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PHASE II
COST QUALITY MANAGEMENT ASSESSMENT REPORT
for the
OFFICE OF
TECHNOLOGY DEVELOPMENT (EM-50)

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

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PREFACE

Cost Quality Management Assessments (CQMAs) are being conducted by the Office of Compliance and Program Coordination, Office of Engineering and Cost Management (EM-24). The CQMA process was instituted by the Assistant Secretary in May 1991 to assess the cost-specific and cost-related practices throughout the Office of Environmental Management (EM). These assessments, and actions such as the Assistant Secretary's memorandum on EM Policies on Cost and Schedule Estimating and Analysis (December 3, 1992), attest to the great emphasis EM management places on being proactive in addressing the opportunities and obligations to achieve EM objectives in a cost-effective manner.

This report presents the results of the CQMA of the Office of Technology Development (EM-50) Headquarters organization. This assessment was conducted at the request of Deputy Assistant Secretary Clyde Frank to evaluate the effectiveness of the current organizational structure in order to compare it to the revised structure about to be implemented. A full CQMA will be performed for the new EM-50 organization when it is fully refined and functional.

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I EXECUTIVE SUMMARY

I.A INTRODUCTION

The Office of Environmental Management (EM) Headquarters (HQ) Cost Quality Management Assessment (CQMA) evaluated the practices of the Office of Technology Development (EM-50). The CQMA reviewed EM-50 management documents and reported results in the HQ CQMA Phase I report (March 1993). In this Assessment Phase, EM-50 practices were determined through interviews with staff members. The interviews were conducted from the end of September through early December 1993. EM-50 management documents (Phase I) and practices (Phase II) were compared to the Performance Objectives and Criteria (POCs) contained in the *DOE/HQ Cost Quality Management Assessment Handbook*. More detail on the CQMA process is provided in section II. Interviewees are listed in appendix A. Documents reviewed during Phase II are listed in appendix B.

Section III contains detailed observations, discussions, and recommendations. A summary of observations and recommendations is presented below.

I.B OBSERVATIONS

EM-50 practices meet much of the intent of the POCs. EM-50 Planning, Budget, and Execution practices meet the intent of 6 POCs, partially meet the intent of 30 POCs, and do not meet the intent of 11 POCs. However, EM-50 practices generally reflect a lack of focus on cost management and a lack of emphasis on the use of cost professionals in the planning, budgeting, and execution processes.

The following observations are based on the assessment of **Planning** practices:

- Goals in the EM-50 *Strategic Plan* are stated as specific actions needed to resolve particular high-priority problems. This reflects a problem/solution orientation and a consequent lack of high-level goals or objectives to help prioritize activities.
- EM-50 views itself as a support organization rather than as a line organization with a specific mission. The lack of an overriding mission in the *Strategic Plan* reinforces this organizational self-perception.
- There is little linkage between planning, especially strategic planning, and the prioritization or selection of EM-50 programs and projects. There also is little linkage between planning and budgeting.
- Cost-management tools such as economic analysis, cost projections, and technology forecasts are seldom used in

- Developing and buttressing EM-50 plans
- Prioritizing or selecting EM-50 programs and projects for execution.
- EM-50 programs and projects selected for funding are needs-driven from the bottom up. That is, they are based on site requirements as opposed to being determined by an iterative process that includes merging (bottom-up) site needs with top-down strategic assessments. One consequence is that most EM-50 funds are concentrated on applied Research and Development (R&D) activities, with emphasis on achieving quick, short-term payoffs to meet immediate site needs.
- Independent of EM-50, the other EM line organizations conduct technology development. While competition among the EM line organizations can be advantageous, no over-arching mechanism exists for ensuring consistency among EM technology development plans or programs or for determining the potential EM-wide impacts of such program plans on milestones and cost-management responsibilities.
 - Coordination appears to be improving, but disagreements concerning jurisdiction over technology development issues continue between EM-50 and other line organizations.
 - Cost and schedule inefficiencies in technology development planning can occur without the knowledge of HQ planners and program managers because there is no formal means for surfacing conflicts or duplications.
 - EM-50 prepares baselines for only the budget year (although it appears to be trying to change this practice). The other line organizations endeavor to develop life-cycle baselines for programs and projects. Consequently, it is difficult to identify and resolve potential cost and schedule conflicts.
- Technology transfer, including the communication of the benefits of technologies that have been developed and of technologies appropriate for R&D funding, remains an ongoing problem.

The following observations are based on the assessment of **Budget** practices:

Many of EM-50's budget practices are commendable. Preliminary and comprehensive budget guidance is provided to all responsible parties within DOE/HQ EM and Operations Offices. Guidance for the congressional budget year is provided in sufficient time to properly prepare and document cost estimates to back up the budget.

The competition/peer-review process *in concept* is well founded. **It is recommended** that the process be further examined to determine the possible benefits to EM if a similar approach were adopted by EM-30, EM-40, or EM-60.

The Financial Plan Data Report, designed and implemented by the EM-50 Office of Resource Management, presents both historical and anticipated *Financial Plan* (FINPLAN) actions. It also

keeps a running account of the availability of funding, including the anticipated uncosted carryover. It is recommended that a database similar to the one developed by EM-50 to accumulate and track funding actions be considered for incorporation EM/HQ level after reorganization is complete and that the database be used to generate an HQ-level financial plan data report and other decision reports.

EM-50's Resource Management Division sponsored a complex-wide effort to collect indirect-cost data from sites. Although these data have not been sufficiently analyzed for ways to plan and effect cost-management improvements for EM-50's indirect-cost activities, the effort is noteworthy and should be continued.

In addition to these positive actions, there are areas that require improvement.

- There is little linkage between budgeting and planning.
- Although, as noted above, the competition/peer-review process is, in concept, well founded, EM-50's HQ cost professionals do not participate, review, or comment during the process and, therefore, do not contribute to developing estimates.

The following observations are based on the assessment of **Execution** practices:

Program managers conduct reviews of program/project activities to assure that cost, schedule, and technical progress is being achieved in accordance with program baselines and milestones. This practice is commendable.

There are, however, areas that could be improved.

- There are inconsistencies in how program managers manage their programs/projects. For example:
 - There are variations in the level of detail that the program managers present in the Technical Task Plan (TTP) and the Program Execution Guidance (PEG).
 - Program managers establish individual requirements for monitoring projects.
- Program managers do not rely on the Progress Tracking System (PTS) because the information is at least 1½ months behind, typically does not match the FINPLAN or the PEG, and does not provide detailed technical information. In lieu of reliable PTS reports, program managers rely on informal monthly status reports.
- EM-50 does not perform risk assessments in the selection and application of technologies to determine the most cost-effective alternatives.
- Risk management is not used in the process to identify and assess risk or in the processes to control project cost and schedule.

- None of the personnel interviewed took organizational ownership or responsibility for the management of indirect cost, nor did they exhibit any in-depth knowledge of the subject.

I.C RECOMMENDATIONS

To help EM-50 more fully meet the intent of the **Planning POCs**, it is **recommended** that:

- A uniquely identifiable technology development mission be stated and reflected in the EM-50 *Strategic Plan* to guide operations. This mission should flow-down from EM's overall mission and the EM-1 *Strategic Plan*. Elements of this mission should include a leadership role for EM-50 in EM-wide technology development.
- Overall technology development goals and objectives, which are linked to the mission of EM-50, be formulated and presented in the EM-50 *Strategic Plan*.
- Strategic initiatives, related to these goals and objectives, be developed and prioritized to guide the planning and budgeting of technology development.
- An analytical framework that includes the use of technology forecasting, economic analysis, risk management, and cost projections be used in preparing EM-50's goals, objectives (including cost objectives), milestones, prioritized strategic initiatives, cost-effective program and project activities, and plans for the phased introduction of new technologies.
- EM-50 take the lead in EM-wide technology development strategic planning and implementation by assigning to a special group the responsibility and authority for coordinating and integrating all EM technology development (R&D).^{*} This group should
 - Have full knowledge of technology development activities and ensure consistency among technology development plans EM-wide
 - Assess, plan, and prioritize all of EM's technology development requirements using inputs from EM-20, -30, -40, -50, and -60
 - Resolve technology cost, schedule, or other cost-management conflicts in the program/project planning and execution stages EM-wide
 - Apply the analytical framework and methods described in the preceding recommendation EM-wide to ensure that technology development activities are strategically based, technically feasible, cost-effective, and economically sensible by using

^{*}An alternative is that this be made an EM-1 staff function. Another is that EM-50 assume the responsibility and be designated a staff organization.

- Rigorous cost estimating and forecasting techniques to achieve a cost-efficient technology development program
- Economic analysis to select those programs/projects offering the greatest benefits (i.e., where benefits are equal to or greater than costs) to society in achieving EM's mission.
- Perform special technology development studies to help determine, for example, the level of resources that should be devoted to R&D activities, the proportions of funds that should be allocated to basic versus applied research, and the longer term opportunities for developing truly innovative technologies that can potentially furnish major benefits to EM specifically and society in general.
- EM-50 management promote consistent, across-the-board use of cost-management tools and the involvement of cost professionals.
- EM-50 develop life-cycle baselines for technology development programs and projects for use in planning, budgeting, and execution.
- EM-50 redouble its efforts to understand the issues, problems, and solutions to technology transfer. This requires thorough inquiry and an action plan for addressing how best to obtain feedback and communicate the benefits of technology developed or in the development stage and how best to commercialize worthwhile technology to obtain broad usage across DOE sites as well as other public and private sites.

To help EM-50 more fully meet the intent of the **Budget** POCs, it is **recommended** that:

EM-50 continue using competition/peer-review but improve the process by further involving its cost professionals in the review of budget submittal estimates.

To help EM-50 more fully meet the intent of the **Execution** POCs, it is **recommended** that:

- To the extent possible, EM-50 adopt a consistent approach to managing its programs/projects.
 - There should be consistency in the level of detail that the program managers present in the TTP and the PEG.
 - There should be consistency in the content and level of detail in monthly status reports.
- Program managers furnish guidance and ensure that risk assessment methodologies are used in selecting cost-effective technologies. Risk assessment also should be applied during design, testing, and evaluation of technologies.
- EM-50 staff be specifically assigned the responsibility for managing indirect cost of EM-50 projects.

II CONDUCT OF THE REVIEW

The *DOE/HQ CQMA Handbook* contains 47 Performance Objectives and Criteria (POCs) that address Planning, Budgeting, and Execution. The Phase II Cost Quality Management Assessment (CQMA) focused on those EM-50 practices that are cost-specific, cost-related, or facilitate the discharge of EM-50's cost-management responsibilities. The CQMA evaluated the practices of EM-50 relative to the intent of each POC. The evaluation was based on interviews and, in some cases, a review of EM-50 documents. A list of the individuals interviewed and a list of the documents reviewed are provided in appendices A and B, respectively.

In section III, each POC is followed by an assessment of whether EM-50 practices meet the intent of that POC. The assessment includes observations, discussions, and recommendations as appropriate.

