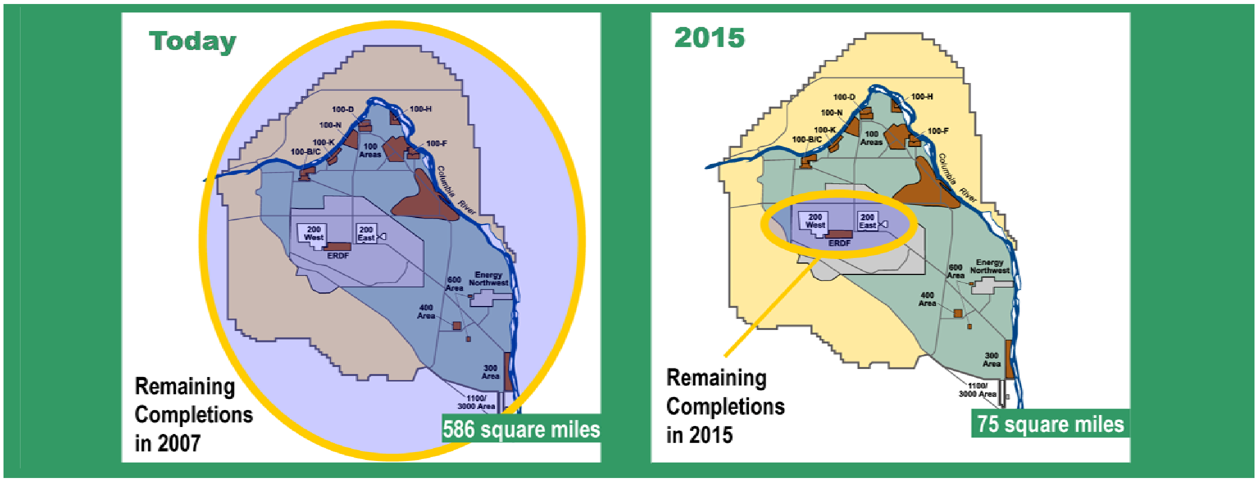
These near-term completion and footprint reduction opportunities are associated with environmental cleanup activities such as transuranic (TRU) waste and low-level waste (LLW) disposal, soil and groundwater remediation, and deactivation and decommissioning (D&D), for which EM has demonstrated successful performance using proven technologies within a well-defined regulatory framework. In order to leverage that success, EM directed its sites to identify footprint reduction and near-term completion opportunities. EM has worked collaboratively with its field sites to define aggressive, but achievable business case strategies for accelerating cleanup of distinct and discrete sites or portions of large sites.

EM has recently undertaken an initiative to divide projects into their underlying discrete scope elements known as analytical building blocks. Developing standardized cost information at this level will enable EM to better understand, communicate, and evaluate costs associated with cleanup work scope and the time and cost associated with delay and/or acceleration. The objective is to understand how LCCs are affected under various scenarios and provide a basis to understand and evaluate the associated compliance and work force implications of alternative scenarios.

3.3.2 Footprint Reduction

At large sites, i.e., the Hanford Site (Hanford), Oak Ridge Reservation (ORR), Idaho National Laboratory (INL), Savannah River Site (SRS), Portsmouth, and Paducah, opportunities exist to reduce the site footprint by focusing cleanup on D&D, soil and groundwater remediation and solid waste disposition. EM's success in these areas can be leveraged to maximize efficiencies and cleanup. Ultimately, completion of these types of cleanup activities reduces the surveillance and maintenance costs associated with managing large tracks of land.

Figure 3.1 Hanford Footprint Reduction Scenario



For example, Hanford's footprint reduction scenario to clean up the River Corridor and complete the D&D of the Plutonium Finishing Plant (PFP) by 2015 results in an 87 percent reduction of the site footprint. This scenario reduces environmental risks with a large return on investment.

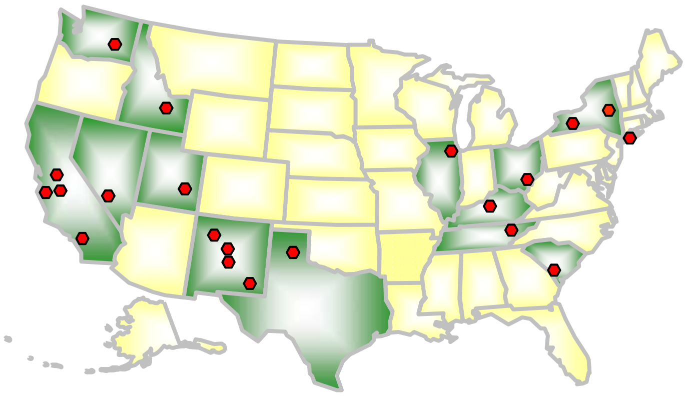
3.3.3 Small Site Near-term Completions

Small sites (Section 1.5.2) submitted near-term completion options that accelerate their remaining EM work scope. This footprint reduction would allow management to focus resources on large site cleanup. Under these scenarios, near-term completion of EM cleanup work would be completed by 2015 at three sites – Brookhaven and Separations Process Research Unit (SPRU) in New York and Stanford Linear Accelerator Center (SLAC) in California. Three other sites could also be accelerated – Moab in Utah, Energy Technology Engineering Center (ETEC) in California, and West Valley Demonstration Project (WVDP) in New York.

In the case of Brookhaven in New York, the remaining EM cleanup mission, which primarily involves the decommissioning of two small nuclear research reactors, would be accelerated from 2020 to 2012. Completion of the remaining work at the SPRU located at the Department's Knolls Atomic Power Laboratory could be accelerated by one year to 2013. This work involves the decommissioning of two nuclear processing facilities and remediation of a small area of soil contamination. In the case of SLAC in California, soil and groundwater remediation would be completed in 2011, one year earlier than now planned.

For the Uranium Mill Tailings Remedial Action Project in Moab, Utah, cleanup would be accelerated by 9 years, from 2028 to 2019. This project involves the remediation of the former uranium-ore processing facility.

Figure 3.2 Sites with Active EM Programs as of 2008

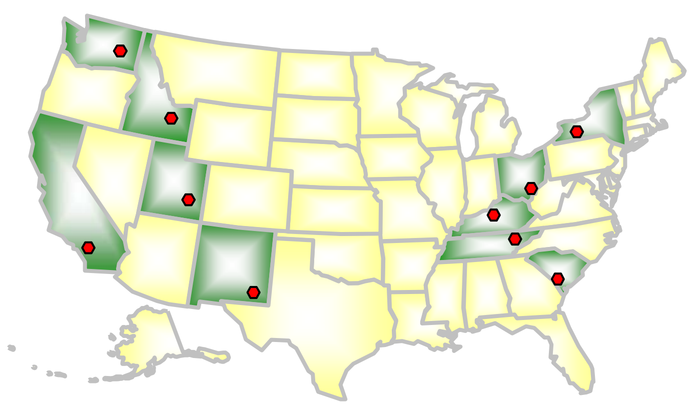


At ETEC, the remaining work is focused on the D&D of nuclear and non-nuclear facilities, remediation of a few soil contamination areas, and one groundwater plume. This work would be completed in 2017 instead of 2018.

The WVDP is divided into two phases. The first phase involves the relocation of canisters of radioactive tank waste to a newly constructed on-site facility for temporary storage, the remediation of contaminated soil areas, and the decommissioning of several nuclear facilities including the original reprocessing plant and stabilization facility. Completion of this work would be accelerated to 2018. The second phase of work would be completed at a later date when a disposition alternative is selected for the high-level waste.

Under the current baseline, cleanup will be complete at 10 of the remaining 21 sites by 2015. If EM were to implement a near-term completion initiative to accelerate small site cleanup, EM would expect to accelerate cleanup at 5 sites—Brookhaven and WVDP in New York, Nevada Test Site (NTS) in Nevada, ETEC in California, and Moab in Utah. This will result in completion of two additional sites (Brookhaven and NTS) by 2015, and the other three shortly thereafter. This strategy delivers significant risk reduction during the 2008 to 2015 timeframe and results in a reduction of active EM work at 21 sites in 13 states to 10 sites in 10 states (see Figures 3.2 and 3.3).

Figure 3.3 Remaining Active EM Sites in 2015



If EM were to successfully implement both the large site footprint reduction initiative and the small site near-term completion strategy, it would effectively reduce the overall EM footprint from approximately 900 square miles to approximately 135 square miles. This will result in a significant reduction in the EM Program life-cycle cost and schedule. More detailed information on life-cycle costs at the project level is provided in Appendix B.

4 EXCESS FACILITIES AND MATERIALS SCOPE TRANSFER

DOE Environmental Liabilities

- 340 surplus facilities and materials
- $3.7 to $9.2 billion estimated cleanup cost

The Department of Energy (DOE or the Department) has hundreds of excess contaminated facilities and tons of materials and radioactive wastes that are not part of the Environmental Management (EM) program. The crucial management and control of these liabilities is vital to the Department given the potential risks to the health and safety of DOE workers, the public and the environment.

For the first decade of the EM program, excess facilities and materials from other DOE Program Secretarial Offices (PSOs) were transferred to EM for cleanup and disposition. In fact, on occasion, whole sites were transferred to the EM program, e.g., Savannah River Site (SRS) and Hanford. At times, funding accompanied the transfer to support surveillance and maintenance activities prior to cleanup.

In 2002, due to concerns about broadening scope creep, work activities beyond the core mission and established planning scenarios, the "facility pipeline" was turned off.

- Progress - Excess Facilities	
Status in FY 2002	**Progress Since FY 2002**
◆ Excess facility pipeline closed	◆ Excess facility & material inventory identified ◆ Preliminary cost estimate defined ◆ Mission Need Statements for the deactivation and decommissioning (D&D) of excess facilities developed for approval or already approved

In 2006, EM was designated by the Deputy Secretary as the cleanup agent for excess facilities and materials for the Department. Commensurate with the risk these activities pose, and in accordance with appropriate DOE Orders and directives, EM is responsible for addressing environmental cleanup and waste management liabilities of other DOE programs, and will incorporate those liabilities into its plans.

To understand the potential scope that the Department has identified, Table 4.1 provides a summary of the 340 excess facilities and materials. The full list is provided in Appendix C.

Table 4.1 Summary of Facilities and Material Groups for Potential Transfer to EM

PSO	Total by PSO/Site		Cost Range ($ in millions)	Total Facility Square Footage (by site)
	Facilities	**Material**		
SC	**164**	**24**	**$1,624.4 - $3,634.2**	**3,144,903**
ANL	15	0	$285.1 - $611.2	1,149,237
BNL	8	3		160,252
SLAC	0	20		
FNAL	0	1		
ORNL	124	0	$980.5 - $2,588.4	832,384
Y-12	17	0	$358.8 - $424.6	1,003,030
NNSA	**102**	**0**	**$1,155.7 - $3,545.9**	**2,285,780**
LANL	11	0	$63.1 - $135.2	92,000
LLNL	4	0		155,000
NTS	5	0		18,710
SRS	3	0		72,349
Y-12	79	0	$1,092.6 - $3,410.7	1,947,721
NE	**40**	**10**	**$954.5 – $1,975.8**	**416,558**
INL	38	10	$886.4 - $1,899.5	134,663
ORNL	1	0	$34.5 - $40.6	26,239
Y-12	1	0	$33.6 - $35.7	255,656
Grand Totals	**340**		**$3,734.6 – $9,145.9**	**5,847,241 (Sq. Ft.)**

Excess Facilities and Materials Strategy

- Identify excess facilities and materials
- Assess condition of facilities and materials

The transfer process is fairly straightforward and is initiated annually by EM's request to other Departmental "owners" to identify what cleanup scope they propose for transfer to EM. Information is consolidated and formalized along with agreements on transfer period and budget responsibility. Upon agreement on transfer conditions, planning steps are initiated to incorporate the facility or material into EM's scope.

Table 4.2 displays the cost range and identifies the DOE site, the owner, and whether the range is for facilities, materials, or both.

Table 4.2 Summarized List of Excess Inventory and Estimated Liability Cost

Site & Owner	Cost Range (+50% / -30%) Future Cost Liability (in Millions)	Facilities and/or Materials/Wastes
LANL / NNSA	$13.9 – $29.8	Facilities
LLNL / NNSA	$26.2 - $56.2	Facilities
NTS / NNSA	$4.0 - $8.5	Facilities
SRS / NNSA	$19.0 - $40.7	Facilities
Y-12 / NNSA	$1,092.6 - $3,410.7	Both
Subtotal NNSA	**$1,155.7 - $3,545.9**	**Both**
ANL / SC	$209.7 - $449.4	Both
BNL / SC	$36.2 - $77.6	Both
SLAC / SC	$37.7 - $80.9	Materials/Wastes
FNAL / SC	$1.5 - $3.3	Materials/Wastes
ORNL / SC	$980.5 - $2,588.4	Both
Y-12 / SC	$358.8 - $424.6	Both
Subtotal SC	**$1,624.4 - $3,624.2**	**Both**
INL / NE	$886.4 - $1,899.5	Both
ORNL / NE	$34.5 - $40.6	Both
Y-12 / NE	$33.6 - $35.7	Both
Subtotal NE	**$954.5 - $1,975.8**	**Both**
Total Potential New EM Liability	**$3,734.6 – $9,145.9**	**Both**

Based on EM's current planning, the earliest EM could accommodate any of the new work without re-prioritization of its existing work scope is 2017. Integration of these liabilities into the existing EM program will require re-prioritization based on an overarching framework that accounts for health and safety, environmental stewardship, and regulatory compliance.

ADDRESSING CHALLENGES

Once EM accepts cleanup work scope from other DOE programs a strategic planning challenge arises. EM will need to integrate these liabilities into its existing cleanup activities focusing on safety, engaging our regulators and the community, and ensuring resources are used efficiently. Deferral of tackling these liabilities in a timely manner may impact ongoing mission work as well as plans to expand and accommodate new missions that are needed to meet energy and national security objectives.

