COST MANAGEMENT IMPROVEMENT in the OFFICE OF ENVIRONMENTAL MANAGEMENT 1991—1995

A PROGRESS REPORT

U.S. Department of Energy
Office of Engineering and Cost Management
Deputy Assistant Secretary for Compliance and Program Coordination
Office of Environmental Management

December 1995

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Office of Engineering and Cost Management
Deputy Assistant Secretary for Compliance and Program Coordination
Office of Environmental Management

Washington, DC 20585

MASTER

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December 1995

Department of Energy

Washington, DC 20585

December 8, 1995

Dear Reader:

I am pleased to present *Cost Management Improvement in the Office of Environmental Management 1991-1995: A Progress Report*. In July 1993, the Assistant Secretary for Environmental Management, Mr. Thomas P. Grumbly, stressed that we must get a firm handle on how we are spending hard-earned tax dollars. This meant establishing better financial and accounting controls and obtaining better cost estimates throughout the system in order to get more for each dollar spent. This report highlights progress made in achieving financial and managerial control and identifies opportunities for further improvement.

We can report that EM has significantly increased its financial and managerial controls over the past four years as evidenced by:

- 20% increase in program productivity and efficiency
- Greater formality and defensibility of cost estimates
- More cost-effective cleanup, waste management, and facility stabilization efforts
- Greater use of Federal personnel to review contractor work and to control cost
- Restructured contracts that include incentives based on performance and efficiency
- "Work out" sessions to forge agreements to achieve compliance and cost savings.

Assistant Secretary Grumbly raised the visibility of financial and managerial control problems and increased accountability for finding and implementing successful solutions.

However, achieving financial and managerial control within EM continues to be complex and challenging. Budgetary pressures and the increasing scope of the EM mission have further driven the need to control resources better. EM's original mission of environmental cleanup, waste management, and technology development has been expanded to include nuclear materials and facility stabilization and landlord (i.e., facility infrastructure management) activities at more than half of the major DOE sites. The size of these operational programs requires a much greater level of business control to address the transactional complexities and costs of site operations.

We have had to take deliberate and measured steps to respond to budget reductions; however, we must do even more to enhance the systematic analysis and control of cost factors that drive up the EM budget. I believe that EM is undergoing a sound evolution as evidenced by the results of the initiatives described in this report. But this is just a beginning.

We must be cost-effective in managing our core activities. This statement implies that we must answer two questions: Are we doing things right? Are we doing the right things? This report addresses the first question. But, we must reach agreement on several fundamental issues in order to answer the second. Only then can we demonstrate complete managerial and financial control. Specifically:

- We must identify and define our core activities.
- We must analyze how we are spending the taxpayers' money and learn from both what we have done well and what we have done less well.
- If we do not have the resources to do everything—and we do not—we must establish clear, defensible priorities and we must make the strongest possible case for increased resources.

This report demonstrates that we are well on the way to doing things right. We will continue along that path as we also commit ourselves to doing the right things.

Sincerely,

A handwritten signature in black ink that reads "Vincent Fayne". The script is fluid and cursive, with the first name "Vincent" and last name "Fayne" clearly legible.

Vincent Fayne
Director
Office of Engineering
and Cost Management

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BETTER COST MANAGEMENT: THE NEED AND THE RESPONSE

The Department of Energy's (DOE's) Office of Environmental Management (EM) has been proactive in meeting the cost management challenges of environmental management activities. EM recognized the need for defining and establishing good cost management practices and has, during the first half of the 1990s, initiated more than a dozen major cost-management-related activities that have resulted in:

- Measurable improvement in cost- and cost-related management practices
- Improved communications between field and Headquarters and among field sites
- Development of cost management tools
- Hiring of cost professionals
- Involving regulators and stakeholders early in the planning process.

Most significantly, these initiatives are instilling and encouraging a cost-conscious culture throughout EM.

The purposes of this progress report are to summarize EM's cost management initiatives, report on the results of its proactive approach to cleaning up the environment at reasonable cost, and identify future cost management needs.

THE NEED

DOE established EM in November 1989 by consolidating the functions of organizations responsible for environmental management activities at the nuclear-contaminated sites for which the Department was responsible. The resulting organization (initially the Office of Environmental Restoration and Waste Management) was structured along the lines of its primary missions. The Office of Waste Management (WM) assumed responsibility for safely inventorying, shipping, and storing contaminated waste to minimize health and safety risks. The Office of Environmental Restoration (ER) was responsible for decontaminating sites so they can be made available for other uses, including public use. To help meet its WM and ER missions, EM established the Office of Technology Development (TD) to facilitate and manage technology development. EM also established the EM-20, Office of Compliance and Program Coordination (originally, the Office of Quality Assurance and Quality Control). EM-20's mission was to oversee EM programs, projects, and operations to ensure environmental compliance, safety and health compliance, technical validity and cost-effectiveness, operational effectiveness, and effective program/project management. As both the rate of transfer and the number of EM sites in need of custodial and landlord functions increased, the Office of Facility Management and Transition was established.

Although EM's first challenges were to meld its disparate components into an effective organization and to initiate planning for waste management and environmental restoration,

the increasing load of nuclear-contaminated properties made it evident that managing the cost of cleanup and improving management systems must receive a high priority.

DOE operated for decades under the stricture of "produce at any cost." Beginning with the Manhattan Project and continuing through the Cold War era, a primary mission of DOE and its predecessor organizations was to produce nuclear weapons regardless of cost—and cost was not measured only in dollars. Environmental considerations were not a constraining factor nor, within broad limits, were health and safety costs.

The planning and operations of EM activities during its first few years were performed with a "show-results-at-any-cost" attitude. One of DOE's priorities was to establish and maintain compliance with environmental regulations, which led to a "comply-at-all-costs" culture. EM quickly realized that improvements were needed in business practices and management systems and that managers should be more accountable for costs. Shortly after EM began to emphasize cost management, two factors combined to make that emphasis even more important. First, the pace at which the EM mission expanded, which included a significant increase in the number of contaminated properties being transferred, drove rapid increases in EM's budgetary requirements. (It is ironic that, although one factor that demanded EM stress cost management was increased funding, the need for cost management is now greater because of decreased funding.) Second, the visibility of EM program results, budget reductions, and scrutiny also increased.

Evidence of this increased external scrutiny (and evidence of the need to improve cost management) can be found in, among others:

- *Weapons Complex Cleanup* (Office of Technology Assessment, 1990)
- *More Can Be Done to Better Control ER Costs* (General Accounting Office, 1992)
- *The Task Ahead* (University of Tennessee, 1993)
- *Cleaning Up DOE's Nuclear Weapons Complex* (Congressional Budget Office, 1994).

Each of these reports noted the daunting environmental management task faced by DOE and the need for DOE to be more cost-effective in performing that task.

THE RESPONSE

Recognizing the need to manage cost, the Deputy Assistant Secretary for Compliance and Program Coordination, through the Office of Engineering and Cost Management, began developing a Cost Quality Management Program in the fall of 1990. The primary components of the Program were Cost Quality Management Assessments (CQMAs) and technical assistance to EM field sites. CQMAs measured and helped improve cost- and cost-related management activities at EM field sites. The assessments, based on field interviews and document reviews, measured management systems and practices against clearly stated performance objectives and criteria contained in the *CQMA Field Handbook (Handbook)*.

In May 1991, former Assistant Secretary for EM Leo P. Duffy issued the CQMA charter, which formally recognized the Cost Quality Management Program. In the memorandum

distributing the charter, Mr. Duffy announced the first round of CQMA's of EM field sites. The objectives of the CQMA's were to:

- Identify problems in EM's cost management practices and procedures
- Provide guidance, tools, and assistance to program and project managers to improve cost management practices
- Instill a cost-conscious culture throughout EM, from program and project managers through all supporting Federal and contractor personnel.

When Mr. Thomas P. Grumbly succeeded Mr. Duffy (May 1993), the growth in the number of decommissioned Defense Programs facilities transferred to EM continued apace; the scope of required environmental and general management responsibilities for each site was not clearly known. The results of the 12 CQMA's conducted in 1991-1992, which identified opportunities for improvement in cost management activities, were available for Mr. Grumbly's review. One of Mr. Grumbly's initial responses to the challenges faced by EM was to establish Six Strategic Goals for the organization, one of which was to bring EM programs under financial and managerial control. Another response was to reaffirm the CQMA charter.

The CQMA was a first step at systematically evaluating and improving EM's cost management and general business practices. This effort demonstrates a strong commitment to changing outdated practices and systems for cost estimating and cost management. More recent efforts are focusing on high-level fundamental assessments and needs that address program-wide cost and management issues in a relatively short span of time. These efforts are driving the development of common program definitions, uniform work breakdown structures, standard code of accounts, more consistent ways of tracking cost and schedules, linkage of physical measures or milestones to cost and schedule, the use of trend analysis and forecasting methods, and other (cost-) management devices. In addition, EM is employing incentivized contracts, privatization, and outsourcing of work to reduce costs.