The following categories are used to summarize the observations in this report:

- *The intent of the POC is met* means that the practices of EM-50 address the intent of the POC. Discussion to support this observation is provided.
- *The intent of the POC is partially met* means that EM-50 practices address some, but not all, of the intent of the POC. When this is the case, the parts of the POC's intent that are met are identified in the discussion. Discussions on the parts of the POC that are not met, an explanation of the basis for the observation, and recommendations to help EM-50 meet the intent of the entire POC also are provided.
- *The intent of the POC is not met* means that EM-50 practices do not meet the intent of the POC. Discussion to support this observation and recommendations to help EM-50 meet the intent of the POC are provided.

III COST MANAGEMENT

III.A PLANNING

Practices of the Office of Technology Development (EM-50) meet much of the intent of the 16 Planning POCs. The Cost Quality Management Assessment (CQMA) determined that EM-50 partially met the intent of 12 of these POCs and did not meet the intent of only 4 POCs. Nonetheless, observations indicate that EM-50 shortfalls in meeting the Planning POCs often occur because the organization either does not have or does not take a leadership role in strategically analyzing or planning for technology development EM-wide. As explained below, the organization views itself in a support role, driven principally to meet site needs or problems. Consequently, EM-50 allocates its monies to applied Research and Development (R&D) activities to achieve quick, short-term payoffs to meet those needs. As a result, there is a lack of top-down planning for technology development. Recommendations call for EM-50 to develop expanded analytical capabilities and be assigned expanded EM-wide program responsibilities for technology development.

III.A.1 Strategic Planning

A.1.1 EM *Strategic Plan* Development

POC

The goals and objectives in the EM *Strategic Plan* are developed with full consideration of the mission requirements and of the cost objectives and efficiencies attainable through integrated program planning and phased introduction of new technologies. Priorities are developed for all strategic initiatives as guides for program planning.

SEN-25A-91, FYP 1993-1997

Observations, Discussion, and Recommendations

The intent of the POC is partially met.

EM-50 completed a draft *Strategic Plan* (Predecisional Draft, September 13, 1993). The Plan states that it addresses one of six priorities established by Assistant Secretary for EM Thomas Grumbly: "Focus technology development efforts on identifying and overcoming obstacles to progress; involve the best talent in DOE and the national science communities." As a consequence, EM-50's mission is stated principally in terms of a "problem/solution" orientation. Technology development activities are expected to focus on "solutions for dealing with the highest priority problem areas facing EM," specifically the following five problem areas:

- High-level waste tanks
- Characterization, treatment, and storage of mixed waste
- Cleanup of contaminant plumes

- Containment of existing landfills
- Decommissioning and final disposition.

Goals in the *Strategic Plan* are presented as actions needed, some with stated time periods for their accomplishment, to begin resolving the five high-priority problems (see tables 1 and 2 of the EM-50 *Strategic Plan*). Importantly, goals established to attack particular problem areas recognize the need for providing "cost-effective near-term remediation technologies" and minimizing "life-cycle cost to taxpayers." Also, the Plan envisions the identification and/or development of technological systems and concepts that will realize "a minimum of a five-to-one return on investment based on costs avoided through implementing new waste management and cleanup technologies as compared to baseline technologies." Additionally, the Plan underscores the need to collaborate with EM offices and other user organizations, avoid duplication of effort, and ensure effective stakeholder participation in technology development.

The EM-50 *Strategic Plan* touches on many of the concepts embedded in this POC. Nonetheless, the following deficiencies in meeting the full intent of this POC were observed:

- There are no overall goals or objectives in the *Strategic Plan* for guiding EM-50 activities. Only goals in the form of actions needed are presented, and these are established solely within specific contamination problem areas.
- Similarly, the EM-50 *Strategic Plan* has no overriding mission statement that, for example, flows down from, and is consistent with, EM's overall mission and the EM-1 *Strategic Plan*. EM-50 is defined as a technology development support organization that is oriented to helping the EM-30, -40, and -60 line offices resolve contamination problems as opposed to being a line organization with its own unique mission.
- Program initiatives are not prioritized to guide program planning, budgeting, and execution; priority is simultaneously established for a number of activities without distinguishing their relative importance.
- There are no technology forecasts, economic analysis, or cost projections employed in the development and buttressing of the EM-50 *Strategic Plan*. These are essential for preparing realistic strategic goals, objectives, and milestones; for answering questions about fiscal affordability; for avoiding investments in R&D activities that may be overtaken by competing technologies; and for determining the worthiness of spending on technology development (e.g., returns on investment of five-to-one based on costs avoided may still not be worthwhile if benefits are less than costs).

It is recommended that:

- A uniquely identifiable mission be established to guide EM-50 operations and that this mission be reflected in the *Strategic Plan*. This mission should flow-down from EM's mission and the EM-1 *Strategic Plan* (or another source if this 1993 document has been formally superseded).

- Overall technology development goals and objectives, linked to the EM-50 mission, be established and reflected in the EM-50 *Strategic Plan*.
- Strategic initiatives be established and prioritized within the context of these goals and objectives to guide planning and budgeting.
- Technology forecasting, economic analysis, and cost projections provide the central analytical framework EM-50 needs to lead DOE's environmental restoration and waste management technology development and to prepare EM-50 goals, objectives (including cost objectives), milestones, prioritized strategic initiatives, and phased introduction of new technologies.

A.1.2 EM *Strategic Plan* Implementation

POC

The mission, requirements, goals, and objectives established in the EM *Strategic Plan* are translated into cost-effective program and project activities through a systematic, iterative planning process.

SEN-25A-91, FYP 1993-1997

Observations, Discussion, and Recommendations

The intent of the POC is not met.

Historically, the selection of technology development programs and projects for implementation has not resulted from a systematic, iterative planning process. Several program managers in one office indicated that it is not clear how program and project activities are linked to planning or plans; they see program and project decisions as being made at the top based on "best judgment." Program managers in other offices and the more senior EM-50 managers, however, see EM-50 program and project activities as being needs-driven; that is, the selection process has been from the bottom up as opposed to being strategically driven from the top down. For example, after EM-50 was initially organized in 1989, programs and projects were selected for funding based on two perceived site needs. Site needs were identified to deal with 1) groundwater and related soil contamination problems and 2) waste processing problems. This needs-driven approach continues, with efforts now also devoted to integrating the technology development needs of EM-30, -40, and -60 into EM-50 program and project activities (see discussions at POCs A.2.1 and A.2.2.1). A reflection of this needs-driven approach is found in how EM-50 allocates its resources; all funds are expended on applied R&D activities where quick, short-term payoffs are sought that will meet immediate needs.

In the future, according to interviews with EM-50 personnel, programs, projects and budgets are likely to be reorganized around the "highest priority problem areas" described in the recently completed *Strategic Plan*. (These areas are listed in the discussion at POC A.1.1.) Even if this means more than simply rearranging activities so that plan and budget presentations conform to the five priority areas (i.e., different technology development programs and projects emerge based on these five priority areas), this would still not meet the intent of this POC. What is missing is top-down strategic analysis combined with a systematic, iterative planning process for

the selection of cost-effective program and project activities. As such, a reorganization around the “highest priority problem areas” merely represents another form of needs assessment (i.e., one in which needs are evaluated to solve problems in the field).

EM-50 has endeavored to recognize the waste management and restoration problems that technology must resolve at the grassroots level across the different DOE facilities; this is essential for implementing a successful technology development program. There must, however, be a merging of this knowledge with top-down strategic analysis and planning. Overall technology development needs cannot be clearly defined without a guiding strategy and the use of economics, cost management, and health and environmental risk-based principles to properly organize and prioritize technology development requirements. This is especially true lacking health- and environment-based standards for radionuclides and a definition for “how clean is clean.” The following recommendations are made to achieve a merging of top-down planning with the bottom-up approach based on technology needs and to meet the intent of this POC,

It is recommended that EM-50 take a leadership role in translating the goals, objectives, and milestones of EM (see POC A.1.1) into cost-effective technology development program and project activities through a systematic, iterative planning process. To accomplish this, EM-50 should perform economic, cost, and technical assessments that determine which technology development programs and projects meet *all* of the following requirements:

- Technologically feasible
- Economically sensible for allocating EM resources so that benefits outweigh costs
- Most effective in achieving EM’s cost objectives
- Best suited to meet the waste management and restoration problems at the grassroots, DOE facility level.

It is recommended that EM-50 take the lead in EM-wide technology development strategic planning and implementation through the use of: 1) rigorous cost estimating and forecasting techniques to achieve a cost-efficient technology development program and 2) economic analysis to help select those programs and projects that will yield the greatest returns—in relation to costs—to society in accomplishing the mission of EM.

III.A.2 Program Planning

A.2.1 Program Plan Definition and Development

POC

The Program Plan is developed and maintained by DOE/HQ EM program management with the full participation and support of Operations Office managers and EM cost professionals. The program planning process ensures consistency among the EM *Strategic Plan*, all Program Plans, Operations Office Project Plans, and interrelated activities such as EM Budget Guidance and Technology Development Plans.

SEN-25A-91

Observations, Discussion, and Recommendations

The intent of the POC is partially met.

EM-50 program planning is the responsibility of HQ management. Site managers participate in and support this activity by making their technology needs known. In addition, each Operations Office has appointed a Technical Program Officer (TPO) to coordinate and implement EM-50 activities at the site. TPO responsibilities include helping to prepare and send out requests for proposals to M&Os, National Laboratories, and others who compete for technology development work as defined, for example, in EM-50 "Calls for Technical Task Plans" (TTPs). Cost professionals do not participate in EM-50 planning activities. Only "rough, back-of-the-envelope cost analyses" are performed in EM-50 during technology development planning. On the other hand, it is EM-50's opinion that its use of a competitive proposal process for performing the work defined in calls for TTPs, combined with peer reviews of the proposals submitted, results in a cost-effective technology development program.

In a broader context, no mechanism exists within EM-50 or elsewhere in EM for ensuring consistency among various EM-wide technology development plans. Independent of EM-50, EM-30, -40, and -60 also conduct technology development. Their expenditures for technology development are said to exceed those of EM-50. Staff interviewed indicated that EM-50 technology development efforts concentrate on contamination problems across sites, whereas the other line organizations tend to focus on site-specific contamination problems. In addition, while coordination among the HQ line organizations has been criticized in the past, several interviewees indicated that more effort is being devoted to conveying the technology needs of the other organizations to EM-50. Several EM-50 program managers also said that they discuss technology needs with their counterparts in the other line organizations; TPOs have a good understanding of local technology needs and are able to communicate across HQ line organizations. However, it is noted that:

- EM-30, -40, and -60 have not yet fully documented their technology development needs.
- Duplication of technology development efforts and a lack of communication regarding outcomes of those efforts among the line organizations continue to waste resources.
- Disagreements concerning jurisdiction over technology development issues continue between EM-50 and the other line organizations, and improvements in communication and coordination of technology development activities are needed among these organizations.

Competition among R&D programs can be beneficial. The concern here, however, is the lack of EM-wide planning that can ensure a coordinated approach to technology development. Such an approach could concentrate resources on the most cost-beneficial development activities while avoiding duplication of efforts and the waste of resources. There is currently no formal means for surfacing and resolving conflicts and duplication.