Challenges

- Liabilities associated with excess facilities and materials from other DOE programs
- Transfer ready condition
- Ongoing missions

APPENDIX A LIST OF ENFORCEABLE MILESTONES

The following table is provided pursuant to section 3130(b)(5) of the National Defense Authorization Act For Fiscal Year 2008. It lists, by site (alphabetically), major enforceable milestones with commitment dates from January 1, 2009 and beyond, their associated Agreement, and associated commitment date.

As noted in Section 2.1 of the report, the list of milestones in this Appendix is not exhaustive. It is intended to provide a high-level summary of compliance at individual EM sites. Some sites, such as National Nuclear Security Administration (NNSA) sites, may have additional regulatory agreements and associated enforceable milestones that are not part of EM's work scope. These agreements and milestones are not listed in this EM report. In addition, most routine, recurring and purely administrative enforceable milestones, which can number in the hundreds at some sites, have been omitted. Instead, EM focused on those milestones related to making cleanup progress at our sites. (Examples of routine administrative milestones are those for monthly/quarterly progress and monitoring reports that document the status of already in-place remedies, versus progress toward making cleanup decisions.)

As also noted earlier in this report, many enforceable milestones at the Savannah River Site (SRS) have been "rolled up" into a smaller number of "aggregate" milestones for reporting purposes to reflect the site's area completion strategy. Under that strategy, SRS and its regulators have agreed that the site may submit one comprehensive remedial document, such as a corrective measures study or a work plan, to satisfy the requirements contained in multiple enforceable milestones related to a common area of the site. While this strategy allows SRS to realize substantial savings in terms of both cost and time, each of the "rolled up" milestones remains individually enforceable and potentially subject to separate fines and penalties if the comprehensive document is not submitted on time.

Enforceable Milestone	Agreement	Commitment Date
Brookhaven National Laboratory		
Submit Interagency Agreement Annual Update	FFA	Annual Requirement through 9/30/2020
Energy Technology Engineering Center (ETEC)		
Site Treatment Plan (STP) Milestone Report (proposes milestones)	STP	Annually 2/15
Annual STP Submittal (discuss new volumes added)	STP	Annually 10/30
Santa Susana Field Laboratory Groundwater Corrective Measures Study Workplan	Consent Order	3/13/2009
Santa Susana Field Laboratory Surficial Media Corrective Measures Study Workplan	Consent Order	4/9/2009
Group 7 Surficial Media RCRA Facility Investigation Report	Consent Order	6/15/2009
Santa Susana Field Laboratory Groundwater Operable Unit RCRA Facility Investigation Report	Consent Order	9/24/2009

Enforceable Milestone	Agreement	Commitment Date
Santa Susana Field Laboratory Site-wide Ecological Group RCRA Facility Investigation Report	Consent Order	9/23/2010
Santa Susana Field Laboratory Surficial Media Corrective Measures Study Report	Consent Order	12/6/2011
Santa Susana Field Laboratory Groundwater Corrective Measures Study Report	Consent Order	5/14/2012
Santa Susana Field Laboratory All Groups Corrective Measures Implementation Workplan	Consent Order	1/21/2015
Santa Susana Field Laboratory Groundwater Corrective Measures Implementation Workplan	Consent Order	2/20/2015
All Groups (Soils) Corrective Measures Implementation Construction Complete	Consent Order	6/23/2017
Santa Susana Field Laboratory Groundwater Corrective Measures Implementation Construction Complete	Consent Order	6/26/2017
All Groups Corrective Measures Implementation Report	Consent Order	12/27/2017
Idaho National Laboratory		
SFE-106 tank system closure certificate	Consent Order	1/26/2009
Evaluate status of purified waste solvent line, INTEC 601-3 facility	Consent Order	3/31/2009
Submit Closure Certificate for Site Tank 005, Tank System TRA-007	Consent Order	5/11/2009
Approve Calcine Disposition Project Critical Decision-1 (or CD-1A)	STP	9/30/2009
Complete annual treatment volumes	STP	9/30/2009
Issue Record of Decision (ROD) for EIS for path forward to treat calcine waste	Batt Settlement Agreement	12/31/2009
Submit certification for fluorine disposition process cell components	Consent Order	6/24/2010
Integrated Waste Treatment Unit: Commence full-scale system performance testing	STP	6/30/2010
Submit draft Closure Plan for RCRA permit application for catch tanks, TRU Pipeline	Consent Order	9/30/2010
Submit Group 7 draft Remedial Action Report	FFA	2/29/2012
Submit draft Operable Unit 3-13 Waste Area Group 3 Phase II Remedial Action Report	FFA	5/11/2012
Inspect/Remove Test Area North "Brown Lines" Subunit #1 piping	Consent Order	9/30/2012
Submit RCRA Part B permit –retrieval and treatment (if required) of HLW calcine	Batt Settlement Agreement and STP	12/1/2012
Complete treatment of sodium bearing waste	Batt Settlement Agreement	12/31/2012
Cease use of tank farm	Consent Order	12/31/2012
Submit Zone 1 remediation draft Remedial Action Report	FFA	9/30/2013
Submit draft Operable Unit 10-04 Phase II Remedial Action Report for TNT/RDX (trinitrotoluene/royal demolition explosive) remediation	FFA	11/30/2015
Ship all TRU waste to WIPP	Batt Settlement Agreement	12/31/2018
Submit final Remedial Action Report for Operable Unit 10-04	Consent Order	9/28/2020
Transfer all spent fuel from wet storage	Batt Settlement Agreement	12/31/2023
Complete treatment of all calcine waste	Batt Settlement Agreement	12/31/2035
Los Alamos National Laboratory		
Install regional groundwater monitoring well R-30	Consent Order	2/15/2009
Submit Investigation Work Plan for Lower Sandia Canyon Aggregate Area	Consent Order	4/30/2009

Enforceable Milestone	Agreement	Commitment Date
Submit Investigation Work Plan for Portillo/Fence Canyon Aggregate Area	Consent Order	4/30/2009
Submit Investigation Report for North Canyons (Guaje/Barrancas/Rendija/Bayo)	Consent Order	6/30/2009
Submit Investigation Work Plan for Lower Mortandad/Cedro Canyon Aggregate Area	Consent Order	10/31/2009
Submit Investigation Work Plan for Chaquehui Canyon Aggregate Area	Consent Order	11/30/2009
Submit Material Disposal Area T Remedy Completion Report	Consent Order	12/31/2009
Submit Investigation Work Plan for Two Mile Canyon Aggregate Area	Consent Order	1/31/2010
Submit general facility information	Consent Order	3/31/2010
Submit Investigation Report for Solid Waste Management Units 49-005(a), -006, Areas of Concern C-49-002, -005(b), -008(a-b)(Areas 5,6, and 10)	Consent Order	5/31/2010
Submit Investigation Report for Solid Waste Management Units 49-001(a-g), 49-003, Area of Concern C-49-008(d)(Material Disposal Area AB, Areas 1,3,4,11, and 12)	Consent Order	5/31/2010
Submit Investigation Work Plan for Lower Pajarito Canyon Aggregate Area	Consent Order	7/31/2010
Submit Investigation Work Plan for Upper Water Canyon Aggregate Area	Consent Order	8/31/2010
Submit S-Site Aggregate Area Investigation Report	Consent Order	8/31/2010
Submit Remedy Completion Report for Solid Waste Management Unit 50-009 (Material Disposal Area C)	Consent Order	9/5/2010
Submit Investigation Work Plan for Starmer/Upper Pajarito Canyon Aggregate Area	Consent Order	9/30/2010
Install regional monitoring well at Technical Area-53	Consent Order	9/30/2010
Install groundwater monitoring well at Los Alamos watershed	Consent Order	9/30/2010
Submit Investigation Work Plan for Frijoles Canyon Aggregate Area	Consent Order	10/31/2010
Submit Remedy Completion Report for Solid Waste Management Unit 21-015 (Material Disposal Area B)	Consent Order	12/31/2010
Submit Investigation Report for Water Canyon/Canon de Valle	Consent Order	12/31/2010
Submit Investigation Report for Ancho/Chaquehui/Indio Canyons	Consent Order	2/28/2011
Submit Remedy Completion Report for Solid Waste Management Unit 21-014 (Material Disposal Area A)	Consent Order	3/11/2011
Submit Remedy Completion Report for Solid Waste Management Units 21-013(b,g), 21-018(a,b) (Material Disposal Area V)	Consent Order	6/2/2011
Submit Remedy Completion Report for Material Disposal Area L	Consent Order	7/9/2011
Submit Remedy Completion Report for Solid Waste Management Unit 54-006 (Material Disposal Area L)	Consent Order	7/9/2011
Submit Investigation Report for Portillo/Fence Canyons	Consent Order	8/31/2011
Submit Los Alamos Pueblo Canyon Aggregate Areas Remedy Completion Reports	Consent Order	8/31/2011
Submit Investigation Work Plan for Technical Area-57 Aggregate Area (Fenton Hill)	Consent Order	10/31/2011
Submit Remedy Completion Report for Solid Waste Management Units 21-017(a-c), 21-022(f) (Material Disposal Area U)	Consent Order	11/6/2011
Submit Remedy Completion Report for Solid Waste Management Units 21-001, 2-010(a-h), 21-011(a,c-j), 21-016(a-c), and 21-028(a), and Areas of Concern C-21-009 and C-21-12 (Material Disposal Area T)	Consent Order	12/19/2011
Submit Remedy Completion Report for Solid Waste Management Units 21-001, 21-010(a-h), 21-011(a,c-j), 21-016(a-c), and 21-028(a), and Areas of Concern C-21-009 and C-21-012 (Material Disposal Area T)	Consent Order	12/19/2011
Submit Canon de Valle Aggregate Area, Technical Area-16 Investigation Report	Consent Order	1/15/2012
Submit Investigation Report for Technical Area-14 subaggregate (Canon de Valle Aggregate Area)	Consent Order	2/15/2012
Submit Canon de Valle aggregate area, Technical Area-15 Investigation Report	Consent Order	6/15/2012

Enforceable Milestone	Agreement	Commitment Date
Submit Investigation Work Plan for Lower Water/Indio Canyon aggregate area	Consent Order	9/30/2012
Submit Los Alamos/Pueblo Canyon aggregate areas Remedy Completion Reports	Consent Order	11/30/2012
Submit Los Alamos/Pueblo Canyon aggregate areas Remedy Completion Reports	Consent Order	11/30/2012
Submit Los Alamos/Pueblo Canyon aggregate areas Remedy Completion Reports	Consent Order	11/30/2012
Submit Investigation Work Plan for South Ancho Canyon aggregate area	Consent Order	3/31/2013
Submit Remedy Completion Report for Material Disposal Area AB, Solid Waste Management Units 49-001(a-g), 49-003, and Area of Concern-49-008(d)	Consent Order	1/31/2015
Submit Remedy Completion Report for Material Disposal Area G	Consent Order	12/6/2015
Nevada Test Site		
Submit Corrective Action Unit 546 Corrective Action Decision Document	FFA	1/7/2009
Submit Corrective Action Unit 370 Corrective Action Decision Document	FFA	3/2/2009
Submit Corrective Action Unit 97 Phase I Source Term	FFA	3/9/2009
Begin Corrective Action Unit 101 Phase II drilling operations	FFA	4/27/2009
Begin Corrective Action Unit 102 Phase II drilling operations	FFA	4/27/2009
Submit Corrective Action Unit 547 Streamlined Approach For Environmental Restoration Plan	FFA	5/30/2009
Submit Corrective Action Unit 97 Phase I Flow Model	FFA	6/29/2009
Submit Corrective Action Unit 134 Closure Report	FFA	6/30/2009
Submit Corrective Action Unit 107 Closure Report	FFA	7/10/2009
Submit Corrective Action Unit 98 Model Document for external peer review	FFA	7/31/2009
Submit Corrective Action Unit 114 Streamlined Approach for Environmental Restoration Plan	FFA	8/17/2009
Submit Corrective Action Unit 139 Closure Report	FFA	8/31/2009
Submit Corrective Action Unit 98 Model Verification Report	FFA	9/4/2009
Submit Corrective Action Unit 166 Closure Report	FFA	9/30/2009
Submit Corrective Action Unit 116 Closure Report	FFA	9/30/2009
Submit Corrective Action Unit 106 Corrective Action Investigation Plan	FFA	10/6/2009
Submit Corrective Action Unit 117 Closure Report	FFA	11/30/2009
Submit Corrective Action Unit 546 Corrective Action Plan	FFA	12/23/2009
Submit Corrective Action Unit 130 Closure Report	FFA	2/16/2010
Submit Corrective Action Unit 99 Phase I Source Term	FFA	2/19/2010
Submit Corrective Action Unit 547 Closure Report	FFA	5/30/2010
Complete Corrective Action Unit 98 Monitoring Well Network Report	FFA	7/23/2010
Submit Corrective Action Unit 408 Closure Report	FFA	9/30/2010
Submit Corrective Action Unit 106 Corrective Action Decision Document	FFA	10/6/2010
Submit Corrective Action Unit 99 Closure Report	FFA	3/20/2028
Oak Ridge Reservation		
Submit ORNL Facilities Remedial Action Work Plan	FFA	1/5/2009
Start construction (Phase 1) – Treatability Studies	FFA	2/23/2009