Exhibit 1 shows many of the significant EM cost management initiatives during 1991-1995. These initiatives reflect the explosive growth of the EM organization. Comparing the initiatives to the EM budget (shown at the bottom of the exhibit), clearly demonstrates and supports the need for better cost- and schedule-management practices.

EM's program and project managers are facing a formidable cost management challenge. There is a noticeable increase in cost management planning and a growing recognition of the need for systematic analysis of cost data in EM's programs and projects. EM is making cultural adjustments and the necessary improvements in cost and schedule management. EM's program and project managers are increasingly applying cost-conscious processes to their cost management planning and work responsibilities (see appendix A for representative field responses). Management approaches are changing; positive results are becoming evident; and the combination of budget reductions, high-level analysis, and good cost management techniques promises greater results in the future.

EXHIBIT 1.—Cost Management Time Line

EM'S COST MANAGEMENT INITIATIVES

INTRODUCTION

The cost management initiatives identified in exhibit 1 are interrelated and have contributed to increased cost consciousness throughout EM and to concomitant improvement in the management of EM's programs and projects. This section highlights several major initiatives that have had a significant impact upon EM personnel and program/project operations: Field Cost Quality Management Assessments (CQMA's), Project Performance Study, Strategic Goals of the Environmental Management Program, "work-out" sessions, addition of cost professionals, and annual cost management conferences. Appendix B contains a brief description of each initiative shown on exhibit 1.

The product of all of the cost management initiatives is positive both in actual cost savings or cost avoidance and in improving the way EM does business. Results at the field level are most important because that is where project cost management activities are initiated. Results at the field level must be supported by EM Headquarter organizations if cost and schedule management is to improve and success is to be sustained.

OPPORTUNITIES FOR IMPROVEMENT

The field CQMA's not only identified site-specific opportunities for cost management improvement but also identified areas for improvement common to most sites. The opportunities for improvement discussed in this report are those that have the potential to lead to the greatest cost savings/cost avoidance in EM activities; these are also the areas in which virtually all sites need to improve.

Changing the Corporate Culture

A major opportunity for cost management improvement was the recognition, early in the CQMA process, that the EM program lacked both financial and management control and that although project managers were focusing on cleaning up the environment, cost was rarely a consideration. This attitude, a legacy of "show-results-at-any-cost," was in some cases encouraged by regulatory and stakeholder groups and virtually precluded cost-effective management because it led to poor project (i.e., scope) definition. Without clear definitions of program/project scope, realistic cost estimates could not be made. As a partial solution to this problem, Assistant Secretary Grumbly initiated a series of reviews of compliance agreements with Federal and State regulatory authorities. Among other things, the reviews led to renegotiation of, and amendments to, several of the agreements.

Defining Project Interrelationships

Field CQMA's revealed that, although many field programs/projects were interrelated, EM Headquarters funding for projects often was managed without regard to overall site activities. This situation led, in many cases, to inefficient use and scheduling of resources.

For example, when a site contracts for drilling services, the costs to DOE include the mobilization and demobilization of equipment and crews. Too frequently, one project manager has contracted for these services only to have another project manager incur the same costs shortly thereafter. With a reasonable degree of management oversight and planning, the same equipment and crews could have been scheduled so that the drilling requirements of both projects could be met without dismissing equipment and crews only to have to pay to have them return.

Obtaining More Experienced Federal Personnel

A major observation of the field CQMAs was that either there were not enough Federal employees experienced in cost estimation and analysis supporting the environmental management program or the cost estimators were not used for EM work. This condition was found at all Operations Offices. Lack of experienced personnel or the non-use of the experienced personnel who were available resulted in poor cost estimates and an inability to analyze project costs.

Managing Indirect Cost

The Round I CQMAs identified a number of concerns associated with the management of indirect cost. There was insufficient EM management attention paid to this major area of environmental cost, characterized by few formal written procedures or guidelines for understanding the development and application of indirect costs.

BUILDING A FOUNDATION FOR IMPROVEMENT

EM's initiatives in 1991-1992 began to reveal the scope of the cost- and schedule-management problem. Round I of the CQMA identified inadequate cost- and schedule-management practices and recommended new approaches. During that time, additional EM initiatives were begun as EM recognized the need to institute actions to address the findings of OMB, GAO, and DOE assessments. As exhibit 1 shows, the pace of cost management activities began to accelerate late in 1992. Both the observations and the programmatic changes resulting from these initiatives created provided the building blocks upon which to base continued improvement in cost management and business practices.

Six Strategic Goals

In 1993, Assistant Secretary Grumbly established Six Strategic Goals for the EM Program. These goals further emphasized EM's commitment to changes in its program/project management philosophy. These goals are:

- Eliminate and manage the urgent risks in our system.
- Emphasize health and safety for our workers and the public.
- Establish a system that is managerially and financially in control.
- Demonstrate tangible results.

- Focus technology development efforts on identifying and overcoming obstacles to progress.
- Establish a stronger partnership between the Department of Energy and its stakeholders.

Three of these goals, the ones that call for dealing with establishing managerial and financial control, demonstrating tangible results, and establishing stakeholder partnership, directly address situations found during the first 2 years of EM cost management reviews. The first goal requires ranking programs/projects by risk, and program/project managers are further required by Goal 3 to consider cost as a factor when making implementation decisions.

The result of these and other cost management activities is a foundation upon which continuing improvements in cost management can be based. This foundation is solid, exists at EM Headquarters and at every Operations Office, and is being actively strengthened. The foundation is a first step in encouraging EM program/project managers to ensure sound cost- and schedule-management practices as they fulfill their management responsibilities.

Improving Cost Estimates

The variance between field estimates and the independent cost review (ICR) estimates during Round II has been significantly reduced when compared to the variance in Round I. An improved cost- and schedule-estimating process and better cost and schedule estimates lead to more realistic budget requests and support managers in defining achievable milestones.

Developing Cost Management Baselines

The Round I CQMA established a qualitative baseline (i.e., reported the status of cost management practices) against which cost management actions and improvements could be measured. CQMA reports provided detailed evaluations of cost management practices in the field and proposed site-specific recommendations to improve those practices. The reports provided field managers with a documented record of what they were doing right as well as opportunities for improvement.

In early 1993, work on the Project Performance Study (PPS) was initiated by EM Headquarters. The first phase of this study, delivered in November 1993, established a quantitative baseline of the results of EM's program and project management practices. That is, while the CQMA program reviewed cost- and schedule-management processes, the PPS looked at the results—actual costs and schedule performance—of those processes. As part of the PPS, EM's environmental program/project costs and schedule performances were statistically compared to those of commercial and other Government organizations. The PPS comparative baseline allowed EM management to establish quantitative management goals for program/project managers. Added to the site-specific baseline results from the CQMAs, the PPS gave EM management a comprehensive performance measurement of program/project management.

Work Outs

The Assistant Secretary initiated a series of "work outs" in April 1995. The work-out sessions—which included senior Headquarters, field, and contractor managers and senior representatives of Federal and State regulatory agencies—are designed to identify more cost-effective methods to meet environmental management goals and commitments. Work outs have been held for three major sites, Hanford, Savannah River, and Rocky Flats; work outs are scheduled for Oak Ridge and Idaho.

These cooperative, site-by-site, problem-solving endeavors have identified opportunities to significantly reduce costs, increase efficiency, find alternative solutions to regulatory challenges, and define better ways to manage resources. Sites for which work outs or related efforts have been conducted will continue to implement the agreements that have been made; in particular they will work to meet the FY 1996 cost-savings targets and efficiency improvements identified during the work out sessions. Unless these significant cost-effectiveness gains can be met for FY 1996, the even more demanding challenges of FY 1997 will not be met.

Sites that have not been the subject of work outs are not, of course, excused from making significant reductions in EM program costs and improving cooperation with their respective regulators. Review of program costs and relationships with regulators are included in EM senior management integrated program reviews of other sites. For example, Federal and State regulators participated in the most recent (October 17, 1995) integrated review of the Ohio Field Office.

Adding Cost Management Professionals

A major observation of the CQMAs was that there were few experienced Federal *environmental* cost analysts/estimators at field sites. Staff was often assigned to environmental cost analysis and estimating tasks without adequate environmental management experience or training. EM management recognized the seriousness of this situation. When EM was granted additional full-time equivalents (FTEs), senior management required each site to designate a portion of these positions for cost professionals and to demonstrate the cost-effectiveness of all the additional FTEs.

Including Regulators and Stakeholders in the Process

Early field assessments also brought the importance of including regulators and stakeholders early in the planning and execution phases of environmental programs/projects to the attention of EM management. Exclusion of these important groups often led to misunderstandings by both EM managers and representatives of the groups. These misunderstandings frequently led to costly delays in environmental programs/projects while details were worked out to the satisfaction of all parties. EM management, at both Headquarters and the field, has become active in developing methods for including regulators and stakeholders early in environmental activities. Assistant Secretary Grumbly established the EM Office of Public Accountability, and in August 1994, the Office promulgated the EM Public Participation Policy, which set forth guidance and requirements for all EM program and project managers. Including these groups and

gaining their cooperation early in planning process continues to have a positive impact on EM program management.