It is recommended that responsibility and the necessary authorities for coordinating and integrating all (R&D) technology development activities of EM be specifically assigned to a

special group. Those assigned to the group should have full knowledge of EM technology development activities and ensure consistency among technology development plans and budgets EM-wide. The group also would endeavor, through the application of analytical methods, to ensure that EM-wide technology development activities are strategically based, technically feasible, cost-effective, and economically sensible. In addition, the group should perform special policy studies for EM-1 to review and act upon. These studies should include the following:

- How much of EM's resources should be devoted to R&D activities? (The aim was to devote 10 percent of the EM program budget to EM-50 activities when it was established, but no economic analysis was performed to give credibility to such a figure.)
- What proportion of R&D funds that should be devoted to basic versus applied research? (No funds are currently devoted to basic research.)
- Whether longer term opportunities exist for developing truly innovative technologies that can furnish major program and national benefits.
- What models or incentives are appropriate for generating technology development breakthroughs that will yield major cost savings in waste cleanup or treatment?

It is recommended that the proposed group be established in either an EM-1 staff office (e.g., in EM-2, EM-4, or EM-10) or EM-50. The latter, seems more reasonable.* Cost professionals, economists, and technology specialists would be needed to staff this group. The analytical skills of these professionals are those needed to implement the EM-50 cost-management recommendations presented at POCs A.1.1 and A.1.2. The establishment of this group in EM-50 would centralize many of the needed technology development planning and analytical activities in EM, allow EM-50 to perform the role for which it was established, and would help EM-50 meet the requirements of other POCs (see especially POC A.2.2.2).

A.2.2 Planning Interrelationships

A.2.2.1 Program Planning Interrelationships

POC

Program planning considers the potential impact of related programs on milestones and cost-management responsibilities. Interrelationships and solutions to cost and schedule conflicts are developed in coordination with other DOE/HQ EM program managers and Operations Office personnel.

Comprehensive Integrated Planning Process, Analysis and Options for Resolution

Observations, Discussion, and Recommendations

The intent of the POC is partially met.

*A variant of this alternative is that the group be placed in EM-50 and EM-50 be designated an EM-1 staff organization.

Within EM-50, there is an understanding of the potential impact of related technology programs and projects on milestones. EM-50 is a relatively small organization, and there are face-to-face interactions at HQ between the senior managers/decision-makers and technology development program managers. Programs and projects also can be carefully monitored because: each TTP is relatively small; the TTPs, in combination with the Program Execution Guidance (PEG) for each TTP, furnish substantial documentation of planned expenditures, schedules and milestones; and the interactive oversight of TTPs is performed by EM-50 program managers and TPOs. Consequently, the results of such understanding and monitoring can be factored into technology planning to help avoid future cost and schedule conflicts in related EM-50 technology development projects and programs.

In contrast:

- As discussed at POC A.2.1, no mechanism exists for integrating or coordinating EM-20, -30, -40, -50, and -60 technology development activities or determining the potential EM-wide impact of related technology program plans on milestones and cost-management responsibilities.
- Possible cost and schedule conflicts in technology development can occur without the knowledge of HQ senior managers, planners, or program managers because there is no formal means for surfacing conflicts or duplications in the planning stages.
- There is the additional problem that EM-50 prepares baselines for only the budget fiscal year (see POC A.3.1 where an exception to this practice is referenced) whereas the other line organizations endeavor to develop life-cycle funding baselines.

This situation creates a potential problem in recognizing any overlaps or conflicts (e.g., cost and schedule conflicts) in technology development plans EM-wide. EM-50, however, recognizes the advantages of life-cycle planning and is moving toward preparing life-cycle baselines for TTPs with a life-cycle longer than 1 year (many TTPs cover work scheduled to be completed in 1 year or less).

It is recommended that EM-50 develop life-cycle baselines for technology development programs and projects and that these be used in planning, budgeting, and execution. This can furnish an improved basis for recognizing, avoiding, and resolving potential technology development cost and schedule conflicts.

It is recommended that the special group that was proposed above (see POC A.2.1) also be responsible for:

- Evaluating the potential EM-wide impact of technology development programs on milestones and cost-management responsibilities
- Resolving technology cost and schedule conflicts through interaction with the appropriate EM/HQ and field personnel.

A.2.2.2 Technology Development Planning

POC

Program managers convey their projected technology requirements to Technology Development for assessment and technology development planning and prioritization. Assessment methodologies include the following:

- Economic analysis
- Risk analysis
- Technical feasibility studies.

Technology that is developed is conveyed to program managers. Program managers communicate the benefits of experience to Technology Development, which shares that information with other sites.

EM Program Management Policies and Requirements

Observations, Discussion, and Recommendations

This POC is partially met.

As noted at POC A.1.2, the EM-50 technology development program is driven principally by needs perceived at the field level. Although communication is improving between the other line organizations and EM-50, the other line organizations develop much of their own technology; consequently, all of their needs are not communicated to EM-50. Also, the other line organizations have not fully documented their technology needs.

There is general agreement among program managers that the EM-50 technology development program is needs-driven. However, in one office, program managers say they play a minor role in planning, prioritizing, or selecting technologies for development; these decisions are said to be made "at the top of the EM-50 organization." In a different office, program managers say they are more involved in planning, prioritizing, and selecting technologies for development.

EM-50 personnel stated that the use of formal approaches such as economic analysis and technology risk management analysis is limited in the planning and prioritization of technology development activities. For example, no risk assessments are performed, and the use of economic analysis is devoted to assessing technologies that have reached the demonstration stage, whenever results suggest that such technologies are capable of commercialization or broad use in waste treatment and/or environmental restoration. Economic analysis is the tool used to evaluate the cost-effectiveness of these technologies in comparison to existing baseline technologies (see discussion at POC A.5.1).

Regarding the communication or transfer of technology as required by this POC, one method being used by EM-50 is the PROTECH database. This system catalogs the technology under development, current status of the technology, and performance to date. Also, the Office of Technology Integration and Environmental Education Development (EM-52) is searching for new

and better models for the commercialization and use of successful technologies. The Technology Reinvestment Program directs efforts toward developing partnerships between the National Laboratories and private industry to commercialize technology successes. Nevertheless, technology transfer remains an ongoing problem, one not helped by the competitiveness between such entities as the National Laboratories and private industry.

It is recommended that the special group proposed above (see POC A.2.1) also be made responsible for assessing, planning, and prioritizing all of EM's technology development requirements using inputs from EM-30, -40, -50, and -60. Economic analysis, risk management analysis, technical feasibility analysis, and other appropriate assessment methodologies should be applied by this group in planning and prioritizing technology development programs and projects. This is consistent with the proposed responsibilities of this group as described above. See especially POC A.2.1, where it is recommended that this group be charged with coordinating and integrating all EM technology development activities and that similar analytical tools be applied to accomplish these tasks. In line with the requirements of this POC, it is proposed that this group be situated in EM-50.

It is recommended that EM-50 redouble its efforts to understand the issues, problems, and solutions to technology transfer. This requires thorough inquiry and an action plan for addressing how best to obtain feedback and communicate the benefits of technology developed or in the development stage and to commercialize worthwhile technology to obtain broad usage as appropriate across DOE sites as well as at other public and private sites.

III.A.3 Program Planning and Cost Management

A.3.1 Cost-Management Policy

POC

DOE/HQ EM cost-management policies are clearly stated and consistently applied throughout the DOE EM organization.

Cost-management policies cover cost-specific and cost-related aspects of program management including the following:

- Economic analyses and cost planning
- Cost-baseline development
- Budget formulation
- Work Breakdown Structure and Code of Accounts applications
- Indirect cost management
- Acquisition planning
- Expenditure authorization
- Delegation of responsibilities, authority, and accountability
- Program/project cost monitoring, analysis, and control.

DOE Order 4700.1, Change 1; *EM Policy on Cost and Schedule Estimating and Analysis*

Observations, Discussion, and Recommendations

The intent of the POC is not met.

A key element of this POC is the requirement to clearly state and convey policy guidance to program participants, and the Office of Program Support's Program Integration Division is contemplating developing guidance to implement EM policies for cost management. When developed, the guidance is to be applicable to all cost estimates prepared for EM-50 programs. However, there is no firm plan or deadline for developing and releasing this guidance.

There is a lack of focus on cost management and observed practices do not meet the intent of the POC. For example:

- HQ uses rules-of-thumb to allocate resources. For example, EM allocates 10 percent of the EM annual budget to EM-50 because private industry allocates approximately 10 percent of its annual budget to technology development. Using the same reasoning, EM-50 allocates 10 percent of its annual budget to EM-52. Economic analysis and cost planning do not play a role in these fundamental resource decisions (see also observations related to POCs in sections III.A.1 and III.A.2).
- The programs' budget-formulation decisions have been made "top down." Program baselines, with perhaps one exception (TTP CH1-1-12-01, see POC A.3.4), are current-year only, and neither budget nor baselines are linked to planning.
- Program managers vary in their use of cost-management tools (e. g., for cost analyses, monitoring, and control) in making program decisions. Also, there is no consistent application—or guidelines for applying—cost-management tools. Applications are individually crafted and done "hands-on" at the site level rather than at the HQ level.
- Although the Resource Management Division sponsored a complex-wide effort to collect indirect-cost data from sites, these data have not been sufficiently analyzed for ways to plan and effect cost-management improvements for EM-50's indirect-cost activities.

It is recommended that the development of both policy guidance development and oversight functions be assigned to a specific, centralized office in EM-50. The Office should be aware of similar guidance already developed and, for example, use the cost-estimating manuals already developed by EM-30 and EM-40 as guides for developing an EM-50 cost-estimating manual. This office also should:

- Work with program and project managers to ensure that budget submittals meet the intent of the POC
- Work with program and project managers to provide assistance and ensure that they consistently use cost-management tools, adequately baseline their program/projects, and prepare and use forecasts in programmatic decision, planning, and budget considerations and

that ensure EM-50 cost-management practices at both the site and HQ level meet the intent of this POC.

A.3.2 Cost-Management Structure

POC

The program cost-management structure is clearly defined. The program incorporates clearly defined authorities, functional relationships, and interfaces for cost management within the DOE/HQ EM organization and between DOE/HQ EM and the Operations Offices. Each program organization has established appropriate levels of authority, accountability, and responsibility and clear lines of communication and interaction for program cost-management functions.

DOE Order 4700.1, Change 1

Observations, Discussion, and Recommendations

This POC is not met.

EM-50 practices do not reflect conditions expected to exist when there are defined and understood authorities, functional relationships, and interfaces for cost management within the program. In addition, the HQ cost professionals do not play a role in prioritization, baselines, schedules or analyses. Program managers rely on and coordinate the support needed for cost management directly from the sites rather than from the program's HQ cost professional support staff.

Although most program managers have adopted some sort of cost-management initiative aimed at controlling the cost of their programs, the effectiveness and consistency of application of these initiatives are problematic because:

- They do not rely on instituting clear lines of communication and interaction for HQ-level cost-management functions between EM-50 program managers and EM-50 support offices.
- They are initiated and carried out independently, without consistent practices regarding accountability and responsibility for cost-management functions.

It is recommended that EM-50 ensure that day-to-day practices reflect a more consistent and structured approach to cost-management functions. The program managers and EM-50 support offices should be assigned joint responsibility for defining the program's cost-management structure. This joint effort should focus on establishing:

- Clear lines of communication for cost-management issues and guidance

- Functional relationships and interfaces between program managers and the HQ-and site-level cost-management professionals
- Appropriate levels of authority, accountability, and responsibility.

