

**Improving Remedial Effectiveness at U.S. Department of Energy through Optimization  
Review and Performance Basis - 8209**

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**ABSTRACT**

The U.S. Department of Energy (DOE), Office of Environmental Management (EM) conducted its first Remediation Process Optimization (RPO) review in 2004, following the methodology and guidance issued by the Interstate Technology & Regulatory Council (ITRC). The intent of this paper is to briefly summarize the following: (1) the overall benefits of the review process toward improving remedial effectiveness and efficiency at DOE, (2) the types and objectives of completed reviews, and (3) how RPO facilitates technology transfer and is complementary to performance-based environmental management (PBEM).

Contract reform began in 1993, at the U.S. Department of Energy (DOE) as a result of the Government Performance and Results Act, followed by recommendations from oversight groups. The precedence of using management and operating (M&O) contracts at DOE facilities, exempt from open competition by definition, shifted to performance basis. Since 1994, DOE has competed over 70% of its then existing M&O contracts; most now contain specific performance objectives, measures, and targets that focus on results in mission critical areas.

In 2001, DOE's Office of Environmental Management (EM) integrated performance-based contracting as a core business process. EM resolved to manage cleanup as a project, encourage innovative contracting strategies, as well as incentives to accelerate risk reduction and cleanup. DOE's efforts to implement performance-based environmental management (PBEM) were further realized by establishing a centralized Office of Acquisitions and the Consolidated Business Center, which support all EM procurements.

In 2004, EM began conducting Remediation Process Optimization (RPO) reviews at select field sites, following the methodology published in the 2004 ITRC guidance. To date, EM has completed nine RPO reviews, including: pump and treat system optimization, monitoring program optimization, in situ barrier performance improvement, remedial design review, as well as strategic planning for feasibility studies and Records of Decision.

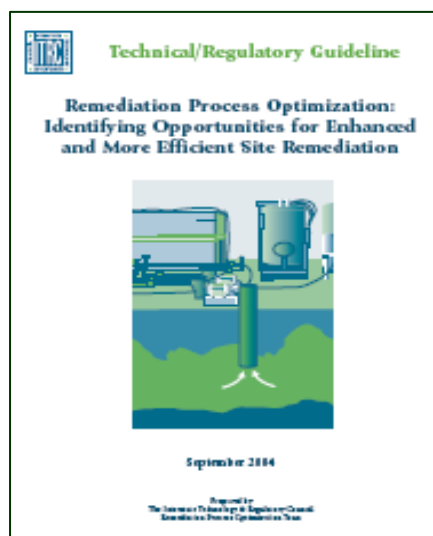
At a higher level, RPO reviews provide EM valuable insight as to how environmental contracts can be improved toward defining better cleanup goals, incentive fees, implementing emerging technologies, and measuring performance against appropriate metrics. As DOE works toward improving its PBEM approach, alliances with other federal agencies have proven valuable in sharing evaluation methods, contracting strategies, software, cost and performance reports, and lessons learned.

## INTRODUCTION

The Government Performance and Results Act (GPRA) of 1993 required each Department within the federal government to submit annual budgets tied to specific, measurable performance objectives. In 1994, GPRA statutes and recommendations from oversight groups initiated contract reforms at the U.S. Department of Energy (DOE). The precedence of using management and operating (M&O) contracts at DOE facilities, exempt from open competition by definition, shifted to performance basis. Historically, DOE began using M&O contracts during the Manhattan Project and beyond, where the capability of industrial and academic institutions was needed to form an ongoing partnership devoted to the development of nuclear weapons and testing, deterrence, and national security. M&O contracts were eventually viewed as inefficient due to lack of competition resulting in excess cost. Reliance on subjective performance measures resulted in growing perceptions of contractor lack of accountability, and of scope expansion toward inherently-governmental mission areas. Since 1994, DOE has competed over 70% of its then existing M&O contracts (32 in number); most now contain specific performance objectives, measures, and targets that focus on results in mission critical areas.

In 2001, an external review of the Environmental Management (EM) Program concluded that process, rather than cleanup results, had been the basis for performance measure. DOE EM was directed to make performance-based contracting a core business process, manage cleanup as a project, and encourage innovative contracting strategies, as well as incentives to accelerate risk reduction and cleanup. EM's efforts to implement performance-based environmental management (PBEM) began in 2003, with establishment a centralized Office of Acquisitions at Headquarters, as well as the Consolidated Business Center in Ohio to support EM on procurements and contracts. Since 2002, EM has replaced traditional M&O contracts with focused cleanup contracts for large and small business leads at several field offices.