Managing Indirect Cost

The Round II CQMA's did not review indirect-cost practices because the Office of Environmental Management and the Office of the Chief Financial Officer agreed, in a formal Memorandum of Agreement, to work jointly to improve the management of indirect costs. Assistant Secretary Grumbly led the Indirect Cost Review Team during DOE's Contract Reform Initiative, further evidence of how important EM considers the management of indirect costs to be.

COST-CONSCIOUS CULTURE

Developing a cost-conscious culture within EM required active commitment of senior management and key initiatives to support and constantly reinforce the new direction. These initiatives, those completed and those still ongoing, have been actively supported by senior management and are showing early results. The field is seeing the positive results of its cost management efforts and this, in itself, is reinforcing. Increasingly severe budget reductions also are strengthening the cost-conscious attitude.

Cost Management Baseline Measurements

Round I CQMA's (July 1991–March 1992) measured cost management practices at field sites against specific performance objectives and criteria (POCs) contained in the *CQMA Field Handbook*. The assessments established each site's baseline of cost management performance. Each site was provided a timely report on the results of the CQMA that contained recommendations for improvements. EM required each site to respond to the report and the recommendations in an *Action Plan* that explained how and on what schedule it was going to improve its cost management practices.

Round II CQMA's (February 1994–May 1995) examined each site's performance against the same POCs, thereby measuring each site against its own baseline. The Round II assessments found that sites had developed and implemented cost management improvements in accordance with their *Action Plans*. Most sites also provided documented cost avoidance and demonstrated some cost-savings trends. The positive results, shown in exhibit 2, confirm the beginnings of a cost-conscious culture in the field. All sites that participated in Round II agreed with the results of the assessment and committed to further improving their cost management practices.

Project Performance Study

The PPS was a watershed event in galvanizing EM's management response, both in the field and within Headquarters, to EM's cost management situation. The PPS confirmed a basic premise of the CQMA's: Poor cost- and schedule-estimating processes lead to increased cost and extended schedules. CQMA's, which looked at the practices at each site, were not designed to quantify actual cost and schedule performance. The PPS, however, was able to compare EM's program/project performance with similar

EXHIBIT 2.—Cost Management Improvement Demonstrated by Percentage of POCs Met at Each Site During Round I and Round II CQMA's

Government and private sector activities. The results of the comparison were not flattering, and Assistant Secretary Grumbly took immediate action.

Based on the results reported by the PPS, Mr. Grumbly ordered a 2-day Stand Down of all EM operations (January 31–February 1, 1994) to highlight the gravity of the situation and solicit ideas and recommendations from all EM personnel. During these meetings, barriers to effective project management were identified and EM staff was assigned to develop action plans to remove those barriers.

In addition to the recommendations developed during the Stand Down and from follow-on activities, the PPS generated another important result: Results of the PPS shifted the focus of cost control from M&O contractors to Federal (i.e., DOE employees). That is, DOE became more accountable by assuming direct responsibility for, and control of, cost management.

Quality Improvement Teams

To implement the actions resulting from the Stand Down meetings and to explore further cost management actions, EM established four Quality Improvement Teams (QITs). Each QIT had a specific area of focus and was responsible for developing an Action Plan for that functional area. To provide a balanced perspective, each focus group included field and Headquarters management personnel. The four focus areas were:

- Project Definition
- Project Control
- Federal Employee Involvement/Empowerment
- General/Cross-Cutting Issues.

Each focus group identified key issues facing the field and/or Headquarters and developed Action Plans to address each issue. Each group's Action Plan was then refined, formalized, and presented at QIT forums guided by Assistant Secretary Grumbly and Principal Deputy Assistant Secretary Richard J. Guimond. The Action Plans were extensive, required implementation over time, and contained actions that applied to specific Operations Offices. Due to implementation requirements, a decision was made to develop a new mechanism to follow through on needed improvements—the EM Corporate Forum.

Corporate Forum

As the QIT Action Plans were considered, it became evident that a more permanent forum would be needed to continue to explore management actions and to implement the proposed actions over a longer period of time; consequently, the Corporate Forum was established. The Forum, headed by Mr. Guimond, consists of senior representatives from the field and Headquarters. It is responsible for addressing major issues that affect the EM program, defining the responsibilities of field and Headquarters offices, defining the accountability of senior managers for accomplishing EM Strategic Goals, and directing other related activities.

Risk-Based Prioritization

EM's early program/project management culture was based upon showing results at any cost and gave little consideration to a risk-based methodology to prioritize environmental actions. Both the field CQMA's and the PPS suggested the use of such prioritization to ensure that cost-effective and technically effective methods were used by program/project management. EM's Six Strategic Goals also call for risk-based strategies associated with managerial and financial control.

EM is using risk-based decision making in its budget process and in the implementation of its program. The challenge of risk-based decision making is to integrate risk-assessment methods and cultural and social values to produce meaningful priorities. EM is improving a framework to incorporate risk into the budget process and to link risk, cost management, budget, and compliance requirements. A draft report to Congress, *Risks and the Risk Debate: Searching for Common Ground*, "The First Step" is one of several reports that, collectively, will provide the technical, environmental, economic, and social analyses needed for the nation to debate and decide how fully, how quickly, and how costly it will be to stabilize and clean up the environmental damage incurred during the Cold War.

Cost Management Conferences

The need for free-flowing communication between field and Headquarters and among field organizations was recognized early in EM's efforts to instill a cost-conscious culture. In October 1993, EM held its First Annual Cost Management Conference. The 2-day conference was attended by about 100 people and some 20 technical papers were presented. The Second Annual Cost Management Conference was held in December 1994 and was attended by approximately 200 people who benefited from the 40 technical papers presented and the poster sessions included in the conference program. Participants considered the conferences a success and a demonstration of EM's continuing commitment to support the exploration and communication of new or improved cost management tools and techniques.

Other Initiatives

The cost management initiatives were encouraged by the Assistant Secretary. Many EM offices have addressed cost management, and EM has worked with other DOE organizations and other Federal agencies to improve cost management. The following sections are illustrative of, and discuss some of the more significant, cost management initiatives.

Benchmarking

Headquarters and field sites have recently completed—or are still conducting—many benchmarking activities. There is even an EM benchmarking clearinghouse accessible through the EM Homepage. EM-40 conducted a successful RI/FS Benchmarking. The Office of Waste Management and the Office of Environmental Restoration conducted a joint Benchmarking for Cost Improvement effort.

Field Management

The Office of Field Management (FM) has played an important role in improving cost management in EM and throughout DOE. the Office of Infrastructure Acquisition Services (FM-50), for example, organized an independent cost estimating (ICE) team that developed the 1992 *EM Five Year Plan ICE*, the most comprehensive analysis of the cost and schedule of all EM projects at the time. EM is a member of the Committee on Cost Methods Development (CCMD), which is led by FM. The CCMD sponsored many cost management activities at its meetings (February and November 1994 and August 1995).

Cost Reviews

In 1991, both the Office of Waste Management and the Office of Environmental Restoration conducted Program Cost Reviews as part of their internal budget validation process. In 1993, the U.S. Army Corps of Engineers reviewed all activity data sheets. These reviews confirmed what other reviews and assessments found: programs and projects were characterized by poor scopes, poor cost estimates, not enough accurate information to allow prioritization or to determine the effects that changes in budget would have on cost or schedule.

CQMAs looked at cost- and schedule-estimating processes; the PPS compared the cost and schedule of a sample of EM programs to similar programs of other Federal agencies and private-sector organizations. The data obtained in those two undertakings are important, and the recommendations based on the data are helping both Headquarters and the field improve their cost management. But more complete, more detailed information on the scopes, costs, and schedules of all EM programs and projects is required.

Policies, Procedures, and Guidelines

Effective cost management is possible only if clear, concise, comprehensive procedures are in place that implement equally clear, concise, and comprehensive policies. Over the past few years, DOE has been reviewing many of its policy-level documents, particularly DOE Orders, with a view toward simplifying them and ensuring they contain only policy statements and do not attempt to be procedural (i.e., implementation) documents. EM corporate guidance and procedure documents are being developed to help implement policy. Among the documents most relevant to cost management are:

- *EM-CAT Handbook*
- *Five-Year Plan Guidance*
- "EM Policies on Cost and Schedule Estimating and Analysis"
- *ABC Cost Estimating Guide*
- Guidance issued by Project Management Working Group.

Within the past few years, all sites have written (or rewritten) their cost management and budget development policies, procedures, and guidelines to ensure that they conform to all appropriate DOE (and other Federal) guidelines and with good cost

management practice. Standard operating procedures and, where appropriate, training programs are being developed to foster consistent implementation. At several sites, particularly those that have acquired a new prime contractor, many of these documents are in draft stage. Even at those sites at which the documents are still in draft stage, the draft policies, procedures, and guidelines are being followed.