A.3.3 Cost Planning, Forecasting, and Analysis

POC

DOE/HQ EM program management promotes the understanding and use of cost analysis and forecasting concepts, methodologies, and techniques and requires their use as tools in support of the development of cost-effective Program Plans.

DOE Order 4700.1, Change 1; DOE Order 5700.2D

Observations, Discussion, and Recommendations

The intent of the POC is partially met.

Although top management and program managers recognize that there are significant benefits to the program from effective use of cost analysis and forecasting concepts, methodologies, and techniques, these tools are not readily available nor widely or consistently used. For example, in lieu of consistent use of analyses, the program routinely relies on its calls for Technical Task Plan (TTP) proposals, the competition resulting from the proposal processes, and peer-review evaluations to select one of the several available alternatives. While reliance on competition and peer-review *in concept* is well founded, there exist opportunities to more effectively use cost analysis and forecasting for better planning “upstream” of the TTP proposal request/evaluation phase of the program.

It is recommended that program management institute an effort to consistently promote across-the-board use of cost analysis. This promotion should emphasize the use of concepts, methodologies, and techniques for cost forecasting and benefit-cost evaluations early in the planning process. EM-50 should assign a central office the tasks of, and responsibility for, coordinating existing tools, developing new tools, and monitoring the consistency of their use.

Once these actions are taken, the program-management organizational elements should focus on and direct a more coordinated and effective effort to consistently use cost analysis and forecasting in program planning. In addition, a guidance document, similar to the contemplated cost-estimating document, should be developed to describe available cost-management tools, provide guidance for their use, and promote the use of cost analysis and forecasting in planning.

A.3.4 Program Planning and Baseline Establishment

POC

Program office management develops baseline procedures. Program managers develop baselines for all programs and projects that are their

responsibility. Field Program Plans and baselines are derived from and are consistent with Program Plan baselines.

DOE Order 4700.1, Change 1

Observations, Discussion, and Recommendations

The intent of the POC is partially met.

As reported in A.3.1, broad HQ-level distribution of funding is made on the basis of rules-of-thumb. In addition, with the exception of TTP CH1-1-12-01 and bid proposals that become part of a TTP, no examples of existing baselines were found. Cost plans reviewed during the assessment were for the current year only. No practices that consistently and completely meet the requirements for technical, cost, and schedule baseline development were observed. However, some program managers stated they have started—or are contemplating starting—efforts to baseline multiyear programs/projects defined (or that will be defined) in TTPs. Although program managers control 1) scope and milestone changes that do not involve budget changes and 2) budget changes that have been approved by higher management, no practices were observed that consistently and completely meet requirements for change control.

EM-50 programs and projects are dynamic and generally short-term (less than 1 year). As a result, support for formal processes to develop and maintain baselines is weak.

It is recommended that EM-50 ensure its personnel know the concepts and rationale for baselining and are trained in their practical application.

It is recommended that baselines for EM-50 efforts be established and maintained.

A.3.5 Indirect Cost and Program Planning

POC

Program managers interface and coordinate plans with those DOE organizational elements that manage the indirect cost process. Program managers recognize and take into account the cost impacts of indirect funding activities and requirements related to indirect cost that are applicable to their programs. They develop strategies to improve the efficiencies and economies of indirect-funded activities.

DOE Order 2200.13; DOE Notice 4700.5; DEAR 970.0901 and 970.3102-1

Observations, Discussion, and Recommendations

The intent of the POC is partially met.

Some program managers obtain information on the indirect-cost activities that affect their specific tasks, but the processes for collecting and handling the information and planning based on the information are individually crafted and not consistent across EM-50 programs. Although program managers support consideration of indirect costs in planning, they do not effectively coordinate their plans with other DOE organizations that have responsibility for indirect costs.

Program managers do have effective cost-management control over the total costs for their specific tasks, but indirect costs are not isolated and dealt with separately. Therefore, the impact of indirect costs on a specific task or the overall program is not a primary concern.

It is recommended that EM-50 initiate efforts to define organizational practices and interfaces and develop indirect-cost guidance for program managers. EM-50 should promote the benefits available from comprehensive and consistent treatment of indirect costs.

In FY 1993, the EM-50 Office of Program Support, Resource Management Division sponsored a complex-wide effort to collect indirect-cost data from sites. The data are being analyzed to determine how to plan and effect improvements in managing indirect cost.

It is recommended that EM-50 continue to systematically collect indirect-cost data.

It is recommended that the effort to collect and analyze indirect-cost data be officially endorsed by EM-50 management.

III.A.4 Program Planning Implementation

A.4.1 Program Planning Field Guidance

POC

DOE/HQ EM program managers provide programmatic objectives, requirements, procedures, priorities, and cost and schedule objectives to Operations Offices for preparation of cost and schedule estimates in support of budget requests and for preparation of execution plans.

DOE/HQ EM managers review and approve Operations Offices' and supporting organizations' planning and cost- and schedule-estimation documents to ensure they are consistent with DOE/HQ EM guidance.

DOE Order 4700.1, Change 1

Observations, Discussion, and Recommendations

The intent of the POC is partially met.

EM-50 HQ managers develop program and project objectives and guidelines based on technology development needs as determined by inputs from the field (see POC A.1.2). Descriptions of technology needs and requests for proposals to meet these needs (i.e., the annual calls for TTPs) are prepared with field personnel and sent to prospective bidders. At this time, rough cost and schedule estimates are derived. By using competitive bidding procedures, including peer reviews of the proposals, relatively firm program and project cost and schedule estimates are derived to support budget requests. The documents generated during this process become the basis for preparing the PEG used in implementing individual projects.

While these activities do not follow the letter of this POC, they do meet much of its intent. Cost and schedule objectives and better estimates, however, should be derived earlier in the planning process. Also, planning tools, such as economic analysis, should be used in developing programmatic objectives, procedures, and priorities. The recommendations furnished at POCs A.1.1 through A.2.2.2 address the use of such planning tools. The kinds of specialists, especially cost professionals, proposed for performing the recommended tasks described at POCs A.1.2 and A.2.1 would, as part of their normal duties, also derive improved program and project cost and schedule estimates earlier in the planning process. Consequently, no additional recommendations are proposed beyond those presented for prior POCs.

A.4.2 Acquisition Strategy

POC

DOE/HQ EM plans, which require contractor support for implementation, contain a strategy for major acquisitions. The acquisition strategy contains an initial statement of requirements as well as cost, manpower, and time estimates and their respective risks. DOE/HQ EM and Operations Office management and cost professionals participate in the development of the acquisition strategy.

DOE Order 4240.1K; DOE Order 4700.1, Change 1

Observations, Discussion, and Recommendations

The intent of the POC is partially met.

Major Systems Acquisitions (MSAs) are defined as those procurements valued in excess of \$100 million over the life of the contract. Based on discussions with EM-50 personnel, there is only one such EM-50 procurement of this magnitude—the current HQ support contract with a potential value of \$130 million over a 5-year period. A scope of work was prepared for this procurement, and cost and labor estimates over the contract period were made based on 1) historical data from the prior omnibus HQ contract serving all the line organizations and 2) expected EM-50 contract support needs. A contractor selection evaluation board was convened to review responses to this publicly advertised procurement. The board consisted of four persons from EM/HQ and a cost analyst from DOE Procurement.

EM-50 also has developed a general program acquisition strategy ("Outline EM-50 Program Acquisition Strategy" from *Procurement Working Subcommittee Study on Need for EM-50 Program Acquisition Strategy and Dedicated Procurement Resources*, Draft, June 9, 1992) for external technology acquisition. While this strategy apparently has not been finalized, it appears to document much of what occurs in acquiring R&D assistance from external sources.

It is recommended that, for any future major procurement, a strategy be developed based on a detailed forecast of contractor requirements for the entire length of the contract. Labor, time, and cost estimates for different time periods in the contract and over the entire contract, and their respective likelihoods or risks due to uncertainty, should be included as part of this strategy. Economic analysis, including research on similar DOE and other (e.g., Environmental

Protection Agency or Corps of Engineers) contracts, would be useful in estimating labor, time, and cost requirements. Also, because much of the work may be performed in the field (e.g., the current EM-50 HQ support contractor is involved in a number of field assessments), it would be reasonable to include field personnel in acquisition strategy development and contractor selection.

III.A.5 Economic Analysis

A.5.1 Use of Economic Analysis

POC

Except where prohibited by regulation and/or legal authorities, economic analyses are used to evaluate the relative efficiencies of strategic and major program or project alternatives and to compare program benefits to costs.

FYP 1993-1997; Executive Order 12291

Observations, Discussion, and Recommendations

The intent of the POC is partially met.

No evidence was found of the use of economic analysis for evaluating strategic, program, or project alternatives during the R&D planning stage. Benefit-cost analysis appears to play no role in EM-50 planning activities. Economic analysis is used to assess the cost-effectiveness of EM-50 technologies only after development, that is when technologies reach the stage where they appear capable of performing better than existing technologies for a particular function. Los Alamos National Laboratory (LANL) performs most of the economic analyses for EM-50. The EM/HQ support contractor (Waste Policy Institute) is occasionally used to perform similar economic assessments (e.g., a cost-effectiveness analysis of technologies at Hanford).

EM-50 and LANL indicate that the principal work of LANL involves cost-effectiveness assessments of a technology near the end of the demonstration phase. A much smaller LANL effort is directed at early screening of technologies, budget justification assessments, and support for quick turn-around decisions on technologies. LANL has written a detailed methodology on how to perform cost-effectiveness analysis of demonstration technologies. It is putting this methodology into "cookbook" form for application by EM and its contractors.

EM-50 management believes that cost-effectiveness analyses are useful for closing out technology demonstrations, for technology communication or transfer, and for calculating potential returns on investments for the demonstration technology. Less than half of the demonstration technologies receive such analysis, and interviewees indicated that this may decline to less than 25 percent in the future. Each analysis generally includes:

- Description of the technology being assessed (including the system of technologies of which it may be a part) as well as a description of competing technologies

- Characterization of the performance and development of life-cycle costs for each alternative technology
- Evaluation of the cost-effectiveness of each alternative
- Estimation of any cost savings over competing technologies that are attributable to the technology being investigated.

A major analytical difficulty is extrapolating results of the technology under investigation from one demonstration site to all sites. Also, while most of the analyses are quantitative, there may be qualitative discussions of health or environmental risks associated with alternate technologies or of the risk associated with commercialization of the demonstration technology. Other risk management assessments, such as the potential effect of any emerging technologies that may compete with the technology being investigated, are not performed.

It is recommended that cost-effectiveness analysis of EM-50 demonstration technologies take into account risk management issues and that technology risk analysis be factored into such technology evaluations.

It is recommended that economic analysis, including benefit-cost analysis, be used as a primary tool in preparing strategic plans and in selecting among program and project alternatives as recommended at POCs A.1.1, A.1.2, A.2.1, and A.2.2.2.