Enforceable Milestone	Agreement	Commitment Date
Start demolition on the K-25 Building	FFA	2/28/2009
Initiate shipment of remote handled TRU waste to WIPP	STP	2/28/2009
Submit Water Resources Restoration Program Remediation Effectiveness Report	FFA	3/30/2009
Submit Environmental Management Waste Management Facility Waste Acceptance Criteria Attainment Capacity Assurance Report	FFA	3/30/2009
Submit Bethel Valley D&D Reactor Area Facilities Remedial Action Work Plan	FFA	4/30/2009
Submit Alpha 4 D&D Engineering Evaluation/Cost Analysis	FFA	4/30/2009
Complete processing of 35 cubic meters of remote handled waste inventory	STP	4/30/2009
Submit ORNL Small Facilities D&D Waste Handling Plan	FFA	5/26/2009
Submit Upper East Fork Poplar Creek West End Mercury Area Remediation Remedial Design Report/Remedial Action Work Plan	FFA	6/25/2009
Start construction on Powerhouse	FFA	6/30/2009
Submit Bethel Valley Chemical Development Lab Facilities Waste Handling Plan	FFA	7/15/2009
Submit Bethel Valley D&D Isotope Area Facilities Waste Handling Plan	FFA	7/15/2009
Submit Bethel Valley Isotopes (Bldg 3026 C&D) Final Waste Handling Plan	FFA	8/15/2009
Submit Bethel Valley Tank Area Facilities Waste Handling Plan	FFA	8/15/2009
Submit Alpha-4 D&D Document 1 Action Memorandum	FFA	8/24/2009
Start construction on ORNL soils and sediments	FFA	9/30/2009
Start construction on Bethel Valley Groundwater Engineering Studies	FFA	9/30/2009
Start construction on Corehole 8	FFA	9/30/2009
Submit Bethel Valley D&D Reactor Area Facilities Waste Handling Plan	FFA	9/30/2009
Start construction on East Tennessee Technology Park ponds	FFA	9/30/2009
Submit K-770 Completion Letter	FFA	9/30/2009
Submit Exposure Units 9 & 11 Phased Construction Completion Report	FFA	9/30/2009
Submit Exposure Units 11, 12, 17, 18, 29, & 38 Phased Construction Completion Report	FFA	9/30/2009
Submit Upper East Fork Poplar Creek Soils Remediation - Soil Engineering Work Plan	FFA	9/30/2009
Submit Bear Creek Valley ROD Phase 2 (Burial Ground) ROD	FFA	9/30/2009
Submit the Upper East Fork Poplar Creek Sediments (81-10 Area) Treatability Study Work Plan	FFA	9/30/2009
Complete processing of 280 cubic meters of contact handled waste for a project total of 587 cubic meters	STP	9/30/2009
Complete processing of 96 cubic meters of remote handled waste for a project total of 131 cubic meters	STP	9/30/2009
Submit the FY 2009 Earned Value Phased Construction Completion Report	FFA	11/15/2009
Submit Work Plan (Phase 2) - Field Studies/Field Implementation	FFA	12/7/2009
Contract mobilization for the Molten Salt Reactor Experiment Flush & Fuel Salt Removal	FFA	12/30/2009
Submit the Molten Salt Reactor Experiment Flush and Fuel Salt Removal Engineering Evaluation Report	FFA	1/30/2010
Submit Water Resources Restoration Program Remediation Effectiveness Report	FFA	3/30/2010
Submit Exposure Units 31, 32, and 36 Phased Construction Completion Report	FFA	3/31/2010
Submit Environmental Management Waste Management Facility Waste Acceptance Criteria Attainment Capacity Assurance Report	FFA	4/1/2010
Submit ETTP Ponds Removal Action Report	FFA	5/9/2010

Enforceable Milestone	Agreement	Commitment Date
Submit Public Involvement Plan	FFA	5/31/2010
Submit Corehole 8 Removal Action Report	FFA	6/30/2010
Submit the Powerhouse Phased Construction Completion Report	FFA	6/30/2010
Submit K-1070-B Burial Ground Phased Construction Completion Report	FFA	7/1/2010
Start construction for the Upper East Fork Poplar Creek West End Mercury Area remediation	FFA	7/1/2010
Submit ETTP Zone 1 D1 Remedial Action Report	FFA	8/1/2010
Start construction (Phase 2) - Field studies/Field Implementation	FFA	8/16/2010
Submit the ORNL Soil & Sediments Phased Construction Completion Report (Phase I)	FFA	9/30/2010
Start construction on the Y-12 Salvage Yard, Scrap Removal	FFA	9/30/2010
Submit the Upper East Fork Poplar Creek Soils Remediation Soil Engineering Report	FFA	9/30/2010
Submit the Upper East Fork Poplar Creek Sediments (81-10 Area) Treatability Study Report	FFA	9/30/2010
Complete processing of 375 cubic meters of contact handled waste for a project total of 962 cubic meters	STP	9/30/2010
Complete processing of 192 cubic meters of remote handled waste for a project total of 323 cubic meters	STP	9/30/2010
Submit the K-25/K-27 FY 2010 Phased Construction Completion Report	FFA	11/15/2010
Submit the ETTP Sitewide ROD Treatability Study Report	FFA	3/31/2011
Submit the Molten Salt Reactor Experiment D&D Removal Action Report	FFA	9/30/2016
Submit the ETTP Sitewide Remedial Action Removal Action Report	FFA	9/30/2016
Submit the Alpha 4 Removal Action Report	FFA	9/30/2016
Submit the Bear Creek Valley S-3 Ponds Remedial Action Report	FFA	9/30/2016
Submit the ORNL Soil & Sediments Remedial Action Report	FFA	9/30/2017
Submit K-25/K-27 Removal Action Report for Approval	FFA	9/30/2017
Submit Remaining Facilities Removal Action Report	FFA	9/30/2017
Submit the Zone 2 Remedial Action Report	FFA	9/30/2017
Submit Upper East Fork Poplar Creek Phase 1 ROD	FFA	9/30/2017
Submit the Y-12 Transition Facility Removal Action Report	FFA	9/30/2017
Submit the Bear Creek Valley White Wing Scrapyard Remedial Action Report	FFA	9/30/2017
Submit the Chestnut Ridge Remedial Action Report	FFA	9/30/2017
Office of River Protection (Hanford)		
Start Cold Commissioning – Waste Treatment Plant	FFA (Tri-Party Agreement – TPA)	2/28/2009
Complete startup and turnover activities for required transfer system upgrades to allow transfer of LAW feed.	TPA	3/31/2009
Annual assessment by WA Department of Ecology and DOE of the adequacy of information and need for additional interim compliance measures	TPA	7/31/2009
Submit biennial update to single shell tank retrieval sequence document	TPA	3/1/2010
DOE, U.S. EPA and Washington Department of Ecology shall meet to establish new milestones, if necessary,	TPA	4/30/2010
Complete negotiations of additional agreement requirements for work to support completion of treatment complex	TPA	6/30/2010
Annual assessment of the adequacy of information and need for additional interim measures	TPA	7/31/2010

Enforceable Milestone	Agreement	Commitment Date
Complete Canister Storage Facility construction	TPA	8/31/2010
Submit Phase 2 RCRA Feasibility Investigation/Corrective Measures Study	TPA	12/31/2010
Complete Hot Commissioning – Waste Treatment Plant	TPA	1/31/2011
Achieve interim completion of single shell tank S-112 waste retrieval and closure	TPA	6/30/2011
Achieve interim completion of single shell tank S-102 waste retrieval and closure	TPA	6/30/2011
Submit biennial update to single shell tank retrieval sequence document	TPA	3/1/2012
DOE, U.S. EPA and Washington Department of Ecology shall meet to establish new milestones , If necessary	TPA	4/30/2012
Submit Phase 2 Corrective Measures Implementation Work Plan for Waste Management Area C	TPA	7/31/2012
Initiate negotiations of single shell tank waste retrievals for remainder of single shell tanks	TPA	10/31/2012
Ecology and DOE shall complete negotiations for waste retrieval from remaining single shell tanks	TPA	2/27/2013
Submit Biennial Update to single shell tank retrieval sequence document	TPA	3/1/2014
DOE, U.S. EPA and Washington Department of Ecology shall meet to establish new milestones, if necessary.	TPA	4/30/2014
Submit Biennial Update to single shell tank retrieval sequence document	TPA	3/1/2016
DOE, U.S. EPA and Washington Department of Ecology shall meet to establish new milestones , if necessary	TPA	4/30/2016
Complete the pretreatment and vitrification of no less than 10% of Hanford Tank waste by mass and 25% by activity	TPA	2/28/2018
Complete work supporting acquisition/operation of Waste Treatment Plant	TPA	2/28/2018
Submit Biennial Update to single shell tank retrieval sequence document	TPA	3/1/2018
DOE, U.S. EPA and Washington Department of Ecology shall meet to establish new milestones, if necessary	TPA	4/30/2018
Retrieve waste from all remaining single shell tanks	TPA	9/30/2018
Complete closure of single shell tank farms with approved closure plans	TPA	9/30/2024
Complete closure of all single shell tank farms	TPA	9/30/2024
Complete vitrification of Hanford HLW	TPA	12/31/2028
Complete pretreatment and immobilization of Hanford LAW	TPA	12/31/2028
Complete pretreatment processing of Hanford tank waste	TPA	12/31/2028
Complete pretreatment processing and vitrification of Hanford HLW and LAW tank waste	TPA	12/31/2028
Provide additional double shell tank capacity	TPA	TBD
Acquire/modify facilities for storage/disposal of immobilized HLW and immobilized LAW	TPA	TBD
Paducah Gaseous Diffusion Plant		
Submit D1 Removal Action Work Plan for the Surface Water Operable Unit (On-Site)	FFA	2/5/2009
Submit D1 Remedial Investigation Work Plan for the Site-Wide Soils Operable Unit	FFA	3/12/2009
Issue D1 Burial Grounds Feasibility Study Report	FFA	7/2/2009
Submit version D1 Focused Feasibility Study for Southwest Plume, 90% Design	FFA	7/28/2009
Characterize all Priority C DOE Material Storage Areas	Agreed Order	9/30/2009
Submit D1 Remedial Action Completion Report for the Groundwater Operable Unit (C-400)	FFA	4/26/2011
Submit D1 Remedial Action Completion Report for the Site-Wide Soils Operable Unit Remediation	FFA	9/30/2015

Enforceable Milestone	Agreement	Commitment Date
Submit D1 Removal Action Completion Report (C-410, C-340, and 15 inactive facilities) for the Decontamination and Decommissioning (17 Inactive Facilities)	FFA	9/30/2017
Submit D1 Response Action Completion Report for the Surface Water Operable Unit (Off-Site)	FFA	12/13/2017
Submit D1 Remedial Action Completion Report for the Burial Grounds Operable Unit	FFA	9/30/2019
Portsmouth Gaseous Diffusion Plant		
Submit Phase III Remedial Action Report for the remediation of X-701B Solid Waste Management Unit	Consent Decree	6/1/2009
Perform polychlorinated biphenyl activities in the process buildings to maintain compliance	TSCA FFA	9/30/2009
Perform polychlorinated biphenyl activities in process buildings to maintain compliance	TSCA FFA	9/30/2010
Submit Final Certification Report for the remediation of the X-701B Solid Waste Management Unit	Consent Decree	12/31/2010
Complete Site Treatment Plan milestone for future offsite incineration	STP	3/31/2011
Complete Site Treatment Plan milestone for commercial stabilization	STP	3/31/2011
Perform polychlorinated biphenyl activities in process buildings to maintain compliance	TSCA FFA	9/30/2011
Richland Operations Office (Hanford)		
Submit Evaluation of Tritium Treatment Technology	TPA	3/31/2009
Submit Revision of mixed TRU waste and MLLW Project Management Plan	TPA	3/31/2009
Complete negotiations on revising milestones consistent with Final Action Memoranda	TPA	3/31/2009
Submit an annual Hanford Land Disposal Restrictions Report	TPA	4/30/2009
Submit revised Feasibility Study Report and revised proposed plan for 200-CW-1 Operable Unit	TPA	5/31/2009
Treat a minimum of 300 cubic meters cumulative of large and/or remote handled MLLW	FFA ("TPA")	6/30/2009
Initiate discussions annually to reaffirm selected wells	TPA	6/30/2009
Conclude negotiations and revise TPA milestone M-024-57 by August of each year.	TPA	8/1/2009
Complete transition and dismantlement of 241-Z Waste Treatment Facility	TPA	9/30/2009
Complete Removal of the K-East Basin structure	TPA	9/30/2009
Submit 200-MW-1 Operable Unit Feasibility Study and proposed plan	TPA	9/30/2009
Submit 105/109-N Reactor Interim Safe Storage Design Report	TPA	9/30/2009
Complete Fast Flux Test Facility sodium drain	TPA	9/30/2009
Submit report for remote handled waste & boxes of remote handled/contact handled waste	TPA	9/30/2009 and annually through 9/30/2013
Initiate soil remediation at K-East Basin (105-KE)	TPA	10/31/2009
Complete K Basins sludge treatment	TPA	11/30/2009
Submit a Remedial Investigation (RI) Phase II Report for the 200-PO-1 Groundwater Operable Unit	TPA	12/30/2009
Complete removal of 6/19 high priority facilities	TPA	12/30/2009
Retrieve suspect TRU from the burial ground (12,200 cubic meters)	TPA	12/31/2009
Designate all newly generated contact handled waste at the point of generation	TPA	12/31/2009
Complete treatment of all contact handled MLLW	TPA	12/31/2009
Treat/certify contact handled mixed TRU waste	TPA	12/31/2009
Treat mixed low level waste to meet Land Disposal Restriction requirements	TPA	12/31/2009