Cost and Schedule Estimating Guide

A *Cost and Schedule Estimating Guide* was developed by the Office of Waste Management (EM-30) to introduce the application of the Activity Based Cost (ABC) estimating process to support the Waste Management (WM) operations cost data included in activity data sheets (ADS). The *Guide* was published in September 1993 and was accompanied by training sessions conducted at all of the Operations Offices to explain ABC estimating for WM operations. ABC provides the operations managers on site the ability to analyze process costs in detail. This permits the evaluation of all aspects of the process to identify cost drivers where the greatest cost savings may be realized. An advanced training program that includes a detailed, hands-on workshop on the ABC estimating process and a workshop that critiques ABC estimates and focuses training on weaknesses identified in the critique have been developed and are available to all Operations Offices and their contractors. The use of ABC for WM operations was recently endorsed by EM-30 in a memorandum to Operations Office managers.

To test the *Cost and Schedule Estimating Guide*, EM-30 conducted a pilot study on the operation costs of the K-Basins at Hanford. A study team composed of Headquarters (HQ) and site personnel reviewed the K-Basins ADS estimate and then applied the ABC estimating process to determine what differences would occur using ABC compared with the traditional level-of-effort estimating techniques. The study indicated that the discipline and detail of the ABC process provided more accurate estimates. In this case, the ABC estimate for the K-Basins operations was \$1.8M less than the estimate prepared based on level of effort. The study also showed that, while initially more time must be expended to develop an ABC estimate, the time required will decrease as experience is gained and ABC historic cost databases are developed.

Baseline Guide for Waste Management Operations

The Baseline Working Group was chartered in August 1994 to develop guidance for preparing and managing Waste Operation Baselines. All Operations Offices and the Office of Program Integration were represented on the working group. Existing Operations Office baseline policies were reviewed and used as a basis for the HQ *WM Operations Baseline Guide*. The *Guide* outlines a systems approach for developing an operations baseline and addresses all aspects of program baseline management—formulation, execution, and evaluation. This holistic approach to baseline management was not contained in any single Operations Office policy. The *Guide* was issued by EM-30 in June 1995.

The *Guide* is a major step in achieving management and financial control over WM operations. The *Guide* is intended to assist Operations/Field Offices in developing and managing baselines. It is not prescriptive but presents an operations baseline process that identifies the HQ expectations for operation/field baselines. The Baseline Guide Working Group has also identified the need for integrated site baselines that consider the WM life cycle from anticipated waste production (by others) through disposal.

CURRENT STATUS

The status of EM's cost management has improved in 4 years. Through the support of senior management, EM has succeeded in motivating both field and Headquarters personnel to raise, explore, and answer questions concerning cost and schedule management. Changing the culture of a major organization is not easy, nor are results expected quickly. But there have been indications in the past 2 years that progress is being made.

Better Cost and Schedule Management

Exhibit 2 compares the results of the two rounds of CQMAs. It shows significant increases in compliance with the cost management POCs, which indicates a significant effort by each office to change and/or restructure its cost management practices. Exhibit 2 also demonstrates that a cost-conscious culture has begun to take root. Each site has made an effort to complete its *Action Plan* and changed its cost management approach. The results are greater productivity and more efficient use of resources.

Cost Analysis

The need for defensible cost estimates has led to the development and increased use of computerized cost-estimating models. The environmental management life cycle of nuclear contamination goes through several complex phases and extends over many years. This makes estimating both more difficult and more important. Better cost and management data analysis tools mean that managers and cost estimators can develop more reliable program/project estimates and can perform better, more useful analyses, which should result in more cost-effective decisions. Presentations at the Second Annual EM Cost Management Conference made it clear that the field has taken the initiative and is developing cost models and analytical techniques to help meet its cost management responsibilities.

DOE participates in the Interagency Cost Estimating Group (ICEG) along with other Federal agencies including the U.S. Army Corps of Engineers, U.S. Navy, and the U.S. Air Force to develop the Historical Cost Analysis System (HCAS), a database of historical (i.e., actual) environmental restoration costs that can be used to develop cost estimates. In addition, the ICEG issued Remedial Investigation/Feasibility Study work breakdown structure for use with HCAS was issued in September 1994.

DOE, particularly EM, has supported the development of several other cost-estimating tools and models including MCACES, HAZRISK, and RAAS.

Use of the *CQMA Field Handbook*

The *Handbook* was designed to guide the CQMA process and to ensure that the assessments were made under the same guidelines at each EM site. In addition to the POCs, the *Handbook* includes procedures and checklists and, as appropriate, explanations of the criteria. This *Handbook* is an excellent EM tool because it presents the Federal requirements for cost management in a single document.

Initially, sites reacted with shock to the *Handbook* because they realized they would not meet many of the POCs. However, after working with CQMA review teams, personnel at many sites realized that the *Handbook* also represented a guideline for the development of good cost management processes. More than 1,500 copies of the *Handbook* have been distributed to DOE organizations, most at the request of EM and contractor personnel. The Fernald Area Office and the Oakland Operations Office have adopted the *Handbook* as its guide to better cost management, and the Chicago Operations Office used the *Handbook* as a guide to conduct a site self-assessment—further evidence of the value-added of the *Handbook*.

ACHIEVING MANAGERIAL AND FINANCIAL CONTROL

One of EM's Six Strategic Goals is to establish a system that is in managerial and financial control. Placing both managerial control and financial control in a single goal statement emphasizes the point that cost management does not take place in a vacuum. Regardless of how cost-conscious personnel may be, regardless of how well cost estimators are trained, regardless of the quality of estimating and analysis tools, effective cost management can be attained only if it is integrated into all aspects of organizational behavior. But what does that mean? What are the characteristics of an Office of Environmental Management in which cost management is fully integrated into the organization? And what is the outcome of such integration?

An organization that is in managerial and financial control is one in which the traditional line between managerial information and financial information becomes less distinct; managerial and financial information are integrated for analytical purposes. The results of the analyses are shared among all organizational levels. The managerial and financial functions at all organizational levels also are integrated to the extent that, as personnel at each level perform their functions, the output (i.e., results, including the data collected/generated) at each level serves as input to the others.

In an EM that is in managerial and financial control, Headquarters identifies the expectations and results of the national EM Program and provides guidance to the field while Field Offices determine how work should be done. Personnel at each level always keep the goal of managerial and financial control in mind as they perform their respective tasks. The entire decision-making process constitutes a feedback loop, with each step—developing the *Strategic Plan* and Implementation Plans and the day-to-day management actions carrying out the plans—providing data analyses to each level to improve the results of the process.

EM's *Strategic Plan* establishes the long-range objectives and priorities (identifies the expectations and results) of the Environmental Management program. In developing the *Strategic Plan*, senior managers are guided and, in many cases, constrained by external factors, among them budget trends, congressional mandates, environmental laws and regulations, and agreements with States. In addition, the managers consider internal factors. Analyses of performance measures of completed and ongoing programs/projects provide information on progress made, cost drivers, impediments to progress, efficiency, and other relevant concerns. The results of the analyses are used as one set of inputs as objectives and priorities are revised.

Many other documents are required to guide the execution of the *Strategic Plan*, among them are policies, procedures, Implementation Plans, and programmatic guidance documents. EM personnel who develop these documents also depend on the analyses of performance measurements to provide the data necessary to determine which policies and procedures are effective (and, therefore, should be continued) and which are ineffective (and need to be replaced or revised). Analyses of progress provide the information needed to reevaluate

priorities, revise schedules, and identify potential problems early enough to address them before they negatively impact short- or long-term goals. Financial control, therefore, cannot be achieved without effective performance measures. Analytical results also help identify what resources (e.g., cost models, automated systems, training) Headquarters should develop to help improve performance at Headquarters and in the field.

Another characteristic of an organization that is in managerial and financial control is that program/project personnel use performance indices to make day-to-day decisions as if they were business managers. As they work to meet the expectations established and follow the guidance provided, field personnel manage and implement their programs/projects in a businesslike manner and recognize that EM's "customers"—stakeholders, regulators, Congress, the public, and future generations—expect EM to meet its environmental responsibilities efficiently, effectively, and economically. To ensure that this expectation is met, performance measures are used both to assess the progress of programs/projects and to evaluate the effectiveness of management decisions. Again, the analyses of the results of the performance measurement are used to improve the quality of both the EM decision-making process and the results of that process.

The outcome of integrating and sharing data and analytical results is an organization that measures progress against goals and adjusts its behavior accordingly. Such an organization is in managerial and financial control.

Over the past 4 years (1991–1995), EM has begun building an organization that fits this description, an organization that is in managerial and financial control. EM will continue its efforts by both reinforcing the foundation and building upon it.

REINFORCING THE FOUNDATION

EM is working with the field to strengthen the foundation created by the initiatives described in this document. EM HQ will provide technical assistance, conduct independent cost reviews (ICRs), and provide forums for sharing lessons learned. On request, EM HQ will help sites assess the defensibility of their priorities.

Technical Assistance

EM's cost management initiatives have created a reservoir of cost management resources—including human resources—and capabilities that can be used to support and accelerate the improvement in the field. EM support activities are being developed to help the field improve its cost management capabilities. EM's cost management support activities will focus on assisting Operations/Field Offices build cost management expertise and to use that expertise to improve program/project management.

Self-Assessments

Self-assessment is a process through which the organization examines the way it does business and adjusts its practices to improve itself. Many sites have recognized that

self-assessment, an integral part of Total Quality Management, can help improve the cost-estimating process.