A.5.2 Methods for Conducting Economic Analysis

POC

Economic analyses conducted by or for DOE/HQ EM line organizations are credible and defensible. The level of rigor and detail given to data collection and analysis is commensurate with the size and strategic importance of the program or project being evaluated. To the extent possible and practical, economic analyses conducted throughout EM use analytical approaches that are consistent with one another.

Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies; DOE/MA-0063, Volume 1; Guidelines for Performing Regulatory Impact Analyses; The Use of Economic Analysis in Valuing Natural Resource Damages

Observations, Discussion, and Recommendations

The intent of the POC is partially met.

Though limited in scope, the economic analyses performed at LANL and described at POC A.5.1 apply the level of rigor and detail necessary to achieve credibility. The analyses employed need to be expanded to include risk analysis, benefit-cost analysis, and other kinds of economic analyses as recommended at POC A.5.1.

It is recommended that benefit-cost, risk, and other economic analyses proposed in the previous discussions be performed with rigor and detail to achieve highly credible and defensible assessments.

A.5.3 Consistency of Data, Assumptions, and Methodologies for Economic Analyses

POC

Economic analyses underlying program recommendations are reviewed to ensure that the data, assumptions, and methodologies on which conclusions are based are consistent among projects reviewed. Justification is provided for the use of inconsistent data or assumptions. Documentation is provided on assumptions and reasons for deviating from standards established for discounting, incorporating risk, and other variables.

Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies; DOE/MA-0063, Volume 1; Guidelines for Performing Regulatory Impact Analyses; The Use of Economic Analysis in Valuing Natural Resource Damages

Observations, Discussion, and Recommendations

The intent of the POC is partially met.

To the limited extent that economic analyses are performed (see POC A.5.1), consistent data, assumptions, and methods are used.

It is recommended that benefit-cost, risk, and other economic analyses be performed and that EM-50 continue using consistent data, assumptions, and methods as it expands its use of economic analyses. The economic analyses should be continually reviewed to ensure such consistency or to be certain that any deviation is fully documented and justified. For example, it may not always be possible to ensure the availability of consistent data in economic analyses; however, a discussion should be presented on how any such problem was dealt with and the expected effect on results.

A.5.4 Updates of Economic Analyses

POC

The need for new economic analyses is determined as significant program changes occur, and revised analyses are performed if necessary.

Observations, Discussion, and Recommendations

The intent of the POC is not met.

As noted at POC A.5.1, the need for economic analyses in the planning stage is not recognized by EM-50 (i.e., only one instance of economic analysis was uncovered, and this was in the post-

development stage). Consequently, the need for new economic analyses as significant program changes occur is not an EM-50 consideration.

It is recommended that EM-50 use economic analyses when significant internal or external changes occur that may affect program or project planning, budgeting, or execution; where appropriate, such analyses should be performed by EM-50. In taking the lead in planning and executing technology development, EM-50 should, for example, evaluate the effects that proposed and new Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) or Resource Conservation and Recovery Act (RCRA) regulations may have on technology development. Moreover, EM-50 has a major stake in CERCLA and RCRA reauthorization. Economic analyses of alternative reauthorization scenarios in relation to their influence on technology development could be useful in helping EM propose legislative alternatives that are cost beneficial to DOE and the nation.

III.B BUDGET ACTIVITIES

EM-50 HQ activities meet much of the intent of the Budget POCs. Although the intent of no POC is fully met, EM-50 partially meets the intent of five of the POCs and does not meet the intent of only one POC.

III.B.1 Budget Guidance Development

POC

Budget guidance includes programmatic information necessary for the development of a responsive budgetary submittal, including fiscal constraints and targets and technical, cost, and schedule/milestone requirements. The budget guidance references the Work Breakdown Structure and Code of Accounts. It also encompasses appropriate administrative requirements.

Budgetary planning and the development of budget guidance is integrated with strategic planning, program planning, and program management by effective communications, coordination, and interaction throughout the year.

Preliminary and comprehensive budget guidance is provided to all responsible parties within DOE/HQ EM and Operations Offices. Guidance is provided in sufficient time to properly prepare and document a responsive cost estimate for budget submittal.

DOE Order 4700.1, Change 1; DOE Order 5700.2D; SEN-25A-91; *FYP Guidance to Field*

Observations, Discussion, and Recommendations

The intent of the POC is partially met.

This POC is met when EM-50 addresses the congressional budget. The Budget Office deals with three levels of budget: the execution year, the upcoming congressional budget, and the Internal Review Budget (IRB) submittal of the following year's congressional budget. As the certainty of the funding and the Department's budget guidance becomes more precise, EM-50 deals with the different levels of budgets in progressively more detail. In formulating the congressional budget, e.g., FY 1994 TTP development in FY 1993, budget guidance includes programmatic information necessary for the development of a responsive budgetary submittal, including fiscal constraints and targets and technical, cost, and schedule/milestone requirements. The budget guidance references the Work Breakdown Structure. The guidance also encompasses appropriate administrative requirements.

The POC is partially met when EM-50 addresses the IRB. Preliminary and comprehensive budget guidance is provided to all responsible parties within DOE/HQ EM and Operations Offices. Guidance for the congressional budget year is provided in sufficient time to properly prepare and document cost estimates that back up the budget submittals. However, the budget guidance addresses the problem areas as linked to needs assessments rather than being linked to an overall strategic or program plan. The results are that the IRB submission for the next fiscal year is prepared at a more aggregate level using technical activity data sheets (TADS) and is not backed up with a detailed quality estimate. The assumption of similar strategic goals as in the previous year is presented as guidance from the DOE Controller's Office and is, in turn, transmitted to the site by EM-50. In fact, the control numbers relayed to the site are "derived by taking the FY 1994 funding amounts contained in the FY 1994 congressional budget and escalating them."

It is recommended that the effort to implement life-cycle costing and full project planning baselines be continued and expanded to include all TTPs. This effort should result in data that can be used to justify outyear budget submittals. There is a greater difficulty in the Technology Development arena to develop multiyear plans because Technology Development are frequently short term and difficult to predict.

It is recommended here, as in the Planning section of this report (e.g., POCs A.1.1 and A.3.1) that there be a stronger link between budget formulation and planning.

III.B.2 Review and Approval of Inputs to Budget (Internal EM)

POC

Cost and schedule estimates submitted by Operations Offices in response to the budget call are reviewed by program managers and cost professionals to ensure that the estimates are

- complete, well-documented, accurate, and reasonable;
- prepared using acceptable methodologies and estimating criteria (e.g., valid quotes, actuals, historical data, and assumptions);

- responsive to programmatic requirements and fiscal constraints; and
- represent a cost-efficient approach to satisfying programmatic requirements.

EM program managers and cost professionals interact with Operations Office counterparts to negotiate and finalize budgetary cost and schedule estimates.

FYP Guidance to Field

Observations, Discussion, and Recommendations

The intent of the POC is partially met.

As noted at A.3.1, EM-50's use of rules-of-thumb to decide program needs results in upper management determining the dollar amounts to give areas of the program before the amounts required are determined based on strategic objectives, site needs, or a combination of the two. After a systematic determination of these factors, the program manager must determine which needs can be addressed with available dollars by using an iterative process that mirrors the traditional approach of building the budget from cost- and schedule-estimate submittals in which scope is adjusted to match the funds made available. The program managers rely on competition and peer-review evaluations to "scrub" the estimates that go forward for budget consideration. The result of this process is that the cost and schedule estimate submitted by the Operations Offices or site plays a similar role in deciding the EM-50 program budget.

As noted at A.3.3, the competition/peer-review process *in concept* is well founded. However, a significant difference was observed between the use and application by other programs versus EM-50's application. EM-50's HQ cost professionals do not participate, review, or comment in these "estimate scrub" processes.

It is recommended that EM-50 continue using competition/peer-review but improve the process by further involving its cost professionals in the review of budget submittal estimates. The organization should define practices to guide all participants, including HQ cost professionals, that ensure the program's estimates that back-up budget submittals or budget-related programmatic decisions meet the intent of the POC.

It is recommended that the peer review portion of EM-50's budget submittal estimate "scrubbing" process be further examined to determine the possible benefits to EM if a similar approach were adopted by other line organizations (i. e., EM-30, EM-40, and EM-60).

III.B.3 Budget-Estimate Validation and Cost Management

POC

The Deputy Assistant Secretary-level line organizations are responsible for developing and implementing the requirements for cost-/schedule-estimate validation in consonance with DOE Orders. EM program managers and

cost professionals validate the cost and schedule estimates submitted by Operations Offices by reviewing and approving the estimating methods, systems, and tools used to prepare the cost and schedule estimates and by requiring/performing independent cost- and schedule-estimate reviews for comparative analysis and evaluation.

DOE Order 4700.1, Change 1; DOE Order 5700.2D; *Cost Estimating and Review Guidance for the FY 1994-1998 Five-Year Plan*

Observations, Discussion, and Recommendations

The intent of the POC is partially met.

Resource Management Division personnel stated the combination of a lack of sufficient up-front planning and the several requests for budget back-up data, made by the Comptroller, Office of Management and Budget, and Congress, among others, hampers efforts to provide effective validation of program budgets.

Although the program managers interviewed recognize that both the budget and schedule need to be validated, they rely on competition from the calls for TTP proposals and peer-review evaluations to ensure that the budget and schedule estimates, for tasks selected for budget consideration, are valid. The competition/peer-review processes also are the only independent cost- and schedule-estimate review efforts observed within EM-50. A shortfall in these practices (see B.2) is that HQ cost professionals do not have any significant hands-on, policy guidance or review role in these processes. In addition, there is no evidence that estimating methods, systems, or tools used to develop estimates have been examined or that those used by peer-reviewers in evaluations have been examined.

An example peer-review report (for TTP #AL241031) indicates that the process is sound in theory, but because only this one report was available, a thorough examination of the practice and the results of the peer-review process could not be conducted. However, the merits of the peer-review concept and its applicability in budget validation considerations is acknowledged.

It is recommended that EM-50 continue using the competition and peer review processes in budget validations. However, the processes should be made a formal and consistent part of EM-50's approach to budget validation, and they should be improved to meet the intent of the validation requirements stated in this POC. Practices and protocols should be defined and adopted to guide all participants, including the HQ cost professionals, in actions that ensure the program's budget is fully validated with respect to the intent of requirements stated in this POC.

III.B.4 Funding Request Requirements

POC

Official budget documents are approved and include, or are accompanied by, summary information that clearly identifies program scope, total funding requirements, and status. The program also maintains documents that are consistent over the life of the program for both continuing efforts and new additions to the program.

SEN-25A-91; *EM Program Management Policies and Requirements*

Observations, Discussion, and Recommendations

The intent of the POC is partially met.

EM-50 uses the PEG as its primary budget execution document. The PEG authorizes and defines the scope and authorizes funding. This document requires a clearly defined hierarchy of approval signatures. The PEG process provides a uniform structure for funds control. The information from the PEG and other financial data are fed into an integrated financial plan database that is used to track funding from the PEG to a detailed accountability of execution activities.

The Financial Plan Data Report, designed and implemented by the EM-50 Office of Resource Management, allows the visibility of both historical and anticipated financial plan actions. It also keeps a running account of the availability of funding, including the anticipated uncostered carryover. This capability not only allows for tremendous visibility of current and historical situations but also allows the quick response to "what if" scenarios that are so common in the management of resources.