## REMEDATION PROCESS OPTIMIZATION REVIEWS



In 2004, EM's Office of Engineering initiated Remediation Process Optimization (RPO) reviews at select field sites following the 2004 guidance published by the Interstate Technology & Regulatory Council (ITRC) (1). RPO is the systematic evaluation and enhancement of site remediation processes to ensure that human health and the environment are protected over the long term at minimum risk and cost. In the end, a successful RPO review will determine if site remediation is progressing toward cleanup objectives that are both acceptable and feasible. The need for a systematic review process emerged from frequently missed cleanup target dates, reflecting the incorrect assumption that a linear "study, design, and build" approach could be applied to environmental remediation projects. Years of documented project management led to the realization that more flexible, iterative approaches that manage project uncertainty would be needed for complete, yet

affordable, site remediation. RPO allows for the systematic reevaluation of initial remediation objectives, and continuous improvement and optimization of remediation technologies and techniques.

With the assistance of the U.S. Army Corps of Engineers (USACE, Omaha District), EM assembled RPO review teams of experts led by the USACE; these remedy reviews were comprised of members from industry, the U.S Environmental Protection Agency (EPA), as well as the national laboratories. To date, EM has completed nine RPO reviews, including: pump and treat system optimization, monitoring program optimization, in situ barrier performance improvement, remedial design review, as well as strategic planning for feasibility studies and Records of Decision. RPO review reports, listed in the reference section by number, are available on the EPA Technology Innovation Program website at [www.cluin.org/remediation\\_optimization](http://www.cluin.org/remediation_optimization).



RPO review reports provide independent findings and recommendations to improve the effectiveness and efficiency of remedial and monitoring systems, planned engineering systems, and exit strategies. At a higher level, RPO report observations provide DOE valuable insights as to how the basis of environmental contracts can be improved toward defining better cleanup goals, incentive fees, implementing emerging technologies, and measuring performance against appropriate metrics. As an example, at the Hanford Site in Washington State, RPO recommendations (2, 3, 4, 5)

are used to guide Columbia River Basin research and remediation efforts, to update the Integrated Groundwater and Vadose Zone Management Plan, and to establish results-oriented performance measures and regular evaluations to gauge the effectiveness of remediation projects.

At the Paducah Gaseous Diffusion Plant (PGDP) in Kentucky, a site wide remedy review in 2006 (6) led to cost-effective optimization of pump and treat systems (7), as well as formal review of the 90% thermal treatment design (8) to remove trichloroethylene (TCE) in soil and groundwater. The later review offered recommendations for site- and technology-specific remedial performance metrics, a phased approach to remediation, modifications to the model design basis, and an independent evaluation of remedial costs. At PGDP, Headquarters and field site staff work together to formulate an Implementation Plan of agreed-upon recommendations, work products, and scheduling. A joint deployment between the Department of Defense (DoD) and DOE applied research programs resulted in innovative enzyme probes and isotope enrichment studies to determine TCE degradation mechanisms and rates in groundwater (9). The TCE remediation team (federal staff, contractors, researchers, and regulators) drafted a Data Quality Objective (DQO) approach (10) to assure consistent interpretation criterion for new technologies under demonstration and validation at PGDP. As a result, the TCE Fate and Transport DQO at PGDP will be refined and incorporated as part of the final report for the correct use of enzyme probes applicable to the estimation of TCE degradation rates under the DoD Environmental Security Technology Certification Program applied research portfolio (11).

## PERFORMANCE-BASED ENVIRONMENTAL MANAGEMENT



At a higher level, remedial recommendations and lessons learned at the DOE field sites provide process improvement into the centralized PBEM and contracting system. Beginning with the GPRA Statute of 1994, DOE established a centralized infrastructure, process, and implementation procedure to support its field offices in successful PBEM. By definition, PBEM is a method of project management that relies on establishing and working towards end-state cleanup objectives, rather than managing only the process. Typically, long-term remediation projects are measured not in years, but in decades, accumulating life-cycle costs in the millions of dollars. In these instances, RPO and PBEM approaches are essential to control remediation costs, minimize project schedules, and achieve the exit strategy.

DOE participated in development and publication of the ITRC's 2007 guidance: Improving Environmental Site Remediation through Performance-Based Environmental Management (12). This document provides the information and tools to help ensure that the remediation process is progressing toward acceptable and feasible site cleanup objectives, and that selected remediation approaches attain performance-based objectives, while remaining protective of human health and the environment. Consistent with RPO, performance-based remediation links the conditions that must be reached at the end point of the cleanup strategy into the continuum of process planning.

As DOE works toward implementing RPO and PBEM, alliances with other federal and state agencies prove valuable in sharing evaluation methods, contracting strategies, software, cost and performance reports, and lessons learned.

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