EM will continue to update the *CQMA Field Handbook* and provide copies to the field. Changes to the *Handbook* will include changes in format to make it more user-friendly and changes in the POCs required by new regulations and policies or by factors such as automating processes (e.g., performance tracking, new contract types). EM also will provide assistance to sites conducting cost management self-assessments and provide training to Operations/Field Offices where cost management self-assessment activities are being initiated.

Cost Estimating

Cost estimating is a fundamental component of the program/project process. Realistic cost estimates are required for management to gain managerial and financial control of the EM program. The estimating process usually raises questions about program/project activities, which when answered, improve management's understanding of the project as well as the cost estimate.

EM's initiatives to improve this process are focused on increasing the number and improving the technical capabilities of cost-estimating personnel. EM's environmental operations have long, complex life cycles and are concerned with toxic and nuclear materials that require complex and often hazardous activities. Estimating the cost of these activities usually requires special techniques for different phases of the project's life cycle and an understanding of the technical and engineering aspects of the project. EM plans to provide on-site training and assistance in cost-estimating techniques to field personnel to assist them in learning new and appropriate cost-estimating techniques and procedures.

In 1995, EM began an aggressive effort to promote the use of Activity Based Costing (ABC). A major tenet of ABC is to assign cost professionals to task teams. (Appendix A contains an example of the application of ABC at the Richland Operations Office.)

Cost Analysis

One of the positive results of EM's increased emphasis on better cost management was the recognition of the need for basic management systems that institutionalize benchmarking and management system analysis and look at higher level issues on a program-wide basis. EM is using many analytical techniques to reveal trends, project cost, and assess project cost and schedule performance, integrated program-wide performance, and budget and milestone completion.

Independent Cost Reviews

An ICR is a valuable project-management tool because it is an independent validation of the planning and the reasonableness of estimates. Increasing the availability of ICRs to program/project managers will assist the Federal managers to develop better understanding of project plans and cost and schedule estimates. EM also supports the use of ICRs as a

diagnostic tool to reestimate the remaining cost and schedule requirements of ongoing projects. EM plans to provide an increased level of ICR support to the field.

Forums for Sharing Lessons Learned

Field personnel are working diligently to improve their cost- and schedule-management capabilities. As new ideas and techniques are developed, there is a need to ensure that these ideas are transmitted to others. The sharing of lessons learned can be facilitated and accelerated by support from Headquarters. On-the-job training, technical cost bulletins, cost management conferences, formal training, and on-site inquiries are only a few of the methods that will be used to improve the cost management capabilities of field personnel.

These forums will improve the technical capabilities of program/project managers and their supporting cost management teams. As cost management capabilities improve, managers will rely increasingly on cost and schedule data and the ability of those data to assist in the analysis of environmental activity. By ensuring that lessons learned are shared throughout the field, EM Headquarters will serve as a catalyst in changing the way cost management activities support field program/project managers.

BUILDING ON THE FOUNDATION

The next steps EM intends to take in creating a cost-effective organization are to institutionalize risk management in decision making, integrate cost and program management by improving cost-data collection and reporting and incorporating them into performance measures, and continue to redefine and reinforce the field/Headquarters partnership.

Managing Risk

As EM's responsibilities for managing sites and protecting the environment and the health of the public, including workers, continue to grow and its budget (in both real and nominal dollars) is reduced, the need is even greater to develop resource allocation priorities based on sound cost-effective and other economic and technical principles. Tools being developed for setting priorities and managing the health, environmental, and other risks in the EM system should include economic, technical, and cost-effective analyses.

Economic Analysis

EM will continue to concentrate on eliminating areas of urgent and critical risk in the system by maximizing the amount of human health and environmental risk-reduction benefits achieved in relation to the economic impact on society. Optimally, risk-reduction benefits will, in each case, exceed (or at least be equal to) program dollar costs. DOE expects selection of the most cost-effective solutions to eliminate risk while conforming to laws, regulations, and site-specific agreements. EM will balance understanding the types and levels of risks posed to human health and the environment against the availability of technology and the costs to manage the risks. Consequently, EM will stress economic analysis when furnishing policies and other guidelines.

Technical and Related Analyses

Technical, cost, and schedule risk analyses are requirements of proper cost management. These analyses involve risk identification (i.e., determining factors or conditions that may affect the reliability or capabilities of technology or other technical, cost, and schedule objectives), risk assessment (i.e., estimating the probabilities of different outcomes for identified risk factors or conditions), and risk control (i.e., developing methods to avoid or mitigate risk and produce desired technical, cost, and schedule outcomes). When appropriately performed, such risk analyses can ensure the selection and application of the most cost-effective technology among alternatives for satisfactorily managing both radioactive and nonradioactive waste. EM will provide guidelines, training, and technical assistance to help the field incorporate technical and analytical tools into its cost management activities.

Integrating Cost Management and Program/Project Management

Cost management should not be separated from program/project management because program/project management cannot be effective without good cost management. To integrate the two requires that actual project data be collected, stored, and reported and that actual costs be incorporated into analysis of program/project performance measures.

Improving cost-estimating tools and procedures also requires the collection and reporting of the actual cost of operations. Comparison of actual costs to estimated costs is a crucial step in project management. The essential link in this comparison is the Work Breakdown Structure (WBS), which is a product-/deliverable-driven tool used for program/project management and, therefore, may be tailored to individual program/projects needs. Costs associated with each element in the WBS need to be reported under a Code of Accounts (COA), which must be the same from project to project and across all sites. It is this uniformly reported cost data that allows actual costs to be meaningfully analyzed for use as a cost management tool.

EM's approach to cost measurement and comparison depends on accurate reporting of cost, schedule, and milestone performance directly from the sites. This reporting allows senior managers to compare, site-by-site, the cost and work being performed and to identify cost-effective performance and productivity and efficiency improvements. This information will allow EM to shift work based on performance, cost controls, and savings to meet congressional and programmatic objectives and budget constraints.

For EM's program/project managers to manage cost properly, they must have cost reports that convey an accurate picture of the current status of the project. Program/project cost reports must link actual cost, productivity, and related performance indices that form the initial basis for project analysis. Inclusion of cost estimates as an integral part of project reports also allows the project to be viewed in its entirety.

The ability to compare actual cost to estimates is a powerful management tool. Therefore, part of EM's planned cost management initiatives is to partner with the field in capturing costs, retaining cost data, and reporting cost information. EM will work to ensure that cost data are compatible for all programs/projects on a site and among sites.

Performance Management

The EM program/project manager must understand and support corporate performance indices and their results to reach a comfort level with the cost and schedule reports that provide the basis for improved management decisions that enhance performance.

Program/Project Cost Reports

Cost reports are one of the manager's principal tools. Improving project cost reports by adding properly developed cost estimates, highlighting variances and performance indices, and ensuring timeliness will greatly assist program/project managers and has the potential to improve project performance. Cost reports will give early warning of potential problems and increase the accountability of managers to take early actions to get the program/project back on track.

Program/Project Cost Analysis

Capturing and reporting program/project data permits a variety of management systems analyses. Such analyses are valuable whether a program/project is going well (i.e., on schedule, on budget) or poorly (i.e., over schedule or budget). In either case, performance measures based on actual, successful operations are superior to measures based on estimates, regardless of the number of projects estimated.

Applying cost analysis to areas of operations that are going well permits identification of the reasons for success and helps managers repeat the successes in other (areas of the) programs/projects.

Cost analyses that focus on areas where performance has not met the estimates also is valuable because it identifies underlying causes of poor performance and helps managers identify the causes of, and in some cases correct or mitigate, poor performance.

The Field/Headquarters Partnership

The Headquarters partnership with the field is based on the organizational policy ("EM Roles and Responsibilities") that places increased responsibility for environmental project/program work with Operations/Field Offices. The August 1995 Headquarters reorganization is based on the new roles and responsibilities and is intended to facilitate the field/Headquarters partnership. EM is applying DOE's Lessons Learned Program standard (May 1995) to detect and disseminate valuable cost- and project-management techniques across the organization.

EM's objective is to build on the foundation its cost management initiatives have created. EM will improve program/project performance by addressing corporate issues such as prioritization, future land use, benchmarking performance, program duration, lack of technical remedies, and a host of key questions that affect the cost of the program. EM is beginning to present this information in its stakeholder meetings, budget development process, contracting strategies, performance measurement activities, and management systems analysis. Efforts to establish consistent ways to track cost and schedule data, link physical measures or milestones to cost and schedule performance, conduct trend analysis/forecasting, and make continuous refinements will be paramount for EM to be successful.

CONCLUSION

Environmental management of contaminated DOE facilities and sites is a relatively new and challenging technical activity. EM has made a good start in instilling a cost-conscious culture in its organizations. However, there is much still to be done, and EM accepts the challenge of increasing its cost management expertise and improving its project performance.

The initiatives carried out since 1991 demonstrate that the field is eager to improve its performance. When cost management and analytic tools are provided, field personnel use them. When these tools are accompanied by clear, consistently delineated expectations, the field will deliver desired outcomes.