It is recommended that the Financial Plan Data Report capability be considered for incorporation into the EM corporate system that will be developed after the reorganization is completed and the Resource Management Offices are combined. The capability provides a very useful tool, allowing tremendous visibility and flexibility and would be a valuable corporate asset.

It is recommended that EM-50 implement use of life-cycle cost and schedule planning and the development of baselines for all projects. This will allow future resource requirements to be included in this database and be available for analysis purposes.

III.B.5 Justification and Defense of the Budget Submittal

POC

Budgetary requests approved by DOE/HQ EM for submittal to the Secretary DOE, the Office of Management and Budget, and Congress are based upon the approved *Strategic Plan* and Program Plan(s); provide for meeting all formal agreements and legal requirements or clearly identify shortfalls; are traceable to specific programmatic goals, objectives, priorities, and milestones; and are well-documented.

SEN-25A-91; *EM Program Management Policies and Requirements*

Observations, Discussion, and Recommendations

The intent of the POC is partially met.

EM-50's mission is primarily defined by needs assessments to resolve problems across the sites. Consequently, the sites and the other line organizations define how all formal agreements and legal requirements will be met. It is important, however, that regulatory requirements be

considered in technology planning. This planning needs to be linked to budget development. Budget justifications, prepared to support the needs-based concept.

It is recommended that the special planning group proposed at POC A.2.1 help coordinate the budget-formulation effort to assure that EM-50 strategic and program plans are more closely linked.

III.B.6 Budget-Program Interactive Relationship

POC

Program Plans are revised to reflect the approved program/project budget and the impact of any budget adjustments that occur during the fiscal year.

EM Program Management Policies and Requirements

Observations, Discussion, and Recommendations

The intent of the POC is not met.

Adjustments are made to the funding levels of the TTPs but are not necessarily reflected in the Program Plans. The budgetary program plans are reflected in the PTS.

EM-50 guidance states: "All recipients of Office of Technology funding are required to report into the Progress Tracking System (PTS). Information reported into the PTS should tie to the EM-50 Financial Plan Data Report. All changes of funding from one TTP to another and PEG updates should be handled in accordance with SOP EM-50.2.2.3 Funds Management and Change Control." However, according to those interviewed, data in the PTS do not yet link to the FINPLAN. The Program Support Group is striving to make that link.

It is recommended that improvements be made in the planning process so that program plans are revised to reflect changes in budgets.

It is recommended that improvements in, and further development of, planning and budgetary links be made (see, for example, POCs A.1.1 and A.3.1).

III.C. EXECUTION

EM-50 execution activities meet the intent of 6 of the POCs, partially meet the intent of 13 POCs, and do not meet the intent of 6 of the POCs. The three POCs that address management of indirect cost are among the six that are not met. Although program managers manage programs according to their individually determined—but undocumented—procedures, the programs are well-managed. Program-management procedures are determined individually; therefore, there are inconsistencies in the way programs/projects are managed. The inconsistencies include:

- Various degrees of coordination with other line organizations
- Differences in the information reported monthly

- Variation in the level of detail with respect to the technical decision process and differences in the level of detail associated with TTPs.

EM-50 is aware of this and is trying to improve the consistency in management. For example, program managers for EM-54 and EM-55 meet each week to discuss management and program issues as well as to improve communication and coordination.

III.C.1 Program Funds Management

C.1.1 Program Funding Priorities

POC

When the program manager receives the approved funding for the assigned program(s), the manager reviews priorities for the distribution of funds against authorized funding.

During the fiscal year, the program manager takes replanning and reprogramming action, if necessary.

DOE Order 4700.1, Change 1; *Management Plans; Management Policies and Requirements*

Observations, Discussion, and Recommendations

The intent of the POC is met.

When a program manager receives approved funding for assigned programs, the manager reviews the TTPs against the priorities and approved funding to determine which TTPs to fund.

If a program manager wants to move funds from one project to another, the following replanning/reprogramming actions are taken:

- FINPLAN change form indicating where the funds will be transferred and where the funds are originating is completed
- Justification for the replanning/reprogramming action on the FINPLAN change form is included.

The affected EM-50 Office Director and the Operations Office(s) must approve the replanning/reprogramming action. Additionally, the PEG is modified to reflect the rationale for the change.

C.1.2 Expenditure Reporting/Cost Management

POC

There is an approved, documented, formal process for reporting expenditures against authorized program/project budgets. Expenditure reports are reconcilable with project schedule and milestone progress.

Requests for reprogramming and/or supplemental budget are supported with current status and cost information.

DOE Order 4700.1, Change 1; *Management Plans; Management Policies and Requirements*

Observations, Discussion, and Recommendations

The intent of the POC is partially met.

The PTS is an approved, documented, and formal process used to report expenditures against authorized TTP budgets. However, when received, the PTS report is 1½ months behind actual events, and the information being reported is not accurate. The PTS report does not provide detailed technical information. Program managers indicated that they cannot rely on the reports from the PTS because they cannot reconcile milestones against progress. Program managers have developed their own systems for reporting expenditures against authorized TTP budgets.

Program managers rely on informal, monthly status reports for measuring progress and tracking expenditures. Each program manager has developed requirements for the monthly status report. As a result, the level of detail varies in the monthly status reports. It is not clear whether program managers check the allocation of expenditures against authorized TTP budgets.

Reprogramming and/or supplemental budget requests are supported with current status and cost information.

It is recommended that EM-50 develop the PTS to be capable of consistent, accurate, and timely reporting of detailed information to assist program managers in monthly monitoring of their TTPs.

III.C.2 Program Direction

C.2.1 Program Execution Direction

POC

The Program execution direction reflects the following:

- Current-year funding defining established baselines
- Responsibilities
- Limits of authorities and accountabilities
- Lines of communication and reporting
- Key functions and individuals within the program/project organization.

DOE Order 4700.1, Change 1; *Management Plans; Management Policies and Requirements*

Observations, Discussion, and Recommendations

The intent of the POC is partially met.

EM-54 and -55 issue a formal call for proposals responding to the needs statement for TTPs. This formal call identifies EM-50 requirements. The program manager sends the formal call to the TPOs and Technical Project Managers who disseminate information to M&Os, National Laboratories, universities, and other contractors.

Program managers form peer review groups to review proposals. Typically, proposals are distributed by the program manager to EM-30, EM-40, U.S. Environmental Protection Agency (EPA), and the DOE Operations Office for a formal review. One resource pool consists of non-DOE contractors—typically retired scientists and engineers from the National Laboratories and scientists and engineers from universities available to perform the review. At least two individuals are selected from the resource pool to review a proposal. A scoring sheet with defined criteria is used to rate each proposal. Each proposal is reviewed against the defined needs and priorities.

Some program managers rely solely on the PEG to inform the bidders if their TTPs were selected. Other program manager send a letter to each bidder indicating whether DOE intends to fund the project under consideration.

Some program managers provide direct input to the FINPLAN indicating which TTPs will be funded during the current fiscal year; other program managers have no authority on how much money is allocated to a TTP; yet other program managers indicated that they provide input to senior managers on which TTPs to fund for the fiscal year. Refer to POC A.2.1 for additional details.

The program managers developed the PEG (4 volumes for FY 1994). Interviewees indicated that the PEG contains current-year funding, defines established baselines, and describes the scope of work and milestones. No evidence was found that program execution guidance (i.e., the PEG or other document) includes responsibilities, limits of authorities and accountabilities, lines of communication and reporting, and key functions and individuals within the program/project organization.

It is recommended that EM-50 develop consistency in managing the TTP review process. There should be guidelines on developing a peer-review group to evaluate the TTPs. Additionally, there should be guidelines established to review the TTPs against specified criteria.

It is recommended that the PEG also include responsibilities of the program and project managers and principal investigator, limits of authorities and accountabilities of the various individuals working on a particular TTP, lines of communication and reporting, and key functions and individuals within the program/project organization.

C.2.2 Program Work Authorization

POC

As a basis for cost management, program managers authorize work from the program offices to the Operations Offices for specific programs and

projects by issuing work authorizations at the beginning of each fiscal year.

Authorization of expenditures is tied to specific Program Plan requirements, approved implementation plans, identified major activities, key deliverables, funding for the fiscal year, milestones, and schedules.

DOE Order 4700.1, Change 1; *Management Plans; Management Policies and Requirements*

Observations, Discussion, and Recommendations

The intent of the POC is met.

The PEG is used to authorize work at the Operations Offices; it is revised annually to include a 2-page description of each current TTP including a scope of work, milestones to be met, deliverables required, and the funds available for the fiscal year. Program managers indicated that the PEG is used to initiate TTP work. A draft PEG is usually sent to EM-30 and -40 for their review prior to finalizing it.

The amount of detail in the PEG and the TTP varies with the program manager. For example, a TTP for EM-52 included a brief task summary, budget summary, milestone summary, guidance, and deliverables listing. A TTP for EM-55 included a detailed task summary, budget summary, milestone summary, summary of deliverables, technical task description, purpose, background approach, planned accomplishments, relationships, manpower estimate, funding basis to FY 1999, benefits, regulatory drivers, and key issues. Authorization of expenditures is tied to specific TTPs.

III.C.3 Technical Management

C.3.1 Technical Decision Process

POC

DOE/HQ EM uses a defined technical decision process that is disciplined and demonstrates that, at a minimum, technical decisions are based on cost effectiveness, total cost, schedule performance, regulatory compliance, technical performance, resource constraints, risk analysis, and goals and objectives of the Strategic and Program Plans.

DOE Order 4700.1, Change 1; DOE Order 4010.1

Observations, Discussion, and Recommendations

The intent of the POC is partially met.

The technical decision processes used by EM-50 to develop a list of TTPs to fund are disciplined and demonstrate that some technical decisions are based on needs assessment. The needs assessments sometimes include input from EM-30 and -40, timeliness of developing the technology (e.g., Record of Decision, best available technology), total cost, schedule

performance, technical performance, and cost-effectiveness (comparison of best available technology relative to cost).

Program managers have developed their own systems and procedures to perform needs assessments. This leads to the situation in which the sophistication of the needs assessment varies and where each program manager determines whether a cost-effectiveness analysis will be performed. Not all program managers require a cost-effectiveness analysis. Further, EM-30 and -40 do not always provide input to the needs assessment process, and LANL performs cost-effectiveness analyses only near the end of the demonstration phase (refer to POC A.5.1).

In general, program managers are not required, nor are they called upon by EM-30 or -40, to participate in the development and approval of regulatory agreements with respect to waste-management or remediation technologies. This is a shortfall that has EM-wide effects. Based upon the knowledge of the technologies under development, testing, demonstration and evaluation, EM-50 could provide valuable input to setting milestones for technology availability and use.

Some program managers indicated that they rely on TPOs and/or principal investigators to ensure regulatory compliance affecting their TTPs; some program managers review the status of regulatory compliance on their TTPs; others only list regulatory drivers in the TTP. For example, EM-55 TTP SR-1420-09 lists CERCLA, RCRA, Clean Water Act, and Federal Recycling & Procurement Policy as regulatory drivers.

The technical decision process does not include Value Engineering and risk analysis.