Enforceable Milestone	Agreement	Commitment Date
DOE shall install a cumulative of 105 wells	TPA	12/31/2009
Complete interim remediation actions at Area 100-B/C	TPA	12/31/2009
Conduct biennial assessments of information and data access needs with U.S. EPA and Ecology	TPA	3/31/2010
Submit an annual Hanford Land Disposal Restrictions Report	TPA	4/30/2010
Submit Revised Feasibility Study Report and Proposed Plan for 200BC Cribs/Trenches for Operable Unit 200-BC-1	TPA	4/30/2010
Treat 300 cubic meters per year remote handled MLLW & large container contact handled MLLW	TPA	6/30/2010
Submit Fast Flux Test Facility Surveillance and Maintenance Plan	TPA	6/30/2010
Complete transition and dismantlement of the 216-Z-9 Crib Complex	TPA	9/30/2010
Complete interim remedial actions for 6 specific wastes sites in the 300-FF-2 Operable Unit.	TPA	9/30/2010
Complete disposition of surplus facilities	TPA	9/30/2010
Closure of non-permitted mixed waste units in 324 Building Radiochemical Engineering Cells B&D	TPA	9/30/2010
Submit 200-BP-5 Operable Unit Feasibility Study and proposed plan	TPA	10/31/2010
Submit a 200-UP-1 Operable Unit Combined Remedial Investigation and Feasibility Study Report as well as a proposed plan	TPA	11/30/2010
Treat 7,600 cubic meters (cumulative) contact handled mixed TRU	TPA	12/31/2010
Complete retrieval of contact handled retrievably stored waste	TPA	12/31/2010
Submit the Feasibility Study Report and a revised recommended remedy(ies) for 200-PW-2 and 200-PW-4 Operable Units	TPA	12/31/2010
Submit a feasibility study report and revised proposed plan for Operable Unit 200-SC-1	TPA	12/31/2010
Initiate full scale retrieval of remote handled retrievably stored waste	TPA	1/1/2011
Complete Fast Flux Test Facility transition and initiate surveillance and maintenance phase	TPA	2/28/2011
Complete closure of the PFP 241-Z Treatment, Storage and/or Disposal Unit	TPA	9/30/2011
Complete transition and dismantlement of the 241-Z Waste Treatment Facility.	TPA	9/30/2011
Complete 105-KE and 105-KW Reactor interim safe storage.	TPA	9/30/2011
Treat/certify contact handled mixed TRU waste (8,600 cubic meters cumulative).	TPA	12/31/2011
Submit a revised Feasibility Study Report & revised proposed plan for 200-TW-1 and 200-PW-5 Operable Units	TPA	12/31/2011
Submit a revised Feasibility Study Report and a revised recommended remedy(ies) for 200-TW-2 Operable Unit	TPA	12/31/2011
Submit 200 Area Chemical Laboratory Waste Operable Units Feasibility Study	TPA	12/31/2011
Complete all 200 Area Non-Tank Farm Operable Unit pre-ROD site investigations under approved work plan schedules.	TPA	12/31/2011
Complete 200 Area Remedial Investigation Feasibility Study Process for all Non-Tank Farm Operable Units	TPA	12/31/2011
Complete Removal of 12/19 high priority facilities	TPA	12/31/2011
Complete the interim remedial actions for Area 100 H	TPA	12/31/2011
Complete the interim remedial actions for Area 100 D	TPA	12/31/2011
Complete acquisition of capabilities and/or facilities necessary for retrieval, designation, storage and treatment prior to disposal of post-1970 TRU/mixed TRU waste	TPA	6/30/2012
Begin treating remote handled mixed TRU waste & boxes & large containers of contact handled mixed TRU waste	TPA	6/30/2012
Submit a Surveillance & Maintenance Plan	TPA	6/30/2012

Enforceable Milestone	Agreement	Commitment Date
Complete 105-N Reactor interim safe storage	TPA	9/30/2012
Complete interim remediation for all Area 300 "Inside The Fence" waste sites	TPA	9/30/2012
Designate contact handled retrievably stored waste as mixed to meet applicable federal and state land disposal restriction standards	TPA	12/31/2012
Designate all remote handled TRU and boxes of contact handled TRU above ground	TPA	12/31/2012
Conduct biennial assessments of information and data access needs with U.S. EPA and Washington Department of Ecology	TPA	12/31/2012
Complete all interim response actions for all Area 100 areas	TPA	12/31/2012
Complete interim remedial actions for 300-FF-2 waste sites	TPA	12/31/2012
Complete the interim response actions for Area 100-N	TPA	12/31/2012
Complete the interim response actions for Area 100-K	TPA	12/31/2012
Submit revisions of Hanford Site TRU/mixed TRU waste Project Management Plan	TPA	3/29/2013
Treat remote handled mixed TRU waste & contact handled mixed TRU waste at minimum rate of 300 cubic meters per year	TPA	6/30/2013 and annually through 6/30/2025
Complete transition of the 242-Z and 236-Z buildings	TPA	9/30/2013
Complete removal of 15/19 high priority facilities	TPA	9/30/2013
Initiate substantial and continuous remediation on the 309 Facility Dedicated Radioactive Liquid Waste Sewer (300 RLWS) and the 300 Area Process Sewer (300-15) systems	TPA	9/30/2013
Submit evaluation of tritium treatment technology	TPA	3/31/2014
Complete retrieval of non-caisson remote handled retrievably stored waste	TPA	12/31/2014
Complete transition of the 234-5Z, 234-5ZA, 243-Z, 291-Z/291-Z-1 facilities	TPA	9/30/2015
Complete removal/transfer/initiate storage of Phase III 300 Area special waste	TPA	9/30/2015
Complete all interim 300 Area remedial actions (excluding 618- 10 and 11 burial grounds)	TPA	9/30/2015
Complete Plutonium Finishing Plant Facility transition & selected disposition activities	TPA	9/30/2016
Include cesium/strontium treatment and/or repackaging parameters in DOE Request for Proposals	TPA	6/30/2017
Complete all interim Area 300 remedial actions (including 618-10 and 11)	TPA	9/28/2018
Establish schedule and milestones for Sodium Disposition facilities	TPA	9/30/2018
Complete retrieval of the 200A Caisson remote handled retrievably stored waste in 218-W-4B Operable Unit	TPA	12/31/2018
Complete remedial actions for all non-tank farm operable units.	TPA	9/30/2024
Sandia National Laboratories		
Submit the Corrective Measure Evaluation (CME) Report for the Burn-Site Groundwater area	Consent Order	9/30/2010
Submit Corrective Measure Implementation (CMI) Report for the Mixed Waste Landfill	Consent Order	Due 180 days after completion of Soil Cover
Savannah River Site		
Remove the Battelle remote handled TRU waste from SRS	MOA	1/1/2009
Submit Statement of Basis/Proposed Plan for P-Area OU (includes 9 subunits w/ 9 associated milestones)	FFA	2/4/2009
Issue third Five-Year Remedy Review	FFA	2/12/2009
Issue the Record of Decision (ROD) for M Area Operable Unit (includes 19 sub-units with 19 associated milestones)	FFA	3/30/2009
Complete periodic monitoring and submit the Lower Three Runs Integrator Operable Unit Periodic Report #3	FFA	5/30/2009

Enforceable Milestone	Agreement	Commitment Date
Start C-Area Burning/Rubble Pit and Old C-Area Burning/Rubble Pit remedial action	FFA	6/18/2009
Complete monitoring and submit the D-Area Groundwater Operable Unit Groundwater Monitoring Report	FFA	7/31/2009
Complete periodic monitoring and submit the Steel Creek Integrator Operable Unit Periodic Report #3	FFA	8/31/2009
Initiate the Savannah River Floodplain Swamp Integrator Operable Unit Second Phase II field start	FFA	9/2/2009
Submit FFCAct Site Treatment Plan Annual Update	STP	11/15/2009 and annually through 2027
Submit workplan for C-Area Operable Unit (includes 6 sub-units with 6 associated milestones)	FFA	12/31/2009
Submit ROD for P-Area Operable Unit (includes 9 sub-units with 9 associated milestones)	FFA	6/2/2010
Initiate the field start for C-Area Operable Unit (includes 6 sub-units with 6 associated milestones)	FFA	9/30/2010
Complete bulk waste removal for 2 tanks	FFA	9/30/2010
Submit H-Tank Farm Performance Assessment	FFA	3/31/2011
Complete bulk waste removal for 1 tank	FFA	9/30/2011
Close High Level Waste Tanks 19 and 18	FFA	12/31/2012
Complete bulk waste removal for 2 tanks	FFA	9/30/2014
Complete F/H Areas Hazardous Waste Management Facility and the Mixed Waste Management Facility semi-annual groundwater monitoring and submit Corrective Action Report	FFA	10/30/2014
Close 4 high level waste tanks	FFA	9/30/2015
Complete bulk waste removal for 2 tanks	FFA	9/30/2016
Complete bulk waste removal for 3 tanks	FFA	9/30/2017
Close 2 high level waste tanks	FFA	9/30/2017
Complete bulk waste removal for 6 tanks	FFA	9/30/2018
Complete bulk waste removal for 1 tank	FFA	9/30/2019
Close 2 high level waste tanks	FFA	9/30/2019
Close 5 high level waste tanks	FFA	9/30/2021
Close 7 high level waste tanks	FFA	9/30/2022
Maintain Defense Waste Processing Facility canister production sufficient to remove all HLW from tanks by 2028.	STP	1/1/2028
Stanford Linear Accelerator Center (SLAC)		
Submit West SLAC Risk Assessment Report	Compliance Order	1/2/2009
Submit Research Yard/Interaction Region-6 Remedial Investigation Report	Compliance Order	3/19/2009
Submit Groundwater/Volatile Organic Compounds Feasibility Study/Risk Assessment Plan	Compliance Order	4/3/2009
Submit Research Yard/Interaction Region-6 Risk Assessment Report	Compliance Order	6/19/2009
Submit West SLAC Feasibility Study/Risk Assessment Plan	Compliance Order	10/19/2009
Submit West SLAC Feasibility Study Report	Compliance Order	12/3/2009
Submit Groundwater Volatile Organic Compounds Feasibility Study Report	Compliance Order	12/3/2009
Submit Groundwater/Volatile Organic Compounds Implementation Report/Operation & Maintenance Plan	Compliance Order	4/12/2010
Submit West SLAC Risk Assessment Plan Report	Compliance Order	5/5/2010

Enforceable Milestone	Agreement	Commitment Date
Submit Groundwater Volatile Organic Compounds Risk Assessment Plan Report	Compliance Order	5/5/2010
Submit West SLAC Implementation Report/Operation & Maintenance Plan	Compliance Order	7/9/2010
Submit West SLAC Risk Management Plan	Compliance Order	10/1/2012
Submit Groundwater Volatile Organic Compounds Risk Management Plan	Compliance Order	10/1/2012

Appendix B Life-Cycle Costs by Project Baseline Summary

Life-Cycle Costs by Project Baseline Summary (PBS)
Dollars in Millions

Site	PBS	PBS Name	Prior Costs	FY08 and Remaining Cost (low range)	FY08 and Remaining Cost (high range)	Lifecycle Cost (low range)	Lifecycle Cost (high range)
Argonne National Laboratory-East	CH-ANLE-0030	Soil and Water Remediation-Argonne National Laboratory-East	$29	$1	$1	$30	$30
Argonne National Laboratory-East	CH-ANLE-0040	Nuclear Facility D&D-Argonne National Laboratory-East	$35	$13	$13	$48	$48
Argonne National Laboratory-East Total			$65	$14	$14	$78	$79
Brookhaven National Laboratory	BRNL-0030	Soil and Water Remediation-Brookhaven National Laboratory	$216	$50	$50	$266	$266
Brookhaven National Laboratory	BRNL-0040	Nuclear Facility D&D-Brookhaven Graphite Research Reactor	$64	$46	$59	$110	$123
Brookhaven National Laboratory	BRNL-0041	Nuclear Facility D&D-High Flux Beam Reactor	$19	$31	$59	$50	$78
Brookhaven National Laboratory	BRNL-0100	Brookhaven Community and Regulatory Support	$3	$0	$0	$3	$3
Brookhaven National Laboratory Total			$302	$128	$169	$429	$470
Energy Technology Engineering Center	CBC-ETEC-0040	Nuclear Facility D&D-Energy Technology Engineering Center	$174	$106	$152	$280	$326
Energy Technology Engineering Center Total			$174	$106	$152	$280	$326
Fernald	OH-FN-0013	Solid Waste Stabilization and Disposition-Fernald	$1,627	$0	$0	$1,627	$1,627
Fernald	OH-FN-0020	Safeguards and Security-Fernald	$16	$0	$0	$16	$16
Fernald	OH-FN-0030	Soil and Water Remediation-Fernald	$1,321	$70	$70	$1,391	$1,391
Fernald	OH-FN-0050	Non-Nuclear Facility D&D-Fernald	$226	$0	$0	$226	$226
Fernald	OH-FN-0100	Fernald Post-Closure Administration	$0	$288	$288	$288	$288
Fernald	OH-FN-0101	Fernald Community and Regulatory Support	$14	$0	$0	$14	$14
Fernald Total			$3,202	$358	$358	$3,561	$3,561
Hanford Site	HQ-SNF-0012X-RL	SNF Stabilization and Disposition-Storage Operations Awaiting Geologic Repository	$3	$0	$0	$3	$3
Hanford Site	RL-0011	NM Stabilization and Disposition-PFP	$1,281	$2,173	$2,204	$3,454	$3,484
Hanford Site	RL-0012	SNF Stabilization and Disposition	$2,018	$955	$983	$2,974	$3,002
Hanford Site	RL-0013B	Solid Waste Stabilization and Disposition-200 Area-2012	$0	$0	$0	$0	$0
Hanford Site	RL-0013C	Solid Waste Stabilization and Disposition-200 Area- 2035	$1,472	$12,368	$13,676	$13,840	$15,148
Hanford Site	RL-0020	Safeguards and Security	$353	$3,232	$3,232	$3,585	$3,585