Our plans to build on the foundation we have created can be successful only if we plan for success. The plans must be fully supported by senior managers at HQ and in the field and can be achieved only if they continue to be undertaken as cooperative efforts—between Headquarters and the field, between program/project managers and their cost management support.

Our goal is to continue to work cooperatively to implement systematic cost and management analysis by identifying and developing good cost management tools for use at HQ and in the field, to provide the field with the technical assistance it needs to use those tools effectively, to provide forums for sharing information, and most importantly, to help integrate cost management with program/project management.

APPENDIX A: FIELD INITIATIVES

This report has focused on cost management initiatives sponsored by Headquarters organizations of the Office of Environmental Management. Many initiatives have originated in the field. Representative field initiatives are described below.

CHICAGO OPERATIONS OFFICE: COST SAVINGS PROGRAM

The Chicago Operations Office (DOE-CH) instituted a formal Cost Savings Program. EM project managers are responsible for identifying cost saving/avoidance and opportunities for productivity improvement. Savings are formally identified against the baseline and implemented through a change control system. Cost-savings commitments are part of the performance evaluation criteria of Federal personnel.

EM personnel at DOE-CH receive training—traditional classroom sessions, video, supplemental training materials—on the Cost Savings Program. Technical guidance establishes fiscal-year cost saving/avoidance targets.

Savings commitments are continually tracked, trended, and evaluated by a team responsible for monitoring and evaluating other areas for savings. The savings already identified by the Cost Savings Program demonstrate its viability and validity.

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT: INTEGRATED PROJECT CONTROL SYSTEM

All DOE sites have automated project management to some extent, but the systems suffer from one or more of the following problems:

- Multiple systems on a site are incompatible.
- System(s) do(es) not provide information in a timely manner.
- Cost management and schedule management systems are not integrated.

An integrated Project Control System (PCS) has been developed and implemented at the Fernald Environmental Management Project. An open-architecture approach to systems development and thorough requirements analysis resulted in a system that provides near-real-time, two-way data transfer between the PCS and all related systems. The careful requirements analysis eliminated redundant systems and redundant input.

All information that relates to the Performance Measurement Baseline emanates from a single source. This has led to a significant gain in the ease and speed with which reports can be prepared.

Perhaps most important, the PCS integrates cost and schedule information at the activity/resource level. The PCS is efficient, provides a reliable, two-way flow of data, and provides management with a tool to control program/project scope, cost, and schedule.

IDAHO NATIONAL ENGINEERING LABORATORY: TRACK 1/TRACK 2 PROCESS

The Idaho National Engineering Laboratory (INEL) developed the Track 1/Track 2 process to assess the need for a Remedial Investigation/Feasibility Study (RI/FS) to reduce both the time and cost requirements for completing the RI/FS of a project.

By working with the State of Idaho and the Environmental Protection Agency, INEL has—in many cases—demonstrated that an RI/FS, frequently a 36-month process, was not necessary before commencing clean-up activities. In point of fact, most cost savings come from a determination that no further action is required.

Sites for which a full RI/FS are not required are categorized as either Track 1 or Track 2. The evaluation of a Track 1 site is primarily a paperwork study and usually takes only 6 months to complete. A Track 2 site requires only a minimal sampling effort and may take up to 18 months to complete.

A significant portion of the cost savings attributable to the Track 1/Track 2 process is a result of a determination that no remedial activity need be taken. In addition to allowing clean-up activities to begin 18–30 months sooner, both the Track 1 and the Track 2 evaluations are significantly less expensive than an RI/FS.

KANSAS CITY PLANT: REBUILDING RELATIONSHIPS WITH REGULATORS

The Kansas City Plant (KCP) has worked hard to rebuild its relationships with regulators and has now established an excellent rapport with them. This rebuilding of trust allows KCP to negotiate with, and obtain approval for alternate approaches from, the regulators. The new working relationship has proven to be cost beneficial. For example:

- Five Corrective Measures Studies were incorporated into a single comprehensive document with an estimated cost avoidance of \$1M.
- \$25,000 was spent on sampling and analysis to determine whether the extent of soil excavation could be reduced. The resulting data supported a Corrective Action that saved \$2.2M compared to the Corrective Action that would have been required.
- Resource Conservation and Recovery Act Facility Investigations (RFIs) are conducted concurrently whenever feasible. This practice has already resulted in a cost savings of \$200,000.

- Preparing RFI reports in-house instead of relying on contractors has reduced annual contractor costs by some \$200,000. The lack of attention to overall program/project activities has led to problems in the use of resources.

NEVADA OPERATIONS OFFICE

Integrated Performance Measurement System

The EM offices at the Nevada Operations Office (DOE-NV) implemented an integrated Performance Measurement System (PMS) to manage and control work assigned to its three component groups. The PMS is a major step in meeting the Strategic Goal of attaining managerial and financial control of EM programs.

The PMS, developed using commercial, off-the-shelf, project-management software (significantly less expensive than developing new software) handles programs/projects with life cycles of 30 years or more. To ensure that the PMS would be an *integrated* performance measurement tool, DOE-NV standardized baseline planning, tracking, measuring, and control. The PMS was developed at the lowest work breakdown structure (WBS) level used by DOE-NV contractors and rolls up earned-value data through WBS levels to report at the level required by DOE, division, and the Assistant Manager for Environmental Management. Although the PMS is not fully mature, and training is not complete, data quality, cost reduction, and resource productivity initiatives have been integrated into EM's day-to-day operations at DOE-NV.

Monitoring Well Study

A Monitoring Well Study was performed for the Nevada Operations Office (DOE-NV) Underground Testing Area by EM-24. The study identified potentials for cost savings, which DOE-NV is implementing. Four key areas were called out as providing the greatest opportunities:

- Grouping technical objectives for each monitoring well and determining the cost drivers on the basis of the technical objectives, ER may be able to reduce the cost of each well from \$2M to \$800K.
- Using a technical working group comprising a representative from each contractor, instead of involving multiple technical parties in decision making, will reduce both cost and schedule.
- The personnel costs of operating monitoring wells 7 days a week instead of 5 are more than offset by the costs and time delays of shut-down and start-up.

Comparing the cost of modifying an existing monitoring well to that of drilling and constructing a new well allows DOE-NV to select the more cost-effective approach.

Cost Estimating

DOE-NV has taken significant steps to improve cost estimating. A cost-estimating guide has been developed for Environmental Restoration and Waste Management (ERWM) programs at DOE-NV. The Round II CQMA team was so impressed with the guide that it recommended that the guide be made available for use throughout DOE.

ERWM formed a cost-estimating group (CEG) in April 1992. The CEG prepared independent cost-estimate reviews covering 90% or more of applicable activity data sheets for ERWM projects and tasks in FY 1992 and FY 1993. The CEG developed check lists for estimating cost of environmental projects and facilitated training in environmental cost estimating for those with experience was in construction cost estimating.

OAK RIDGE OPERATIONS OFFICE: TASK-ORDER INCENTIVE PROJECT CONTRACTING

The Office of Environmental Management at the Oak Ridge Operations Office (ORO) has developed and implemented an innovative method—task-order projects or Environmental Management Program Integrating Contractor (EPIC) projects—for managing environmental restoration projects. The project management technique significantly reduces costs by incentivizing contractor performance while streamlining and consolidating requirements using Standard Requirement Identification Documents. A performance incentive fee is awarded quarterly during the life of the project. At the end of the project, a percentage of a prenegotiated maximum incentive fee, based on the amount saved and other performance indicators, is awarded. However, if the final cost exceeds the target cost, the incentive fee is reduced and may eventually become a prenegotiated maximum penalty.

All environmental projects above \$2M will be task-order projects; as appropriate, smaller may be designated task-order projects. One EPIC project has been completed; four are ongoing; and thirty others are in the planning and proposal stages.

Results of this contracting mechanism include improved project management oversight and reduced costs. The percentage of project-management costs for EPIC projects has decreased from approximately 15% to 8.5%, a reduction attributable to the incentive approach. The task-order method reduces reporting requirements, combines schedules, consolidates estimates, collocates the project team, motivates the project team to increase efficiency, reduces construction-engineering oversight, and ultimately reduces overall project cost and schedule.

RICHLAND OPERATIONS OFFICE

Value Engineering Studies

The number of value engineering (VE) studies completed at the Richland Operations Office's Hanford site and the cost savings realized from those studies have steadily increased since the inception of the VE program in 1989. In just the first 4 years of the program (i.e., by the end of FY 1993), the cumulative, documented cost savings/

avoidance was \$407M; the cumulative cost to conduct the studies was \$6M. Preliminary figures for later years indicate that Hanford continues to realize similar results.

An example of a recent VE study yielding immediate cost savings and long-term cost avoidance is the study performed on the Decontamination Laundry Service. The VE study demonstrated that it was feasible to contract the service to a commercial firm rather than construct a new \$24-million facility. The cost avoidance over the next 20 years is projected at \$80M.

Hanford, in conjunction with DOE/HQ, is promoting VE on site and throughout DOE. It publishes articles in the *Hanford Reach* and conducts local and national presentations to both public and private sectors.