It is recommended that EM-50 incorporate regulatory compliance, resource constraints, and risk analysis into the technical decision process. In addition, EM-50 should consider using Value Engineering in its technical decision process.

It is recommended that EM-50 program managers provide input to the development and approval of regulatory agreements. This input may include recommending milestones for completion of a feasibility study as well as the Record of Decision.

C.3.2 Potential Regulatory Impact on Program Objectives

POC

Proposed and new regulations, legislation, regulatory agreements (e.g., Federal Facility Agreement, Consent Orders) are evaluated to determine the cost and schedule impact on the program. Evaluation activities focus on the following:

- Cost and schedule impact due to new compliance requirements
- Identification of cost-effective alternatives
- Negotiation strategies to achieve compliance with minimal cost and schedule impact.

Executive Order 12291; DOE Notice 4700.5

Observations, Discussion, and Recommendations

The intent of the POC is not met.

EM-50 does not evaluate the cost and schedule impact on its program as a result of proposed regulations, legislation, and regulatory agreements. Refer to POC A.5.4 for additional details.

It is recommended that EM-50 participate in analyses of proposed and new regulations, legislation, and/or regulatory agreements to determine the cost and schedule impacts on their program.

C.3.3 Data Quality Objectives

POC

DOE/HQ EM provides guidance to the Operations Offices on the requirements, importance, and application of Data Quality Objectives in both planning and execution.

Observations, Discussion, and Recommendations

The intent of the POC is met.

EM-56 established requirements for the application of EM sampling and analytical activities by Operations Offices to meet data quality objectives (DQOs). Additionally, EM-56 provided training and conducted audits to determine compliance with the DQOs requirements.

Although DQOs have been developed by EPA for application to field data, DQOs also can be applied to the collection and analysis of testing and demonstration data. No evidence was found that EM-50 applies DQOs to the collection and analysis of testing and demonstration data.

It is recommended that program managers require principal investigators to use DQOs in the collection and analysis of testing and demonstration data.

C.3.4 Quality Assurance

POC

Each program organization has developed and implemented program-specific Quality Assurance policies, guidance, direction, and procedures as appropriate. The program organizations have provided Quality Assurance guidance to the Operations Offices.

DOE Order 5700.6C; *EM Program Management Policies and Requirements*

Observations, Discussion, and Recommendations

The intent of the POC is met.

The EM-50 Quality Assurance (QA) Officer spot checks QA Plans from the Operations Offices. However, there is no requirement for the principal investigators working on EM-50 projects to

submit a QA Plan to HQ, and not all principal investigators do so. Interviewees indicated that the program manager sometimes requests submittal of QA plans for review. EM-50 relies on NQA1 to provide policies, guidance, direction, and procedures to the Operations Offices. EM-50 program managers depend on the QA Officer to implement EM-50 QA policies.

It is suggested that EM-50 program managers require their principal investigators to submit QA Plans to the QA Officer for review in order to ensure that EM-50 QA policies are being implemented.

C.3.5 Technology Risk Assessment

POC

Program managers provide guidance and ensure that risk assessments are performed in both the selection and application of technologies to determine the most cost-effective alternative actions.

Observations, Discussion, and Recommendations

The intent of the POC is not met.

EM-50 does not perform risk assessments in the selection and application of technologies to determine the most cost-effective alternatives. EM-50 program managers implied it is the Operations Offices' responsibility to perform such analyses. In addition, EM-54 program managers indicated that the Office of Research and Development does not use risk assessment methodologies in its activities, including development, design, testing and evaluation.

Although EM-50 does not meet the intent of the POC, it is undergoing a reorganization in which an Office of Technology and Risk Integration is being established. This Office will be responsible for developing and implementing the processes needed to assist DOE HQ and its facilities in making risk-based, cost-conscious environmental restoration and waste management (ERWM) decisions. However, the mission and functions statements for this Office do not specify if technology risk assessment will be integral to the Office.

It is recommended that EM-50 examine the mission and function statements of the Office of Technology and Risk Integration and, as necessary, clarify the intent of those statements concerning the application of technology risk assessment to selecting and applying cost-effective technologies.

It is recommended that EM-50 furnish guidance on the use of risk assessment methodologies to select and apply cost-effective technologies during development, design, testing, and evaluation and that program managers ensure the guidance is followed.

III.C.4 Risk Management

POC

Risk management is applied by the program manager as a means of identifying, assessing, and controlling the cost and schedule.

DOE Order 4700.1, Change 1; DOE Order 5700.2D; Field

Observations, Discussion, and Recommendations

The intent of the POC not met.

Program managers do not use risk management as a means of identifying, assessing, and controlling cost and schedule. Although EM-50 does not meet the intent of the POC, it is undergoing a reorganization in which the Office of Technology and Risk Integration is being established. This Office is expected to be responsible for developing and implementing the processes needed to assist DOE HQ and its facilities in making risk-based, cost-conscious ERWM decisions.

It is recommended that program managers use risk management as a means of identifying, assessing, and controlling cost and schedule.

It is recommended that EM-50 examine the mission and function statements of the Office of Technology and Risk Integration and clarify, as necessary, the statements concerning risk identification, risk assessment, and control of cost and schedule.

III.C.5 Program Evaluation

C.5.1 Program Review

POC

The program manager conducts periodic reviews of program/project activities to assure that cost, schedule, and technical progress is being achieved in accordance with program baselines and milestones. Program/project reviews focus on funding, cost and schedule status, cost and schedule to complete, significant problems, variance analysis against baselines, trend analysis, technical performance, significant milestone status, quality and operating issues, critical items, and compliance with regulatory requirements. Technical, cost, and schedule issues are identified and evaluated to determine the necessary corrective actions that can mitigate the issues in order to maintain the baselines.

The results of the program review are documented in reports.

DOE Order 5700.2D; *Management Policies and Requirements*

Observations, Discussion, and Recommendations

The intent of the POC is partially met.

Each program manager performs a review of TTP activities to determine whether cost, schedule, and technical progress are being achieved in accordance with program plans (see POC A.3.4.) and milestones. The frequency of the TTP review varies with the program manager. Typically, EM-55 program managers conduct periodic reviews of TTPs, whereas, EM-54 program managers may only perform one major TTP review per year. EM-55 program managers are supported by many technical specialist because the program managers are usually involved with multiple technologies. EM-54 program managers deal with only one technology and, therefore, have a smaller number of technical specialists to support them.

The depth of TTP review also varies with the program manager. Some program managers focus on funding, cost and schedule status, cost and schedule to complete, and significant problems. Variance and trend analyses are not usually evaluated during a TTP review. In addition, there is variation in the completeness of the review documentation.

It is recommended that, as part of the TTP reviews, program managers include evaluating variance and trend analyses. Additionally, program managers should document the results of the reviews.

C.5.2 Program Status Reports and Analyses

POC

Program/project status reports and analyses (e.g., monthly, quarterly) are required and reviewed by the appropriate program managers to monitor the progress of the program/project against cost, schedule and technical baselines.

The reports are accurate and timely and convey the information needed to understand the program/project status and make cost-effective and technical decisions.

The analysis provides actual and projected variances and trends for technical, cost, and schedule baselines to identify any potential impact to the program.

Plans for developing and implementing corrective actions necessary to mitigate any potential negative impacts to the program are identified and described in the report.

DOE Order 4700.1, Change 1; *Management Policies and Requirements*

Observations, Discussion, and Recommendations

The intent of the POC is partially met.

The PTS reports the cost, schedule, and technical aspects of the TTP. As noted (POC C.2.1), program managers indicated that the PTS reports are about 1½ months behind and do not provide detailed technical information on the progress of a TTP. Also, the PTS reports do not

always agree with the dollar amounts provided in the FINPLAN and in the Work Authorizations. Program managers do not use PTS reports to monitor technical cost, and schedule progress against the TTP because the reports are neither timely nor accurate and they do not provide detailed technical information.

Also as noted at POC C.1.2, informal monthly status reports are submitted to program managers by the principal investigators. Program managers use the informal monthly status reports to provide current information on the progress and status of their TTPs. These reports are more accurate and timely than the PTS reports, and the information they contain are used by the program manager to make technical decisions.

Monthly status reports of projects being funded through Morgantown are submitted to the EM-50 contracts representative who reviews the information and sends copies to the program managers. The monthly status report includes a narrative report, list of deliverables and work in progress, and list of hours worked by individual by subtask; each task is plotted on a schedule.

It is recommended that EM-50 use a system that is capable of consistent reporting of information to assist program managers in monthly monitoring of their TTPs.

It is recommended that monthly status reports include actual and projected variances and trends for technical requirements, cost, and schedule.

It is recommended that EM-50 provide guidelines for submitting plans for developing and implementing corrective actions necessary to mitigate any potential negative impacts to the program that are identified.

C.5.3 Baseline Change Control Process

POC

The program office has an established baseline change control process to control changes that significantly impact program cost, schedule, and technical baselines. The process provides guidelines for assessing the life-cycle cost impact on proposed changes that impact the baselines.

DOE Order 4700.1, Change 1; *Management Plans; Management Policies and Requirements*

Observations, Discussion, and Recommendations

The intent of the POC is partially met.

Although there is an approved Standard Operating Procedure (SOP) on the change control process, practices relevant to change control are not consistent. For example, program managers could initiate changes with respect to HQ technical, cost, or schedule baseline when baselines exist. EM-54 program managers indicated that they do not use a formal change control process but use the PEG to specify a change to a project. When the site requests a change that impacts technical requirements, cost, or schedule, the program manager will review the requested change and its impact to decide whether to approve the change.

It is recommended that EM-50 establish one change control process to be used by all program managers.

C.5.4 Maintaining Technical, Cost, and Schedule Baselines and Program Plans

POC

The program manager maintains the technical, cost and schedule baselines. Once a change has been approved, the technical, cost, and schedule baselines are revised to reflect current information. The Program Plan, management control systems, and other documentation are revised to include the current technical, cost, and schedule baselines.

DOE Order 4700.1, Change 1; *Management Plans; Management Policies and Requirements Management Plan*

Observations, Discussion, and Recommendations

The intent of the POC is partially met.

Procedures covering maintenance of baselines and program plans do not fully address the intent of this POC. As a result, there is a lack of consistency on which systems and documents are revised to reflect current technical requirements, cost, and schedule. Some program managers revise the PEG to reflect the current technical requirements, cost, and schedule; other program managers do not.

It is recommended that EM-50 senior management inform program managers on which systems and documents should be revised to reflect current technical, cost, and schedule baselines. In addition, program managers should become aware of the process for revising the baselines.

III.C.6 Cost and Schedule Management Support

C.6.1 Program Manager Cost and Schedule Responsibility, Accountability, and Authority

POC

Cost and schedule responsibility for each program or subprogram element is assigned to DOE/HQ EM program managers at an appropriate level in the organization. Authorities are delegated commensurate with the level of responsibility assigned.

DOE Order 4700.1, Change 1

Observations, Discussion, and Recommendations

The intent of the POC is met.

Program managers are responsible for the cost and schedule aspects of assigned efforts. In general, program managers delegate the hands-on aspects of their cost and schedule responsibilities to the TPO in the Operations Office that is handling the tasks performed under the TTP. The hands-on aspects of the program manager's responsibility may be further

delegated to the Principal Investigator in the laboratory, M&O contractor, or other site support contractor.