Life-Cycle Costs by Project Baseline Summary (PBS) Dollars in Millions							
Site	PBS	PBS Name	Prior Costs	FY08 and Remaining Cost (low range)	FY08 and Remaining Cost (high range)	Lifecycle Cost (low range)	Lifecycle Cost (high range)
Hanford Site	RL-0030	Soil and Water Remediation-Groundwater/Vadose Zone	$532	$7,524	$7,711	$8,056	$8,243
Hanford Site	RL-0040	Nuclear Facility D&D-Remainder of Hanford	$973	$18,078	$19,073	$19,051	$20,046
Hanford Site	RL-0041	Nuclear Facility D&D-River Corridor Closure Project	$1,563	$3,337	$3,496	$4,900	$5,059
Hanford Site	RL-0042	Nuclear Facility D&D-Fast Flux Test Facility Project	$261	$987	$1,055	$1,247	$1,317
Hanford Site	RL-0043	HAMMER Facility	$7	$0	$0	$7	$7
Hanford Site	RL-0044	B-Reactor Museum	$1	$0	$0	$1	$1
Hanford Site	RL-0080	Operate Waste Disposal Facility	$67	$3	$3	$70	$70
Hanford Site	RL-0100	Richland Community and Regulatory Support	$144	$1,064	$1,064	$1,208	$1,208
Hanford Site	RL-0900	Pre-2004 Completions	$130	$0	$0	$130	$130
Hanford Site Total			$8,805	$49,722	$52,496	$58,527	$61,303
Headquarters, TD, Completed Sites, Other	CBC-CA-0013B-N	Solid Waste Stabilization and Disposition-California Sites-2012 (Non-Defense)	$6	$0	$0	$7	$7
Headquarters, TD, Completed Sites, Other	CBC-CA-0100-N	Community and Regulatory Support (Non-Defense)	$2	$0	$0	$2	$2
Headquarters, TD, Completed Sites, Other	VL-FOO-0013B-N	Solid Waste Stabilization and Disposition-Oakland Sites-2012 (Non-Defense)	$0	$0	$0	$0	$0
Headquarters, TD, Completed Sites, Other	VL-FOO-0100-N	Oakland Community and Regulatory Support (Non-Defense)	$0	$0	$0	$0	$0
Headquarters, TD, Completed Sites, Other	VL-FOO-0900-N	Pre-2004 Completions (Non-Defense)	$21	$0	$0	$21	$21
Headquarters, TD, Completed Sites, Other	CH-OPS-0900	Pre-2004 Completions	$99	$0	$0	$99	$99
Headquarters, TD, Completed Sites, Other	VL-GA-0012	SNF Stabilization and Disposition-General Atomics	$15	$0	$0	$15	$15
Headquarters, TD, Completed Sites, Other	LEHR-0040	Nuclear Facility D&D-Laboratory for Energy-Related Health Research	$40	$0	$0	$40	$40
Headquarters, TD, Completed Sites, Other	VL-LEHR-0040	Nuclear Facility D&D-Laboratory for Energy-Related Health Research	$0	$0	$0	$0	$0
Headquarters, TD, Completed Sites, Other	CBC-LBNL-0030	Soil and Water Remediation-Lawrence Berkeley National Laboratory	$34	$0	$0	$34	$34
Headquarters, TD, Completed Sites, Other	VL-LBNL-0030	Soil and Water Remediation-Lawrence Berkeley National Laboratory	$2	$0	$0	$2	$2
Headquarters, TD, Completed Sites, Other	OH-OPS-0900-N	Pre-2004 Completions (Non-Defense)	$397	$0	$0	$397	$397

Life-Cycle Costs by Project Baseline Summary (PBS) Dollars in Millions							
Site	PBS	PBS Name	Prior Costs	FY08 and Remaining Cost (low range)	FY08 and Remaining Cost (high range)	Lifecycle Cost (low range)	Lifecycle Cost (high range)
Headquarters, TD, Completed Sites, Other	CH-PPPL-0030	Soil and Water Remediation-Princeton Site A/B	$0	$0	$0	$0	$0
Headquarters, TD, Completed Sites, Other	CBC-SEFOR-0040-N	CBC - Non-Defense Post Closure Administration	$0	$0	$0	$0	$0
Headquarters, TD, Completed Sites, Other	OH-AB-0030	Soil and Water Remediation-Ashtabula	$136	$0	$0	$136	$136
Headquarters, TD, Completed Sites, Other	OH-CL-0040	Nuclear Facility D&D-West Jefferson	$171	$0	$0	$171	$171
Headquarters, TD, Completed Sites, Other	CBC-0100-FN	CBC Post Closure Administration - Fernald	$31	$8	$8	$38	$38
Headquarters, TD, Completed Sites, Other	CBC-0100-MD	CBC Post Closure Administration - Mound	$0	$8	$8	$8	$8
Headquarters, TD, Completed Sites, Other	CBC-0100-RF	CBC Post Closure Administration - Rocky Flats	$0	$27	$27	$27	$27
Headquarters, TD, Completed Sites, Other	CBC-ND-0100	CBC - Non-Defense Post Closure Administration	$0	$0	$0	$0	$0
Headquarters, TD, Completed Sites, Other	CBC-UM-0100	CBC - Non-Defense Post Closure Administration - UMTRA Sites	$0	$0	$0	$0	$0
Headquarters, TD, Completed Sites, Other	OH-OPS-0900-D	Pre-2004 Completions	$58	$0	$0	$58	$58
Headquarters, TD, Completed Sites, Other	HQ-MS-0100	Policy, Management, and Technical Support	$628	$960	$960	$1,588	$1,588
Headquarters, TD, Completed Sites, Other	HQ-OPS-0900	Pre-2004 Completions	$0	$0	$0	$0	$0
Headquarters, TD, Completed Sites, Other	HQ-UR-0100	Reimbursements to Uranium/Thorium Licensees	$432	$331	$331	$763	$763
Headquarters, TD, Completed Sites, Other	VL-FOO-0013B-D	Solid Waste Stabilization and Disposition Support-Lawrence Livermore National Laboratory	$14	$2	$2	$15	$15
Headquarters, TD, Completed Sites, Other	VL-FOO-0100-D	LLNL Community and Regulatory Support	$5	$0	$0	$5	$5
Headquarters, TD, Completed Sites, Other	VL-KCP-0030	Soil and Water Remediation-Kansas City Plant	$30	$0	$0	$30	$30
Headquarters, TD, Completed Sites, Other	VL-FAO-0100-D	Nuclear Material Stewardship (Defense)	$109	$0	$0	$109	$109
Headquarters, TD, Completed Sites, Other	VL-FAO-0100-N	Nuclear Material Stewardship (Non-Defense)	$15	$0	$0	$15	$15
Headquarters, TD, Completed Sites, Other	VL-FAO-0900	Pre-2004 Completions	$233	$0	$0	$233	$233
Headquarters, TD, Completed Sites, Other	VL-FAO-0101	Miscellaneous Programs and Agreements in Principle	$83	$10	$10	$93	$93

Life-Cycle Costs by Project Baseline Summary (PBS)
Dollars in Millions

Site	PBS	PBS Name	Prior Costs	FY08 and Remaining Cost (low range)	FY08 and Remaining Cost (high range)	Lifecycle Cost (low range)	Lifecycle Cost (high range)
Headquarters, TD, Completed Sites, Other	NV-0030	Soil and Water Remediation - Off sites	$71	$0	$0	$71	$71
Headquarters, TD, Completed Sites, Other	HQ-PD-0100	Program Direction	$3,266	$8,802	$8,802	$12,068	$12,068
Headquarters, TD, Completed Sites, Other	HQ-TD-0100	Technology Development	$1,613	$1,194	$1,194	$2,807	$2,807
Headquarters, TD, Completed Sites, Other Total			$7,508	$11,342	$11,342	$18,850	$18,850
Idaho National Laboratory	CH-ANLW-0030	Soil and Water Remediation-Argonne National Laboratory-West	$8	$0	$0	$8	$8
Idaho National Laboratory	HQ-SNF-0012X	SNF Stabilization and Disposition-Storage Operations Awaiting Geologic Repository	$60	$0	$0	$60	$60
Idaho National Laboratory	HQ-SNF-0012X-ID	SNF Stabilization and Disposition-Storage Operations Awaiting Geologic Repository	$19	$0	$0	$19	$19
Idaho National Laboratory	HQ-SNF-0012Y	SNF Stabilization and Disposition-New/Upgraded Facilities Awaiting Geologic Repository	$67	$0	$0	$67	$67
Idaho National Laboratory	ID-0011	NM Stabilization and Disposition	$14	$5	$30	$19	$43
Idaho National Laboratory	ID-0012B-D	SNF Stabilization and Disposition-2012 (Defense)	$386	$136	$295	$522	$681
Idaho National Laboratory	ID-0012B-N	SNF Stabilization and Disposition-2012 (Non-Defense)	$9	$0	$0	$9	$9
Idaho National Laboratory	ID-0012C	SNF Stabilization and Disposition-2035	$46	$4,355	$5,312	$4,401	$5,358
Idaho National Laboratory	ID-0013	Solid Waste Stabilization and Disposition	$1,766	$1,451	$2,157	$3,217	$3,923
Idaho National Laboratory	ID-0014B	Radioactive Liquid Tank Waste Stabilization and Disposition-2012	$1,245	$488	$855	$1,733	$2,102
Idaho National Laboratory	ID-0014B-T	Radioactive Liquid Tank Waste Stabilization and Disposition-2012 (T)	$65	$0	$0	$65	$65
Idaho National Laboratory	ID-0014C	Radioactive Liquid Tank Waste Stabilization and Disposition-2035	$35	$6,680	$9,451	$6,715	$9,486
Idaho National Laboratory	ID-0030B	Soil and Water Remediation-2012	$1,005	$541	$614	$1,547	$1,635
Idaho National Laboratory	ID-0030C	Soil and Water Remediation-2035	$7	$4,447	$6,111	$4,454	$6,118
Idaho National Laboratory	ID-0040B	Nuclear Facility D&D-2012	$295	$536	$542	$831	$837
Idaho National Laboratory	ID-0040C	Nuclear Facility D&D-2035	$0	$1,783	$1,968	$1,783	$1,968

Life-Cycle Costs by Project Baseline Summary (PBS) Dollars in Millions							
Site	PBS	PBS Name	Prior Costs	FY08 and Remaining Cost (low range)	FY08 and Remaining Cost (high range)	Lifecycle Cost (low range)	Lifecycle Cost (high range)
Idaho National Laboratory	ID-0050B	Non-Nuclear Facility D&D-2012	$109	$38	$38	$147	$147
Idaho National Laboratory	ID-0050C	Non-Nuclear Facility D&D-2035	$0	$0	$0	$0	$0
Idaho National Laboratory	ID-0100	Idaho Community and Regulatory Support	$55	$158	$158	$212	$212
Idaho National Laboratory	ID-0900	Pre-2004 Completions	$310	$0	$0	$310	$310
Idaho National Laboratory Total			$5,501	$20,617	$27,530	$26,117	$33,049
Inhalation Toxicology Laboratory	CBC-ITL-0030	Soil and Water Remediation-Inhalation Toxicology Laboratory	$10	$0	$0	$10	$10
Inhalation Toxicology Laboratory	VL-ITL-0030	Soil and Water Remediation-Inhalation Toxicology Laboratory	$0	$0	$0	$0	$0
Inhalation Toxicology Laboratory Total			$10	$0	$0	$10	$10
Lawrence Livermore National Laboratory	VL-LLNL-0013	Solid Waste Stabilization and Disposition-Lawrence Livermore National Laboratory	$72	$0	$0	$72	$72
Lawrence Livermore National Laboratory	VL-LLNL-0030	Soil and Water Remediation-Lawrence Livermore National Laboratory - Main Site	$134	$0	$0	$134	$134
Lawrence Livermore National Laboratory	VL-LLNL-0031	Soil and Water Remediation-Lawrence Livermore National Laboratory - Site 300	$114	$9	$9	$122	$122
Lawrence Livermore National Laboratory Total			$319	$9	$9	$328	$328
Los Alamos National Laboratory	VL-LANL-0013	Solid Waste Stabilization and Disposition-LANL Legacy	$330	$471	$520	$801	$850
Los Alamos National Laboratory	VL-LANL-0030	Soil and Water Remediation-LANL	$679	$952	$1,810	$1,630	$2,489
Los Alamos National Laboratory	VL-LANL-0040-D	Nuclear Facility D&D-LANL (Defense)	$0	$198	$237	$198	$237
Los Alamos National Laboratory	VL-LANL-0040-N	Nuclear Facility D&D-LANL (Non-Defense)	$3	$14	$14	$17	$17
Los Alamos National Laboratory Total			$1,011	$1,635	$2,582	$2,647	$3,593
Miamisburg	OH-MB-0013	Solid Waste Stabilization and Disposition-Miamisburg	$265	$0	$0	$265	$265
Miamisburg	OH-MB-0020	Safeguards and Security-Miamisburg	$28	$0	$0	$28	$28
Miamisburg	OH-MB-0030	Soil and Water Remediation-Miamisburg	$208	$14	$14	$222	$222
Miamisburg	OH-MB-0031	Soil and Water Remediation - OU-1	$0	$0	$0	$0	$0
Miamisburg	OH-MB-0040	Nuclear Facility D&D-Miamisburg	$505	$0	$0	$505	$505
Miamisburg	OH-MB-0100	Miamisburg Post-Closure Administration	$23	$831	$831	$854	$854
Miamisburg	OH-MB-0101	Miamisburg Community and Regulatory Support	$10	$0	$0	$10	$10
Miamisburg Total			$1,039	$845	$845	$1,884	$1,884