Business Quality Improvement Team

Richland realized tens of millions of dollars in savings in 1995 through a series of actions to instill best management practices. RL, working with its management contractor, reexamined technical processes, organizational structure, ER culture, contractor relationship, and business-management practices. On the basis of that examination, changes were made in the way business is conducted.

A Business Quality Improvement Team (BQIT), consisting of DOE and contractor personnel, was chartered to "Improve the way the Hanford Site does business through fostering implementation of cost-effective commercial practices that reduce costs and increase efficiencies in support of the Hanford clean-up mission." Some items reviewed were small (e.g., buying signs commercially rather than producing them in-house); others were large (e.g., complete review of the Project's radiation protection services). In FY 1995, the BQIT had documented savings of \$11.9M; another \$5M in FY 1995 savings is anticipated.

DOE-RL also motivated the ER contractor to achieve cost savings by redirecting efforts toward fixed-price contracting, privatization, and competitive pricing; providing incentives that share cost savings; and making productivity savings a part of the performance fee evaluation. In response, the contractor was able to achieve productivity improvements of more than \$33M—in a \$230M-project—in FY 1995.

Other improvements made in 1995 will pay dividends for many years. A redesign of the ER Disposal Facility to "right size" the facility and apply commercial practices reduced the life-cycle cost by more than \$90M. For the longer term, the Richland ER Project performed a complete review of the baseline and reduced the estimated total cost of the project by more than \$3B.

Activity Based Costing

Activity Based Costing (ABC) is a method for developing cost estimates in which a project is subdivided into discrete, quantifiable activities or work units. Each activity must be defensible and productivity must be measurable in units (e.g., number of samples per

man hour). A cost estimate is then proposed for each activity. The individual estimates are summed to produce the overall estimate. Contingency and escalation factors can be calculated for each activity or as a total for all activities. One important component of the ABC methodology is the use of cost professionals on task-teams.

In FY 1995, Richland established an ABC process to significantly improve cost estimate validity. This action was taken in response to two sets of findings. In August 1994, the Office of Infrastructure Acquisition Services (FM-50) conducted an Independent Cost Assessment of Tank Waste Remediation System (TWRS) and concluded that the quality of the estimate was marginal. In February 1995, the EM-36 *TWRS System Requirements Review Report* state that "The *Multi-Year Work Plan* [MYWP] is not an adequate cost estimate for the TWRS program. . . . [T]he MYWP does not define work scope adequately for its cost estimates."

In March 1995, management decided that all Hanford budgets would be required to be based on ABC. The Deputy Assistant Secretary for Waste Management, calling ABC "a powerful tool" endorsed the use of the methodology by Richland staff and the M&O contractor.

In moving to ABC, Richland took other steps to enhance its estimating. These include:

- Moving from an organizational basis to a product or task basis
- Improving scope definition
- Producing an estimate document for each program
- Encouraging management reviews of estimates
- Using proven estimating software.

The use of ABC within this new environment will continue to be vigorously applied in FY 1996. Richland expects ABC to yield significant improvement in cost estimates and provide a sound basis for life-cycle costing.

Managing Indirect Costs

Richland Operations Office has committed to reduce its indirect cost by \$200M by the end of FY 1996. By the end of FY 1995, 9 months after the commitment was made, Richland had met 61 % of its goal, incurring \$123M less in indirect cost than it had in FY 1994. Continuing efforts to reduce indirect costs will rely heavily on ongoing reengineering efforts at two major contractors, Westinghouse Hanford Company and Battelle Pacific Northwest Laboratory.

To gain management control of indirect costs, Richland program managers have been assigned to each indirectly funded activity so that the costs are managed in the same manner as they are in programs. In addition, Richland established an Indirect Management Team (IMT) within the Office of the Chief Financial Officer to manage indirect costs for the Hanford Site. The IMT has established written procedures and guidelines for developing and executing indirect cost budgets. These include:

- Management Plan to set indirect costs at appropriate levels. The levels require review and approval by Federal and contractor senior program managers.
- Procedures to review and approve contractors' planning and execution of indirect cost rates.
- Monthly report to track all indirect costs and variances between accumulated and distributed costs as well as between budget and actual costs.
- *Indirect Cost Reduction Plan* to achieve senior management's commitment to reduce indirect costs.

ROCKY FLATS FIELD OFFICE: ER 2000 PROGRAM

The Rocky Flats Field Office (RFFO) instituted an ER 2000 program that includes presenting proposals to stakeholders, informing them about the direction of the ER program, and providing them an opportunity to express their concerns and make suggestions early in the planning process. ER 2000 presentations also provide ER with the opportunity to respond to the stakeholders. The early briefings encourage stakeholder buy-in, encourage an atmosphere of cooperation, and foster mutual understanding, all of which are helping to rebuild trust among the participants.

Obtaining stakeholder support early will prevent costly, time-consuming changes to program/project scopes and consequent schedule delays and should help avoid the even costlier and more time-consuming law suits that result when stakeholders are brought into the process too late for their input to be considered.

APPENDIX B:

EM COST MANAGEMENT ACTIVITIES: 1991–1995

As the priorities of the Department of Energy have shifted from production to environmental management, the budget for the Office of Environmental Management (EM) has increased. For example, the EM budget for Fiscal Year (FY) 1991 was \$3.6 B; in FY 1995, the EM budget was \$6B. This increase came at a time of severe Federal budgetary restraints. The combination of increased funding and the need to control costs required DOE in general and EM in particular to place greater emphasis on cost management.

The Cost Quality Management Assessment (CQMA) program was the longest and most comprehensive of the many cost management initiatives that the Office of Environmental Management (EM), other Department of Energy organizations, and the Department itself instituted during 1991–1995. Two other series of initiatives, the Project Performance Study and its follow-ons and the First Annual EM Cost Management Conference and its follow-ons, are direct results of the CQMA. In addition, results of the CQMA were used as input into at least two other initiatives, Contract Reform and the FTE Bid Process. All are briefly described below as are other DOE and interagency cost management activities in which EM participated.

COST QUALITY MANAGEMENT ASSESSMENTS

Assistant Secretary Leo P. Duffy formally issued the **CQMA Charter** and announced the Round I CQMAs in a May 22, 1991, memorandum. Although planning and preparation for CQMAs began in 1990, the time line begins with the May date.

Round Site I CQMAs

Round I CQMAs, which began in July 1991 and ended in March 1992, were conducted at 12 sites (table 1). The Round I CQMAs established a qualitative performance baseline. That is, by measuring site performance against clearly stated Performance Objectives and Criteria (POCs), EM was able to measure the quality of cost- and cost-related activities. The Round I CQMAs gave program, site, and Headquarters managers a comprehensive review of cost-related practices and identified opportunities for managers to formulate strategies, develop approaches, evaluate alternatives, and negotiate options.

Headquarters CQMAs

Headquarters CQMAs were conducted in two phases. Phase I (October 1992–January 1993) was a review of policy, procedure, and guidance documents. Phase II (May–December 1993), which was not completed for all Headquarters EM organizations, assessed performance at the HQ program level.

Round II Site CQMA

Round II CQMA were conducted February 1994–May 1995 at 10 of the sites at which Round I CQMA were performed (table B-1).

TABLE B-1.—Round I and Round II CQMA Schedule

SITE	ROUND I	ROUND II
Chicago	December 9–20, 1991	June 6–17, 1994
Fernald	July 15–26, 1991	March 14–25, 1994
Idaho ¹	February 3–14, 1992	September 19–30, 1994
Kansas City	March 16–27, 1992	August 22–September 2, 1994
Los Alamos ¹	August 19–30, 1991	²
Nevada	August 15–29, 1991	February 7–18, 1994
Oakland (formerly San Francisco)	March 16–26, 1992	October 17–28, 1994
Oak Ridge ¹	July 15–25, 1991	April 24–May 5, 1995
Pantex	July 15–26, 1991	²
Richland ¹	February 3–13, 1992	August 15–26, 1994
Rocky Flats	March 16–26, 1992	March 5–17, 1995
Savannah River	February 3–14, 1992	April 24–May 5, 1995
¹ During Round I, EM-50 cost management activities at this site were assessed subsequent to the assessment of EM-30 and EM-40 activities. Results were contained in a separate report. During Round II, cost management activities for all EM organizations at a site (EM-30, -40, -50, and the newly created -60, were assessed at the same time.		
² This site will conduct a self-assessment.		

Round II CQMA measured cost-related management practices against the same POCs used during Round I. Round II determined that all sites had made significant improvements in all aspects of cost management.

INITIATIVES RESULTING FROM CQMA

The results of the Round I CQMA led directly to two other series of cost management activities.

Project Performance Study and Related Activities

An assumption of the CQMA is that if sound cost- and cost-related management practices are not followed, the cost of doing business will be too high. The Round I assessments indicated that EM activities were not characterized by good cost management, and a separate study was conducted to quantitatively validate the qualitative benchmark established by Round I CQMA's. The **Project Performance Study (PPS)** compared DOE's cost for waste management and environmental restoration activities to the costs of conducting similar programs, over the same time span, for other Government agencies and private sector organizations.

The results of the PPS, issued in November 1993, were so disturbing that the Assistant Secretary called a 2-day **EM-Wide Stand Down** (January 31–February 1, 1994) to emphasize the need for increased productivity and cost effectiveness. Among the results of the Stand Down was the creation of **Quality Improvement Teams** (February 1994) to look at many aspects of cost management. The Quality Improvement Teams have been reformed into the **Corporate Forum** (May 1995).

First Annual EM Cost Management Conference and Related Activities

The Round I CQMA's identified a need for a forum for a site-site and site-Headquarters exchange of information on cost management. EM, therefore, determined to test whether a cost management conference could be an effective forum for that purpose. The **First Annual EM Cost Management Conference** was held in November 1993 and was most successful. The **Second Annual EM Cost Management Conference** convened in December 1994; in terms of the number of participants and the number of papers presented, it was even more successful than the first. The programs of the annual cost management conferences are designed for all cost professionals (e.g., cost estimators, economists, budget analysts) and EM managers. Cost estimators, meeting informally at the second cost management conference, felt that a meeting for Federal cost estimators—and only cost estimators—would be beneficial. The First Federal Cost Estimators meeting was held in March 1995. Participants found the meeting so beneficial that they plan to meet twice each year—once in conjunction with the annual cost management conference and once independently.

INITIATIVES RECEIVING INPUT FROM CQMAS

During the first quarter of calendar year 1993, the Secretary of Energy established a committee to look at **Contract Reform**. The committee, working through subcommittees, looked at all aspects of contracting (e.g., vehicle type, award-fee process, management of contractors) and recommended actions for more cost-effective contracting. As a result of the observations of the Indirect Costs Subteam of the CQMA Team during Round I, a subcommittee of the Contract Reform Committee was established to look at indirect costs.

The results of the Round I CQMA's influenced another cost management initiative. In 1993, the Office of Management and Budget authorized full-time equivalent (FTE) positions for DOE under a program called the Pilot Project for National Performance Review. In return for the new positions, DOE was required to show savings from productivity gains exceeding

the cost of the new FTEs. Based on the observations made during the Round I CQMA's, the Assistant Secretary issued guidance (February 10, 1994) requiring all EM sites participating in the **FTE Bid Process** to include requests for cost professionals. Of the 700 bid-process hires, some 118, nearly 17%, were cost analysts and financial specialists. This figure does not include other cost-related positions such as budget analysts.

OTHER COST MANAGEMENT INITIATIVES

Two actions of the Assistant Secretary for Environmental Management highlight the importance EM places on cost management. In 1993, EM-1 promulgated **Six Strategic Goals**. One of those goals is: "Establish a system that is managerially and financially in control." This goal establishes cost management as a top priority within EM.

In 1994, EM-1 established the **Office of Integrated Risk Management** within the Assistant Secretary's office. Placing risk management, a critical component of cost management, at that level, emphasized its importance.

In October–November 1991, as a Secretarial initiative, an **Interagency Review Group** comprising DOE's Office of Procurement, Assistance and Program Management, the Office of Management and Budget, and the U.S. Army Corps of Engineers, conducted independent cost estimates of some 3,200 activity data sheets supporting the Department's *Five Year Plan*. This activity was designed to ensure that the activity data sheet estimates, which were the basis of budget requests, were reasonable.

Good cost- and schedule-estimating practices begin with good policy. That policy must be clear and concise, must be consistent with governing laws and regulations, and must be updated regularly to recognize new tools and technologies that impact estimating practices. In December 1992, at the direction of the Assistant Secretary, **EM Policies on Cost and Schedule Estimating and Analysis** were issued. Analysts were concerned that policies were clear, comprehensive, and non-overlapping. Additionally, analysts reviewed policies to ensure that they were compliant with those of parent or superseding organizations. Results of the analysis were issued in January 1993.

In March 1995, the *Baseline Environmental Management Report* (BEMR) was issued. The BEMR was prepared to meet the requirements of the National Defense Authorization Act for FY 1994.

In addition, EM can point to **Productivity Improvement Initiatives** including **Government Performance and Results Act** activities, independent cost estimates and budget validations, **Privatization** and other **Contract Reform Initiatives**, and the work of the **Environmental Management Advisory Board Subcommittee on Cost** and the **Federal Remediation Technologies Roundtable**.

Industry Support Experts Forum

The Industry Support Experts (ISE) Forum was instituted in 1992. The objective of the ISE Forum is to assemble a small group of high-level representatives of academia and industry to discuss subjects of concern to EM-30 and enhance the focus and efforts of the Total Cost Management Program. Forum members have a great deal of knowledge and experience in the management of highly technical activities, which has a direct relationship to the problems that confront EM-30. The membership of the Forum can vary as the emphasis of the EM-30 concerns change. EM-30 has conducted three ISE Forums. The first (June 1992) addressed cost and schedule estimating, and the participants made suggestions for improvements in the estimating process and in establishing cost controls. The second (February 1993) Provided feedback on the draft *Cost and Schedule Estimating Guide*, which was incorporated in the final version. The third (January 1994) focused on ABC training, the ABC pilot program, and baselining. The approach and use of these tools in the private sector was compared to EM-30 applications and suggestions for improving their effectiveness in EM-30 were developed.

Cost Collection/Cost Infrastructure Partnership

In October 1994, EM-30 entered into a partnership with the Office of Engineering and Cost Management (EM-24) to investigate the cost estimating processes required to develop Work Breakdown Structures (WBS) and Cost Breakdown Structures that most appropriately describe the Environmental Management (EM) operating processes and allow the collection of costs in an organized manner. Cost drivers will be identified and integrated into the cost-collection process. This will permit EM field sites to make accurate cost estimates for future operations and provide the means to evaluate on-going operations. Coupled with the ABC estimating procedures, this cost collection initiative will provide sound, reliable databases for increasingly accurate cost estimates as well as provide the basis for evaluating the efficiency of operations at EM field sites. Through partnering arrangements, field sites will be involved in the development and testing of this program.

Benchmarking

The Joint EM-30/Office of Environmental Restoration (EM-40) Benchmarking for Cost Improvement Study, completed in September 1993, concluded that benchmarking could be a valuable tool for achieving improved productivity and cost savings. In September 1994, EM-30 commenced development of a guidance document for conducting benchmarking studies at field sites. A pilot test of the guide and its associated training was commenced, in partnership with the Tank Waste Remediation System (TWRS) program at Richland, in April 1995.

The pilot test was extremely successful. A number of process improvements were identified and cost avoidance is expected to be realized when they are implemented. The pilot study benchmarking team partnered with both Department of Energy field sites and a commercial pharmaceutical company. These relationships have resulted in additional sharing of information and process improvements at the partner sites. In addition, the

study had the benefit of strengthening the morale and work effort at the Richland evaporator site, the focus of the pilot study.

Discussions commenced in May 1995 with EM-40 and the Office of Transition and Management (EM-60) on a joint benchmarking study and introduced the possibility of issuing the *Benchmarking Guide* as a joint EM-30, EM-40, and EM-60 document. The *Benchmarking Guide* has been revised to make it applicable to the entire EM program and will be released for field review in late 1995. HQ briefings also will be conducted during that time.

The EM-30 partnership with EM-40, EM-60, and TWRS has expanded to accelerate the use of benchmarking in EM. A field team has been established to provide on-site assistance to organizations embarking on a benchmarking program. The partnership will use the team to support cross-functional benchmarking efforts throughout the complex.

Total Cost Management Program

The EM-30 Total Cost Management (TCM) Program ensures the effective application of cost management practices across the Waste Management complex. This is accomplished through establishing processes which emphasize consistency in estimating, control, and improvement activities. The integrated roles, procedures, and requirements defined by these processes reduce duplication of effort, minimize use of resources, create a team environment, and facilitate coordination.

All elements of the TCM Program are defined based on input from Headquarters and field personnel. This input helps define processes that have the flexibility to work under various conditions. Clear lines of responsibility create an understanding of everyone's role in each process. Headquarters is responsible for leading the development of methods and requirements, providing training, and supporting problems which cannot be solved utilizing standard procedures. The field is responsible for assisting headquarters in developing the processes, performing the work, providing feedback on effectiveness of methods, and input on new requirements.

The TCM framework consists of the following three areas: 1) cost and schedule estimating; 2) program and project controls; and, 3) cost improvement and analysis. Each area consists of elements that are critical to the overall success of the entire program (See Figure 1). Cost estimating is the determination or forecasting of costs, within a defined scope, required to conduct a program. Program and project controls involves directing, controlling, monitoring, and evaluating activities to ensure that established objectives are achieved on time and cost effectively while meeting all quality standards and requirements. Cost improvement and analysis applies various process improvement techniques and financial analysis to minimize costs without sacrificing quality.

Activity based costing (ABC) and Activity Based Management (ABM) is the major attribute underlying the TCM Program. ABC provides a strong basis for the program by quantifying the series of activities directed at producing an output. For cost estimating, ABC helps identify the cost of an activity on a per unit basis in terms of requirements for

resources such as labor and materials. By focusing attention on processes and the relationships between cost drivers, management can more effectively control how resources are being used. ABC also allows identification of ineffective and inefficient utilization of resources which facilitates analysis of opportunities for cost improvement.