Life-Cycle Costs by Project Baseline Summary (PBS) Dollars in Millions							
Site	PBS	PBS Name	Prior Costs	FY08 and Remaining Cost (low range)	FY08 and Remaining Cost (high range)	Lifecycle Cost (low range)	Lifecycle Cost (high range)
Moab	CBC-MOAB-0031	Soil and Water Remediation-Moab	$60	$939	$982	$999	$1,042
Moab Total			$60	$939	$982	$999	$1,042
Nevada Test Site	VL-NV-0013	Solid Waste Stabilization and Disposition-Nevada Test Site	$79	$19	$30	$98	$109
Nevada Test Site	VL-NV-0030	Soil and Water Remediation-Nevada Test Site	$654	$1,030	$1,321	$1,684	$1,979
Nevada Test Site	VL-NV-0080	Operate Waste Disposal Facility-Nevada	$62	$508	$535	$570	$597
Nevada Test Site	VL-NV-0100	Nevada Community and Regulatory Support	$40	$60	$60	$100	$100
Nevada Test Site	VL-SV-0100	South Valley Superfund	$5	$0	$0	$5	$5
Nevada Test Site Total			$841	$1,616	$1,946	$2,457	$2,790
Oak Ridge Reservation	OR-0011Y	NM Stabilization and Disposition-ETTP Uranium Facilities Management	$52	$0	$0	$52	$52
Oak Ridge Reservation	OR-0020	Safeguards and Security	$92	$191	$198	$283	$290
Oak Ridge Reservation	OR-0040	Nuclear Facility D&D-ETTP (D&D Fund)	$1,546	$1,524	$1,704	$3,070	$3,250
Oak Ridge Reservation	OR-0043	Nuclear Facility D&D-ETTP (Defense)	$85	$44	$46	$129	$131
Oak Ridge Reservation	OR-0102	ETTP Contract/Post-Closure Liabilities/Administration	$128	$177	$184	$305	$312
Oak Ridge Reservation	HQ-SW-0013X-OR	Solid Waste Stabilization and Disposition-Science Current Generation	$143	$0	$0	$143	$143
Oak Ridge Reservation	OR-0011Z	Downblend of U-233 in Building 3019	$46	$315	$339	$361	$385
Oak Ridge Reservation	OR-0042	Nuclear Facility D&D-Oak Ridge National Laboratory	$266	$933	$1,056	$1,199	$1,323
Oak Ridge Reservation	OR-0900-D	Pre-2004 Completions (Defense)	$17	$0	$0	$17	$17
Oak Ridge Reservation	OR-0900-N	Pre-2004 Completions (Non-Defense)	$617	$0	$0	$617	$617
Oak Ridge Reservation	OR-0013A	Solid Waste Stabilization and Disposition-2006	$465	$0	$0	$465	$465
Oak Ridge Reservation	OR-0013B	Solid Waste Stabilization and Disposition-2012	$851	$813	$905	$1,664	$1,757
Oak Ridge Reservation	OR-0030	Soil and Water Remediation-Melton Valley	$350	$0	$0	$350	$350
Oak Ridge Reservation	OR-0031	Soil and Water Remediation-Off sites	$49	$13	$13	$62	$63
Oak Ridge Reservation	OR-0100	Oak Ridge Reservation Community & Regulatory Support (Defense)	$87	$59	$62	$146	$148

Life-Cycle Costs by Project Baseline Summary (PBS) Dollars in Millions							
Site	PBS	PBS Name	Prior Costs	FY08 and Remaining Cost (low range)	FY08 and Remaining Cost (high range)	Lifecycle Cost (low range)	Lifecycle Cost (high range)
Oak Ridge Reservation	OR-0101	Oak Ridge Contract/Post-Closure Liabilities/Administration	$105	$0	$0	$105	$105
Oak Ridge Reservation	OR-0103	Oak Ridge Reservation Community & Regulatory Support (D&D Fund)	$44	$0	$0	$44	$44
Oak Ridge Reservation	OR-0041	Nuclear Facility D&D-Y-12	$282	$767	$903	$1,049	$1,184
Oak Ridge Reservation Total			$5,226	$4,835	$5,410	$10,061	$10,636
Paducah Gaseous Diffusion Plant	PA-0011	NM Stabilization and Disposition-Paducah Uranium Facilities Management	$29	$31	$31	$60	$60
Paducah Gaseous Diffusion Plant	PA-0011X	NM Stabilization and Disposition-Depleted Uranium Hexafluoride Conversion	$281	$1,144	$1,144	$1,425	$1,425
Paducah Gaseous Diffusion Plant	PA-0013	Solid Waste Stabilization and Disposition	$203	$126	$208	$329	$411
Paducah Gaseous Diffusion Plant	PA-0020	Safeguards and Security	$32	$866	$866	$898	$898
Paducah Gaseous Diffusion Plant	PA-0040	Nuclear Facility D&D-Paducah	$623	$1,442	$1,559	$2,065	$2,182
Paducah Gaseous Diffusion Plant	GDP D&D	Nuclear Facility D&D-Paducah	$0	$5,800	$12,500	$5,800	$12,500
Paducah Gaseous Diffusion Plant	PA-0100	Paducah Community and Regulatory Support (Non-Defense)	$11	$0	$0	$11	$11
Paducah Gaseous Diffusion Plant	PA-0101	Paducah Contract/Post-Closure Liabilities/Administration (Non-Defense)	-$2	$0	$0	-$2	-$2
Paducah Gaseous Diffusion Plant	PA-0102	Paducah Contract/Post-Closure Liabilities/Administration (D&D Fund)	$31	$14	$14	$45	$45
Paducah Gaseous Diffusion Plant	PA-0103	Paducah Community and Regulatory Support (D&D Fund)	$15	$111	$111	$126	$126
Paducah Gaseous Diffusion Plant Total			$1,223	$9,533	$16,432	$10,757	$17,656
Pantex Plant	VL-PX-0030	Soil and Water Remediation-Pantex	$155	$26	$26	$181	$181
Pantex Plant	VL-PX-0040	Nuclear Facility D&D-Pantex	$12	$0	$0	$12	$12
Pantex Plant Total			$166	$26	$26	$193	$193
Portsmouth Gaseous Diffusion Plant	PO-0011	NM Stabilization and Disposition-Portsmouth Uranium Facilities Management	$82	$49	$49	$131	$131
Portsmouth Gaseous Diffusion Plant	PO-0011X	NM Stabilization and Disposition-Depleted Uranium Hexafluoride Conversion	$188	$1,272	$1,272	$1,460	$1,460
Portsmouth Gaseous Diffusion Plant	PO-0013	Solid Waste Stabilization and Disposition	$345	$151	$152	$496	$497

Life-Cycle Costs by Project Baseline Summary (PBS) Dollars in Millions							
Site	PBS	PBS Name	Prior Costs	FY08 and Remaining Cost (low range)	FY08 and Remaining Cost (high range)	Lifecycle Cost (low range)	Lifecycle Cost (high range)
Portsmouth Gaseous Diffusion Plant	PO-0020	Safeguards and Security	$82	$657	$657	$739	$739
Portsmouth Gaseous Diffusion Plant	PO-0040	Nuclear Facility D&D-Portsmouth	$498	$5,250	$12,242	$5,747	$12,741
Portsmouth Gaseous Diffusion Plant	PO-0041	Nuclear Facility D&D-Portsmouth GCEP	$66	$0	$0	$66	$66
Portsmouth Gaseous Diffusion Plant	PO-0101	Portsmouth Cold Standby	$379	$0	$0	$379	$379
Portsmouth Gaseous Diffusion Plant	PO-0103	Portsmouth Contract/Post-Closure Liabilities/Administration (D&D Fund)	$4	$37	$37	$41	$41
Portsmouth Gaseous Diffusion Plant	PO-0104	Portsmouth Community and Regulatory Support (D&D Fund)	$2	$18	$18	$19	$19
Portsmouth Gaseous Diffusion Plant Total			$1,645	$7,434	$14,428	$9,079	$16,074
River Protection	HQ-HLW-0014X-RV	Radioactive Liquid Tank Waste Stabilization and Disposition-Storage Operations Awaiting Geologic Rep	$0	$122	$122	$122	$122
River Protection	ORP-0014	Radioactive Liquid Tank Waste Stabilization and Disposition	$3,780	$40,337	$58,267	$44,117	$62,053
River Protection	ORP-0014-T	Radioactive Liquid Tank Waste Stabilization and Disposition (T)	$0	$0	$0	$0	$0
River Protection	ORP-0060	Major Construction-Waste Treatment Plant	$3,940	$8,323	$8,323	$12,263	$12,263
River Protection	ORP-0061	pre-Waste Treatment Plan, Transition Activity	$433	$0	$0	$433	$433
River Protection	ORP-0100	Office of River Protection Community and Regulatory Support	$1	$0	$0	$1	$1
River Protection Total			$8,155	$48,782	$66,713	$56,937	$74,873
Rocky Flats Environmental Technology Site	RF-0011	NM Stabilization and Disposition	$471	$0	$0	$471	$471
Rocky Flats Environmental Technology Site	RF-0013	Solid Waste Stabilization and Disposition	$871	$0	$0	$871	$871
Rocky Flats Environmental Technology Site	RF-0020	Safeguards and Security	$298	$0	$0	$298	$298
Rocky Flats Environmental Technology Site	RF-0030	Soil and Water Remediation	$2,055	$0	$0	$2,055	$2,055
Rocky Flats Environmental Technology Site	RF-0040	Nuclear Facility D&D-North Side Facility Closures	$1,908	$0	$0	$1,908	$1,908
Rocky Flats Environmental Technology Site	RF-0041	Nuclear Facility D&D-South Side Facility Closures	$748	$0	$0	$748	$748

Life-Cycle Costs by Project Baseline Summary (PBS) Dollars in Millions							
Site	PBS	PBS Name	Prior Costs	FY08 and Remaining Cost (low range)	FY08 and Remaining Cost (high range)	Lifecycle Cost (low range)	Lifecycle Cost (high range)
Rocky Flats Environmental Technology Site	CBC-RF-0102	Rocky Flats Future Use	$3	$0	$0	$3	$3
Rocky Flats Environmental Technology Site	RF-0100	Rocky Flats Environmental Technology Site Contract Liabilities	$92	$2,632	$2,632	$2,724	$2,724
Rocky Flats Environmental Technology Site	RF-0101	Rocky Flats Community and Regulatory Support	$37	$0	$0	$37	$37
Rocky Flats Environmental Technology Site Total			$6,484	$2,632	$2,632	$9,116	$9,116
Sandia National Laboratory	VL-SN-0030	Soil and Water Remediation-Sandia	$226	$9	$9	$235	$236
Sandia National Laboratory Total			$226	$9	$9	$235	$236
Savannah River Site	SR-0100	Non-Closure Mission Support	$196	$155	$155	$351	$351
Savannah River Site	SR-0101	Savannah River Community and Regulatory Support	$89	$233	$233	$321	$321
Savannah River Site	SR-0900	Pre-2004 Completions	$198	$0	$0	$198	$198
Savannah River Site	HQ-HLW-0014X-SR	Radioactive Liquid Tank Waste Stabilization and Disposition-Storage Operations Awaiting Geologic Rep	$0	$0	$0	$0	$0
Savannah River Site	HQ-SNF-0012X-SR	SNF Stabilization and Disposition-Storage Operations Awaiting Geologic Repository	$68	$0	$0	$68	$68
Savannah River Site	SR-0011A	NM Stabilization and Disposition-2006	$134	$0	$0	$134	$134
Savannah River Site	SR-0011B	NM Stabilization and Disposition-2012	$3,663	$127	$127	$3,790	$3,790
Savannah River Site	SR-0011C	NM Stabilization and Disposition-2035	$694	$6,681	$7,311	$7,376	$8,006
Savannah River Site	SR-0012	SNF Stabilization and Disposition	$259	$790	$812	$1,049	$1,071
Savannah River Site	SR-0013	Solid Waste Stabilization and Disposition	$970	$3,312	$3,756	$4,281	$4,725
Savannah River Site	SR-0014B	Radioactive Liquid Tank Waste Stabilization and Disposition-2012	$0	$0	$0	$0	$0
Savannah River Site	SR-0014C	Radioactive Liquid Tank Waste Stabilization and Disposition-2035	$5,002	$16,893	$25,385	$21,896	$30,388
Savannah River Site	SR-0014C-T	Radioactive Liquid Tank Waste Stabilization and Disposition-2035 (T)	$138	$0	$0	$138	$138
Savannah River Site	SR-0020	Safeguards and Security	$1,025	$2,576	$2,576	$3,601	$3,601
Savannah River Site	SR-0030	Soil and Water Remediation	$1,109	$2,928	$3,415	$4,037	$4,524
Savannah River Site	SR-0040	Nuclear Facility D&D	$482	$5,157	$5,918	$5,639	$6,400
Savannah River Site	SR-0040B	Nuclear Facility D&D-2012	$1	$0	$0	$1	$1
Savannah River Site Total			$14,028	$38,852	$49,688	$52,880	$63,716

Life-Cycle Costs by Project Baseline Summary (PBS) Dollars in Millions							
Site	PBS	PBS Name	Prior Costs	FY08 and Remaining Cost (low range)	FY08 and Remaining Cost (high range)	Lifecycle Cost (low range)	Lifecycle Cost (high range)
Separations Process Unit	VL-SPRU-0040	Nuclear Facility D&D-Separations Process Research Unit	$25	$197	$197	$222	$222
Separations Process Unit Total			$25	$197	$197	$222	$222
Stanford Linear Accelerator Center	CBC-SLAC-0030	Soil and Water Remediation-Stanford Linear Accelerator Center	$22	$23	$39	$46	$62
Stanford Linear Accelerator Center Total			$22	$23	$39	$46	$62
Waste Isolation Pilot Plant	CB-0020	Safeguards and Security	$18	$174	$174	$192	$192
Waste Isolation Pilot Plant	CB-0100	US/Mexico/Border/Material Partnership Initiative	$11	$0	$0	$11	$11
Waste Isolation Pilot Plant	CB-0900	Pre-2004 Completions	$7	$0	$0	$7	$7
Waste Isolation Pilot Plant	CB-0080	Operate Waste Disposal Facility-WIPP	$1,693	$3,225	$3,671	$4,918	$5,363
Waste Isolation Pilot Plant	CB-0081	Central Characterization Project	$90	$411	$480	$500	$570
Waste Isolation Pilot Plant	CB-0090	Transportation-WIPP	$274	$670	$750	$944	$1,024
Waste Isolation Pilot Plant	CB-0101	Economic Assistance to the State of New Mexico	$149	$110	$110	$259	$259
Waste Isolation Pilot Plant Total			$2,240	$4,590	$5,184	$6,830	$7,425
West Valley Demonstration Project	OH-WV-0012	SNF Stabilization and Disposition-West Valley	$32	$0	$0	$32	$32
West Valley Demonstration Project	OH-WV-0013	Solid Waste Stabilization and Disposition-West Valley	$191	$158	$187	$349	$377
West Valley Demonstration Project	OH-WV-0014	Radioactive Liquid Tank Waste Stabilization and Disposition-West Valley High Level Waste Storage	$0	$366	$407	$366	$407
West Valley Demonstration Project	OH-WV-0020	Safeguards and Security-West Valley	$14	$32	$32	$46	$46
West Valley Demonstration Project	OH-WV-0040	Nuclear Facility D&D-West Valley	$425	$630	$721	$1,056	$1,147
West Valley Demonstration Project Total			$662	$1,187	$1,347	$1,849	$2,009
Grand Total			$68,939	$205,432	$260,532	$274,371	$329,471

APPENDIX C FACILITIES PROPOSED FOR TRANSITION TO EM

Appendix C. Facilities Proposed for Transition to EM		
Site	PSO	Facility Name/Description
ANL	SC	[1]Alpha Gamma Hot Cells Clean-out and Decontamination
ANL	SC	[1]Alpha Gamma Building Demolition
ANL	SC	[1]WM Reactor Engineering Building D&D
ANL	SC	[1]IPNS (Neutron Accelerator)
ANL	SC	[1]Building 202 Demolition
ANL	SC	[1]K Wing Hot Cell Cleanout
ANL	SC	[1]Building 205 Demolition
ANL	SC	[1]Waste Management Facility Building 306 Waste & Material Cleanout
ANL	SC	[1]Building 200 M-Wing Excess Nuclear Material Cleanout
ANL	SC	[1]Building 330 CP-5 Reactor Demolition
ANL	SC	[1]Excess Nuclear Material and Waste Cleanout Building 205 (Multiple wings other than K)
ANL	SC	[1]Shell Radioactive Building Demolition
ANL	SC	[1]Waste Removal from Shell Radioactive Building
ANL	SC	[1]Demolition of Waste Management Facility Building 306
ANL	SC	[1]D&D of Building 200 M and K Wings, MB Hot Cell
BNL	SC	[1]Brookhaven Medical Research Reactor
BNL	SC	[1]BGRR Project Offices
BNL	SC	[1]Reclamation Facility
BNL	SC	[1]Liquid Waste Transfer
BNL	SC	[1]Waste Concentration Facility
BNL	SC	[1]Environmental Waste Tech Center
BNL	SC	[1]Cyclotron Removal
BNL	SC	[1]Tandem van de Graff
BNL	SC	[1]Contaminated Media (Shotgun Range)
BNL	SC	[1]Contaminated Media (STP Sand filter beds)
BNL	SC	[1]Contaminated Equipment/Material
FNAL	SC	[1]206 Nevis Shield Blocks
INL	NE	[2]Radiological/ Environmental Science Laboratory
INL	NE	[2]WERF Incinerator Building
INL	NE	[2]CITRC Control System Research Facility
INL	NE	[2]CITRC Explosives Detection Research Center
INL	NE	[2]EBR-II Reactor Facility & Ancillary Buildings, structures, and piping including ...
INL	NE	[2]ZPPR Reactor Facility & Ancillary Buildings, structures, and piping including . . .
INL	NE	[2]Alcohol Recovery Facility
INL	NE	[2]Alcohol Recovery Facility
INL	NE	[2]Legacy Remote-Handled Transuranic Waste Disposition
INL	NE	[2]Legacy Spent Nuclear Fuels Disposition
INL	NE	[2]Legacy Special Nuclear Material Disposition
INL	NE	[2]Legacy Remote-Handled Low-Level Waste Disposal
INL	NE	[2]Legacy Low-Level/Mixed Low-Level Waste Disposition
INL	NE	[2]Remote-Handled Waste Disposition Project

Appendix C. Facilities Proposed for Transition to EM		
Site	PSO	Facility Name/Description
INL	NE	[2]Advanced Test Reactor Irradiated Beryllium Blocks
INL	NE	[2]Voluntary Consent Order RCRA Closure Activities
INL	NE	[2]Excess Legacy Radioactive and Hazardous Materials Disposition
INL	NE	[2]INL CERCLA Long-Term Stewardship Activities
INL	NE	[2]Retention Basin Sump Pump House Facility & ancillary structures and piping including…
INL	NE	[2]Hot Waste Storage Pump House Facility & ancillary structures, tanks, and piping
INL	NE	[2]Acid Caustic Pump House & Tanks including. . .
INL	NE	[2]Gamma Building
INL	NE	[2]Cold Storage Building
INL	NE	[2]Radioactive Waste Storage Building
INL	NE	[2]Fuel Oil Tanks
INL	NE	[2]Fuel Oil Tanks
INL	NE	[2]Hot Cell Building
LANL	NNSA	[3]Phermex Complex
LANL	NNSA	[3]Ion Beam Facility
LANL	NNSA	[3]TA-16-88 Machining Facility
LLNL	NNSA	[3]Vacant
LLNL	NNSA	[3]Heavy Element Facility
LLNL	NNSA	[3]Vacant
LLNL	NNSA	[3]Vacant
NTS	NNSA	[3]Cryogenic Lab
NTS	NNSA	[3]Equipment Building
NTS	NNSA	[3]Pump Shop
NTS	NNSA	[3]Locomotive Storage Shed
NTS	NNSA	[3]Motor Drive Building
SLAC	SC	[1]High Resolution Spectrometer (HRS)
SLAC	SC	[1]Mark II Detector
SLAC	SC	[1]Ethane Tanks Disposal
SLAC	SC	[1]SPER Magnets at Sector 0/1
SLAC	SC	[1]Remedial System for Research Yard Storm Drain System & IR-6 Drainage Channel
SLAC	SC	[1]Cleanup of historic vessels and debris site wide
SLAC	SC	[1]SLAC Large Detector (SLD)
SLAC	SC	[1]SLC Disassembly and D&D
SLAC	SC	[1]PEP II Disassembly
SLAC	SC	[1]PEP II Equipment & Impacted Soil
SLAC	SC	[1]PEP II D&D
SLAC	SC	[1]Barbar Detector disassembly
SLAC	SC	[1]Barber Detector transportation & disposal of non-reusable components following disassembly
SLAC	SC	[1]Magnet Storage Legacy Rad Materials
SLAC	SC	[1]Radioactive Material Storage Yard Legacy Radio active Materials
SLAC	SC	[1]Bone Yard Shielding Blocks
SLAC	SC	[1]End Station B Shielding Blocks
SLAC	SC	[1]Excess Lead Disposal

Appendix C. Facilities Proposed for Transition to EM		
Site	PSO	Facility Name/Description
SLAC	SC	[1]Final Focus Test Beam Shielding blocks
SLAC	SC	[1]Soil & Groundwater Remediation
SRS	NNSA	[3]Manufacturing Building - 232-H
SRS	NNSA	[3]Manufacturing Building - 232-H
SRS	NNSA	[3]Manufacturing Building - 232-H
ORR	SC	[4]Solid State Annex/Quality Assurance/Ins2000
ORR	SC	[4]Information Center Complex
ORR	SC	[4]Solar Energy/Laser Laboratory
ORR	SC	[4]Quality Assurance & Inspect
ORR	SC	[4]Storage I-E
ORR	SC	[4]Emergency Generator for Bldg 2000
ORR	SC	[4]Storage
ORR	SC	[4]Calibration Laboratory
ORR	SC	[4]ORNL Whole Body Counter
ORR	SC	[4]Radioactive Materials Analytical Laboratory
ORR	SC	[4]2026 Cooling Tower (X185479)
ORR	SC	[4]Office Maintenance Shops & Storage (BETA 1)
ORR	SC	[4]Helium Compressor Building
ORR	SC	[4]Biology
ORR	SC	[4]9207 Annex
ORR	SC	[4]D Mammalian Genetics
ORR	SC	[4]BD Co-Carcinogenesis
ORR	SC	[4]BD Virus Control Laboratory
ORR	SC	[4]Cell Fractionation System
ORR	SC	[4]Steam House (Old Steam Plant Building)
ORR	SC	[4]Pigeon House
ORR	SC	[4]Utilities
ORR	SC	[4]Utilities (Fan House for 9207)
ORR	SC	[4]Lead-lined Source Shed (Radiation Source Building)
ORR	SC	[4]FRC Field Support Trailer
ORR	SC	[4]Cafeteria Warehouse
ORR	SC	[4]Electric & AC Service Center
ORR	SC	[4]East Research Service Shop
ORR	SC	[4]Elect & Air Cond Service Ctr
ORR	SC	[4]Smoke Stack
ORR	SC	[4]Source & Special Material Vault
ORR	SC	[4]Rolling Mill
ORR	SC	[4]West Complex Field Shop
ORR	SC	[4]Reactor Experiment Control Room - Super Conductivity Laboratory
ORR	SC	[4]Neutron Spectrometer Station 2
ORR	SC	[4]Reactor Area Equipment Building
ORR	SC	[4]West Complex Maintenance Shop
ORR	SC	[4]Sentry Post No 8b
ORR	SC	[4]Misc. Storage Building

Appendix C. Facilities Proposed for Transition to EM

Site	PSO	Facility Name/Description
ORR	SC	[4]CMSD Office and ESTD Laboratory (FMIS lists as Solid State Office)
ORR	SC	[4]Personnel Monitoring Station
ORR	SC	[4]Emergency Generator for 3127, 3129, 3027 with Diesel Tank
ORR	SC	[4]Liquid Chiller
ORR	SC	[4]Bulk Shielding Reactor Support Facility
ORR	SC	[4]Solid State Accel Facility Graphite Reactor Fan House
ORR	SC	[4]Radioisotopes Services Building
ORR	SC	[4]Nuclear Materials Storage Vault
ORR	SC	[4]Isotope Area Storage and Services Bldg
ORR	SC	[4]Chemical Technology Offices
ORR	SC	[4]Solid State Research Facility - Ceramics & Thin Film Lab
ORR	SC	[4]West Weather Port
ORR	SC	[4]East Weather Port
ORR	SC	[4]Solid State Lab & Hot Cells (IMET)
ORR	SC	[4]IMET Facility Hot Cells & Solid State (CMSD Office & Lab Building)
ORR	SC	[4]Dispatch Center Emergency Generator
ORR	SC	[4]3047 Cooling Tower (X185557)
ORR	SC	[4]3047 Emergency Generator
ORR	SC	[4]High Radiation Level Chem Exam Lab - Irradiated Fuel Exam Lab
ORR	SC	[4]Cooling Tower (For 3525)
ORR	SC	[4]Cylinder Tank Storage Building 3525
ORR	SC	[4]Cask Tool Storage
ORR	SC	[4]Sewage Pumping Station
ORR	SC	[4]East Research Service Center
ORR	SC	[4]Container, Paint Storage
ORR	SC	[4]Mail Services Building
ORR	SC	[4]Storage Building
ORR	SC	[4]Tent, Spill Response Vehicle Shelter
ORR	SC	[4]High Radiation Level Chem Engr Lab
ORR	SC	[4]Geosciences Laboratory
ORR	SC	[4]Expensed Bench Stock Building
ORR	SC	[4]MSR Development Lab
ORR	SC	[4]CCSD Office Building
ORR	SC	[4]TSD Storage Building
ORR	SC	[4]Process Waste Treatment Complex - South - I&C Office Bldg
ORR	SC	[4]Building 3503 Storage Pad
ORR	SC	[4]Trailer, Van Type (Intercomparison SDL)
ORR	SC	[4]P&E Machine Shop Facility
ORR	SC	[4]General Machine Shop
ORR	SC	[4]Coal Research Lab
ORR	SC	[4]West Precipitator
ORR	SC	[4]East Precipitator
ORR	SC	[4]Steam Plant Scale House
ORR	SC	[4]Building 2528 Storage Tank

Appendix C. Facilities Proposed for Transition to EM		
Site	PSO	Facility Name/Description
ORR	SC	[4]Fire Station and Protective Services Headquarters
ORR	SC	[4]HR & Diversity Training / Programs
ORR	SC	[4]Facility and Operations Office
ORR	SC	[4]Decontamination Laundry
ORR	SC	[4]Emergency Generator for 2500, Includes Diesel Fuel Storage Tank
ORR	SC	[4]Waste Operations Support Shop
ORR	SC	[4]Fire Protection, Maint., & Storage
ORR	SC	[4]Decontamination Laundry Annex
ORR	SC	[4]2652A Office Trailer - HP dosimetry
ORR	SC	[4]2652B Office Trailer - ATLC
ORR	SC	[4]2642C Office Trailer
ORR	SC	[4]Radiochemistry Laboratory
ORR	SC	[4]Exper Eng
ORR	SC	[4]Transuranium Research Lab
ORR	SC	[4]Oak Ridge Electron Linear Accelerator (ORELA)
ORR	SC	[4]Hazardous Material Storage
ORR	SC	[4]7025 Local Air Monitor
ORR	SC	[4]Electrical Services
ORR	SC	[4]MSR Process Development Laboratory
ORR	SC	[4]Research Lab Annex
ORR	SC	[4]Coal Conversion Facility
ORR	SC	[4]Experimental Gas Cooled Reactor
ORR	SC	[4]EGCR Stack Monitoring Building
ORR	SC	[4]Energetic Systems Area Storage Building
ORR	SC	[4]Exhaust Stack
ORR	SC	[4]Health Physics Research Reactor
ORR	SC	[4]DOSAR
ORR	SC	[4]DOSAR Low Energy Accelerator
ORR	SC	[4]Rad Calibration Lab
ORR	SC	[4]HFIR Parts Storage
ORR	SC	[4]TSF 6,000 Gallon Steel Tank (Floor Drain Collection Tank)
ORR	SC	[4]7709 Fast Burst (HPRR) Reactor (X900045)
ORR	SC	[4]Sewage Treatment Plant, including Generator and Diesel Fuel Tank
ORR	SC	[4]Coal Sample Preparation Building, includes Sewage Sludge Holding Tank
ORR	SC	[4]Sludge Drying Facility
ORR	SC	[4]Chlorinator Building
ORR	SC	[4]Fire Training Facility
ORR	SC	[4]Sewage Treatment Plan Water Monitor Station
ORR	SC	[4]Sodium Metabisulfide Building
ORR	SC	[4]Sewage Treatment Aeration Basin
ORR	SC	[4]ORNL Sewage Treatment
ORR	SC	[4]ORNL Sewage Treatment Plant Filter System
ORR	SC	[4]Sewage Digester Building
ORR	SC	[4]Coal Yard Building

Appendix C. Facilities Proposed for Transition to EM		
Site	PSO	Facility Name/Description
ORR	SC	[4]ORNL Waste/Water Treatment Facility
ORR	SC	[4]Storage Building for 7856 Operations
ORR	SC	[4]Process Water Control Station
ORR	SC	[4]Interim Manipulator Repair Fac
ORR	SC	[4]Surface Science Laboratory
ORR	SC	[4]3019 Motor control Center
ORR	SC	[4]QSD Storage Building
ORR	SC	[4]QSD Storage Building
ORR	SC	[4]Fusion Energy Building (ALPHA 2)Fusion
ORR	SC	[4]Carpentry Shop
ORR	SC	[4]Switchgear Building
ORR	NNSA	[4]161 KV Steel Transformer
ORR	NNSA	[4]Office Building
ORR	NNSA	[4]Office Complex (ALPHA 3)
ORR	NNSA	[4]Utility Room (Painter Facility)
ORR	NNSA	[4]161 KV Steel Transformer
ORR	NNSA	[4]Storage
ORR	NNSA	[4]Utilities
ORR	NNSA	[4]Switchgear Building
ORR	NNSA	[4]Production (ALPHA 5)
ORR	NNSA	[4]Pumphouse
ORR	NNSA	[4]Demineralizer Facility
ORR	NNSA	[4]Laborer Shack
ORR	NNSA	[4]Cooling Tower
ORR	NNSA	[4]Utilities (management)
ORR	NNSA	[4]Fire Protection Valve House
ORR	NNSA	[4]Storm Drain Monitoring #6
ORR	NNSA	[4]Storm Drain Monitoring #16
ORR	NNSA	[4]Storm Drain Monitoring #5
ORR	NNSA	[4]Steam House (Inactive)
ORR	NNSA	[4]Chiller Building
ORR	NNSA	[4]Maintenance
ORR	NNSA	[4]Utilities
ORR	NNSA	[4]Change House
ORR	NNSA	[4]161 KV Steel
ORR	NNSA	[4]Laboratory & Storage
ORR	NNSA	[4]Depleted Uranium Forming, Quality, Evaluation and Storage Operations (BETA 4)
ORR	NNSA	[4]Storage Building (CAS Alarms)
ORR	NNSA	[4]Cooling Tower
ORR	NNSA	[4]161KV Steel
ORR	NNSA	[4]Warehouse Building
ORR	NNSA	[4]Storage Building
ORR	NNSA	[4]Steam Valve Room
ORR	NNSA	[4]Steam Valve Room

Appendix C. Facilities Proposed for Transition to EM		
Site	PSO	Facility Name/Description
ORR	NNSA	[4]Waste Oil Storage
ORR	NNSA	[4]Tanker Transfer Station
ORR	NNSA	[4]Office
ORR	NNSA	[4]Emergency Generator
ORR	NNSA	[4]Laboratory
ORR	NNSA	[4]Production
ORR	NNSA	[4]Butler/Storage Building
ORR	NNSA	[4]Utilities
ORR	NNSA	[4]Power House
ORR	NNSA	[4]Tank Farm
ORR	NNSA	[4]Production
ORR	NNSA	[4]Cooling Tower
ORR	NNSA	[4]Cooling Tower
ORR	NNSA	[4]Cooling Tower
ORR	NNSA	[4]Cooling Tower
ORR	NNSA	[4]Utilities (management)
ORR	NNSA	[4]Fire Protection Valve House
ORR	NNSA	[4]Utility Support for Cooling Tower (Water Treatment Valve House)
ORR	NNSA	[4]Valve House
ORR	NNSA	[4]Maintenance Shop (Material Storage Warehouse)
ORR	NNSA	[4]Office/Support Trailer
ORR	NNSA	[4]Changehouse/Offices
ORR	NNSA	[4]Chiller Building
ORR	NNSA	[4]Tanker Loading Station (Lean-To)
ORR	NNSA	[4]Abandoned Tanker Station (Tank Pit)
ORR	NNSA	[4]Material Recovery (Nitrate Facility)
ORR	NNSA	[4]Material Recovery (Acid Waste Neutralization)
ORR	NNSA	[4]Old Butler Building (Electrical Storage)
ORR	NNSA	[4]Dry Exhaust System (Bag Filter System)
ORR	NNSA	[4]Dry Exhaust System (Probe House)
ORR	NNSA	[4]Dry Exhaust System (Bag Filter House)
ORR	NNSA	[4]Cylinder Storage
ORR	NNSA	[4]Storage and Office (Physical Testing, X-Ray)
ORR	NNSA	[4]Vaults (Physical Testing, X-Ray)
ORR	NNSA	[4]Tooling Storage
ORR	NNSA	[4]Emergency Generator Room
ORR	NNSA	[4]Foam House for OD-9
ORR	NNSA	[4]Foam House for OD-10
ORR	NNSA	[4]Steam Plant
ORR	NNSA	[4]Unloading Station
ORR	NNSA	[4]Waste Water Treatment Facility
ORR	NNSA	[4]Dry Ash Handling Facility
ORR	NNSA	[4]Wet Ash Handling Facility
ORR	NNSA	[4]Monitoring Station

Appendix C. Facilities Proposed for Transition to EM		
Site	PSO	Facility Name/Description
ORR	NE	[4]CTD - Isotope Separations (BETA 3)
ORR	NE	[4]Isotope Technology Building
NOTES	1 – The need for deactivation and decommissioning of these 47 Science facilities will be considered for approval by the Deputy Secretary in the first quarter of FY 2009.	
	2 – The need for deactivation and decommissioning of these 27 Nuclear Energy facilities will be considered for approval by the Deputy Secretary in the first quarter of FY 2009.	
	3 – The need for deactivation and decommissioning of these 15 NNSA facilities will be considered for approval by the Deputy Secretary in the first quarter of FY 2009.	
	4 - The DOE Deputy Secretary approved the need for deactivation and decommissioning of these facilities on July 20, 2007.	

.

APPENDIX D LIST OF ACRONYMS

Acronym	Definition
ACMP	Acquisition and Career Management Program
ANL	Argonne National Laboratory
BEMR	Baseline Environmental Management Report
CAP	Corrective Action Plan
CCIM	Cold Crucible Induction Melter
CCP	Central Characterization Project
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CIP	Corporate Implementation Plan
CH	contact handled
DART	days away restricted or on job transfer
DAU	Defense Acquisition University
DBT	design basis threat
D&D	deactivation and decommissioning
DOE	U.S. Department of Energy
DRR	domestic research reactor
DU	depleted uranium
DUF_6	depleted uranium hexafluoride
DWPF	Defense Waste Processing Facility
EIS	Environmental Impact Statement
EM	Office of Environmental Management
EMCBC	Environmental Management Consolidated Business Center
ETEC	Energy Technology Engineering Center
ETR	External Technical Review
ETTP	East Tennessee Technology Park
EVMS	earned value management system
FBSR	Fluidized Bed Steam Reforming
FFA	Federal Facility Agreement
FFCAct	Federal Facility Compliance Act
FFTF	Fast Flux Test Facility
FPD	Federal Project Director
FRR	foreign research reactor
FY	Fiscal Year
GDP	Gaseous Diffusion Plant
GTCC	Greater-than-Class C
HCA	Head of Contracting Activity
HEU	highly enriched uranium
HLW	High-level waste
IDIQ	indefinite delivery/indefinite quantity
INL	Idaho National Laboratory
IPT	Integrated Project Team
ISM	integrated safety management
ISS	interim safe storage
KAMS	K-Area Material Storage
LANL	Los Alamos National Laboratory
LAW	low activity waste
LCC	Life-cycle cost

Acronym	Definition
LEU	low enriched uranium
LLW	low-level waste
LLNL	Lawrence Livermore National Laboratory
LM	Office of Legacy Management
M&O	management and operating
MAA	material access area
MFFF	MOX Fuel Fabrication Facility
MLLW	mixed low-level waste
MOX	mixed oxide
MT	metric tons
MTHM	metric tons of heavy metal
NAPA	National Academy of Public Administration
NDA	non-destructive assay
NDAA	National Defense Authorization Act
NDE	non-destructive examination
NE	Office of Nuclear Energy
NEPA	National Environmental Policy Act
NNSA	National Nuclear Security Administration
NPL	National Priorities List
NTS	Nevada Test Site
OCRWM	Office of Civilian Radioactive Waste Management
OECM	Office of Engineering and Construction Management
ORNL	Oak Ridge National Laboratory
ORR	Oak Ridge Reservation
PBI	Performance-Based Incentive
PBS	Project Baseline Summary
PCB	polyclorinated biphenyl
PFP	Plutonium Finishing Plant
PMP	Performance Management Plan
PSO	Program Secretarial Office
Pu	Plutonium
RCRA	Resource Conservation and Recovery Act
RH	remote handled
ROD	record of decision
S&S	Safeguards and Security
SC	[Office of] Science
SNF	spent nuclear fuel
SPRU	separations process research unit
SRS	Savannah River Site
SRNL	Savannah River National Laboratory
STP	site treatment plan
SWPF	Salt Waste Processing Facility
TAN	Test Area North
TPA	Tri-Party Agreement
TRA	Technology Readiness Assessment
TRC	total recordable case
TRU	transuranic waste

Acronym	Definition
TSCA	Toxic Substances Control Act
TSCAI	TSCA Incinerator
U.S. EPA	U.S. Environmental Protection Agency
U.S. NRC	U.S. Nuclear Regulatory Commission
USTC	U.S. Transport Council
WIPP	Waste Isolation Pilot Plant
WTP	Waste Treatment and Immobilization Plant
WVDP	West Valley Demonstration Project

This page intentionally left blank.

APPENDIX E LIST OF REFERENCES

U. S. Department of Energy, February 2002. *A Review of the Environmental Management Program.*

U.S. Department of Energy, October 2003. *Report to Congress Top-to-Bottom Review of the Environmental Management Program: Status of Implementation.*

U.S. Department of Energy, June 2004. *Closure Planning Guidance*.

National Academy of Public Administration, December 2007. *Office of Environmental Management: Managing America's Defense Nuclear Waste*.

U.S. Department of Energy, 1995 & 1996. *Baseline Environmental Management Report*. Office of Environmental Management, Washington, DC.

U.S. Department of Energy, 1995, *Environmental Management Taking Stock: A Look at the Opportunities and Challenges Posed by Inventories of the Cold War Era*. Office of Environmental Management, Washington, DC.

U.S. Department of Energy, 1996. *Closing the Circle on the Splitting of the Atom: The Environmental Legacy of Nuclear Weapons Production in the United States and What the Department of Energy is Doing About It*. Office of Environmental Management, Washington, DC.

U.S. Department of Energy, *1997. Linking Legacies Connecting the Cold War Nuclear Weapons Production Processes to their Environmental Consequences.* Office of Environmental Management, Washington, DC.

U.S. Department of Energy, *1998. Accelerating Cleanup: Paths to Closure.* Office of Environmental Management, Washington, DC.

U.S. Department of Energy, July 2008. *Root Cause Analysis Contract and Project Management Corrective Action Plan.*

U.S. Department of Energy, May 1997. *Final Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste*. Office of Environmental Management, Washington, D.C

U.S. Department of Energy, September 2008. *Report on Liabilities Associated with Department of Energy Excess Facilities.* Office of Environmental Management, Washington, DC.

U.S. Department of Energy, January 2008. DOE O 361.1B, *Acquisition Career Development Program.*

U.S. Department of Energy, October 2000. Order 413.3, *Project Management for the Acquisition of Capital Assets.*

U.S. Department of Energy, July 2006. DOE Order 413.3A, *Program and Project Management for the Acquisition of Capital Assets.*

U.S. Department of Energy. Order 430.lA, *Life-Cycle Asset Management.*

U.S. Department of Energy, September 2003. Order 430.1B, *Real Property Asset Management.*

U.S. Department of Energy, July 1999. Order 435.1, *Radioactive Waste Management.*

Report to Congress

Status of Environmental Management Initiatives
to Accelerate the Reduction of Environmental Risks
and Challenges Posed by the Legacy of the Cold War

January 2009

DOE/EM-0004

U.S. DEPARTMENT OF ENERGY

Office of Environmental Management
1000 Independence Avenue, SW
Washington, DC 20585
(202) 586-5000
E-mail: EM-40CustomerServiceDesk@em.doe.gov