C.6.2 Cost and Schedule Objectives

POC

The program manager has clearly defined cost and schedule objectives and has conveyed them to the Operations Offices. The program manager encourages cost-effective management initiatives.

DOE Notice 4700.5; DOE Order 4700.1, Change 1; DOE Order 5700.2D

Observations, Discussion, and Recommendations

The intent of the POC is met.

Setting cost and schedule objectives as a part of the TTP is a way to encourage participants to adopt cost-effective management initiatives. But, as noted at POC B.2, the distribution of funds and the amount available to individual organizational elements are decided at the higher levels of EM-50 on the basis of a combination of rules-of-thumb and more objectively determined program needs. As a result, the program managers must use a combination of top-down and bottom-up approaches to decide cost and schedule objectives (i.e., to decide the funding to commit to an effort and the time to allow for its completion.)

This method hinges on the competitive bidding and peer review aspects of obtaining approved of a TTP. Once the projected cost and schedule are decided, they become part of the TTP documentation used to convey cost and schedule objectives. The funds allocated, milestones, and projected costs become the cost and schedule objectives against which progress is measured for work elements covered by the TTP.

C.6.3 Cost-Management Support

POC

Cost-management support is available to program managers. The support recognizes and emphasizes cost/schedule management as a key element of program cost management.

DOE Order 4700.1, Change 1; DOE Order 5700.2D

Observations, Discussion, and Recommendations

The intent of the POC is partially met.

The program managers' use of HQ cost professionals for cost-management support is inconsistent. For example, while HQ budget professionals are used, program managers rely on the Operations Offices, National Laboratories, and/or other contractor for support in developing cost and schedule estimates and cost analyses or for collecting actual cost data for controlling program costs. The HQ cost professionals—other than those involved in budgeting—do not have a hands-on, advisory, review, or policy role in these cost-management activities.

EM-50's Office of Program Support has initiated efforts to improve cost-management such as the Resource Management Division's FY 1993 action to collect and analyze indirect cost data from sites complex-wide and the Program Integration Division's action to routinely extract data from the PTS and produce reports containing progress/actual cost information. Although the reports produced are designed to be more usable for controlling program/project cost than current PTS reports, there are drawbacks to their use. One drawback is that by the time the cost/progress data are available to extract from the PTS, they are out of date. This limits the usefulness of these reports and forces program/project managers to base decisions that affect cost on information from other sources.

Another effort to improve cost management is the Program Integration Division's call for site estimating-guideline documents. The plan is to use the existing guidelines as a "straw man" when developing and publishing HQ-level guidance. The Division contemplates the guidance will be applicable to all cost estimates produced for EM-50.

It is recommended that EM-50 take action to increase consistency in the use of HQ cost professionals and foster a common approach to cost management. The program should call on HQ cost professionals to identify the actions needed to bring about consistency and use of cost analyses and other cost-management tools. For example, action is needed at both HQ and the site to have all program participants fully use analysis tools, methods, and techniques and to take a consistent approach to cost management.

C.6.4 Cost Estimating

C.6.4.1 Cost-Estimating Responsibilities and Support to the Program Manager

POC

Responsibilities for cost estimating are assigned to the program manager. These responsibilities include promoting and requiring effective and consistent cost estimating and analysis through development, dissemination, and required use of procedures, standards, guidelines, handbooks, and training.

Professional cost-management staff is available to support program managers in meeting their responsibilities for cost estimates.

The program office supports and/or makes available cost-estimating tools, handbooks, computer models, computer programs, and training to support development of cost estimates.

DOE Order 5700.2D

Observations, Discussion, and Recommendations

The intent of the POC is partially met.

As described in C.6.3 and other POCs, program managers generally rely on cost and schedule estimating, cost analysis, cost control, and cost-management support from sources other than HQ cost professionals. No evidence confirming that cost-estimating tools, handbooks, models, or training was available to support development of cost estimates.

It is recommended that EM-50 revise practices to better promote and require effective and consistent cost estimating and analysis. The program should develop, disseminate, and require use of common procedures, standards, guidelines, handbooks, and training. This includes making available cost-estimating tools in the form of parametric cost-estimating models and computer programs to encourage consistent treatment of cost evaluations and analyses.

C.6.4.2 Cost-Estimating Functions

POC

The program-level cost-estimating functions include the following:

- Preparing program-level estimates and reviewing and approving estimates prepared and submitted by Operations Office, including estimates that support
 - Project decision phases (e.g., KD 0 through KD 4)
 - Capital funding request
 - Operations and maintenance funding request
 - Significant contract modification/change order request
 - Procurement decisions (Independent Government Estimate)
 - Major programmatic decisions
- Reviewing contingency development and support/require use of risk analyses
- Assisting the Operations Offices (project/program and Chief Financial Officer personnel) in developing and using a comprehensive and uniform Code of Accounts that is complementary to the Work Breakdown Structure and suitable for
 - Systematic array of tasks and subtasks for estimate preparation
 - Collection of actual cost
 - Providing a consistent, program-wide framework for comparing estimated and actual cost and for sorting and analyzing historical costs
- Developing and monitoring the collection of historical cost data and reviewing the maintenance of current cost databases including

- Unit prices (for material/labor/equipment)
 - Labor productivity
 - Special-work factors
 - Indirect cost
- Developing and monitoring cost trends, identifying and evaluating budget impact implications
 - Supporting and requiring estimating participation in value engineering studies
 - Supporting and requiring use of cost analyses such as Life Cycle Cost Analysis
 - Ensuring escalation rates employed conform to DOE guidelines
 - Overviewing all costs associated with the program.

Cost-estimating management practices and functions are coordinated within DOE/HQ EM and coordinated with other DOE offices. Cost-estimating practices are consistent to the extent possible.

DOE Notice 4700.5; DOE Order 4010.1; DOE Order 4700.1, Change 1; DOE Order 5700.2D

Observations, Discussion, and Recommendations

The intent of the POC is partially met.

Cost analyses are used, but there is no consistent effort to:

- Use Life Cycle Cost Analyses
- Review (including review of contingency development), formally approve, and/or validate estimates submitted by sites
- Support and/or require the use of risk assessments, risk analyses, and risk management
- Guide or direct the development and use a common code of accounts
- Participate in Value Engineering studies or similar evaluation efforts
- Overview all program costs
- Systematically collect and analyze actual cost program-wide or build effective cost databases
- Check that escalation rates employed conform to guidelines.

In regard to developing and monitoring cost trends and to identifying and evaluating budget impact implications, the principal concerns of cost professionals were the cost reporting capabilities of the PTS, extraction of data from the PTS, and the production of reports of limited utility because they contain (due to the nature of the PTS) out-of-date data.

It is recommended that EM-50 change practices and establish a more structured and clearly defined approach to cost-estimating functions. The requirements for these functions should be clearly defined.

C.6.5 Schedule Estimating

C.6.5.1 Schedule Estimating Responsibilities and Support to the Program Manager

POC

Responsibilities for schedule estimating are assigned to the program manager. These responsibilities include promoting and requiring professional, effective, and consistent schedule estimating through policies, procedures, standards, guidelines, handbooks, and training.

Professional staff is available to support program managers in meeting their responsibilities for schedule estimating.

The program office makes available tools, handbooks, programs, and training to support scheduled development.

DOE Notice 4700.5; DOE Order 4700.1, Change 1

Observations, Discussion, and Recommendations

The intent of the POC is partially met.

There is a lack of consistency in schedules; related policies, procedures, standards, guidelines and handbooks are not in-place. Program managers rely on the Operations Offices, National Laboratories, or other contractor for schedule-estimating support. The HQ professional staff do not have a hands-on, advisory, review, or policy role in schedule preparations.

It is recommended that EM-50 change practices and conduct training to promote and require effective and consistent schedule estimates in support of program managers.

It is recommended that HQ cost professional staff develop HQ-level policies and procedures, conduct training, and make available schedule-estimating tools, guidance, handbooks, and computer programs.

C.6.5.2 Schedule Estimating Functions

POC

Program-level schedule estimating functions include the following:

- Preparing program-level schedules and reviewing and approving schedules prepared and submitted by Operations Offices including schedules that support
 - Project decision milestones, (e.g., KD 0 through KD 4)
 - Significant operations and maintenance milestones
 - Contract change-order requests affecting milestones
 - Procurement decision milestones
 - Major programmatic decisions milestones
- Reviewing and approving of Operations Office-prepared and -submitted schedules to ensure that programmatic constraints such as availability of funding and other external factors, (e.g., future regulations or policies) are included.

Schedule-estimating management practices are consistent within DOE/EM and coordinated with other DOE offices.

DOE Notice 4700.5; DOE Order 4700.1, Change 1

Observations, Discussion, and Recommendations

The intent of the POC is partially met.

Program-level schedule estimates are not consistent. There is no evidence that schedule estimates prepared at the sites are consistently, formally, and systematically reviewed and approved.

It is recommended that EM-50 establish a more structured and clearly defined approach to schedule-estimating functions. The program should establish HQ-level schedules that not only support programmatic decisional milestones but also reflect funding and other programmatic constraints.

C.6.6 Cost and Schedule Control System Responsibilities and Functions

POC

Cost and schedule control conforms to SEN 27-90 and DOE Order 4700.1, Change 1.

The system is maintained and operated at a state of readiness that ensures that its output is dependable and that allows the output to be used on a regular, consistent basis as a fundamental support tool facilitating effective cost/schedule management.

Estimated contingencies are identified and managed separately within the system throughout the life of the program.

DOE Notice 4700.5; DOE Order 4700.1, Change 1; DOE Order 5700.2D

Observations, Discussion, and Recommendations

The intent of the POC is partially met.

Program managers and program support personnel agree that, by the time PTS reports are received, the information in them is out-of-date. The dollar amounts in the PTS seldom agree with dollar amounts provided in the FINPLAN and in work authorizations. Also, estimated contingencies are not separately identified and managed in the PTS or elsewhere.

In lieu of reliable, timely, and meaningful reports from the PTS, program managers must rely on individually crafted reports. These are supplied by the EM-50 TPO, the Principal Investigator, or other site source. The progress/cost information in these reports is considered to be more reliable and timely than that in the PTS. However, these reports are provided on an ad-hoc basis, and although they may be the only way to obtain essential cost and progress information, they are not structured to meet, nor do they meet, the full intent of the POC.

The Program Integration Division prepares reports based on cost data extracted from the PTS. These reports are based on, and updated by, data extracted from the PTS; therefore the report is out-of-date when delivered. Other observations relevant to EM-50's reports are at POC C.6.3.

It is recommended that EM-50 use its representation on committees developing and overseeing operations of the PTS to effect improvements in timeliness and accuracy in the information reported in the PTS.

It is recommended, that EM-50 develop a single approach to a program control system. For example, the system should take a consistent approach toward control of scope, schedule, and cost including the way actual costs and status data are collected and performance is measured against plan.

III.C.7 Indirect Cost

The areas of indirect cost and indirect-cost management have been virtually ignored by EM management. There is essentially no demonstrated knowledge of indirect-cost methodologies or of how to manage indirect cost. The responsibility for education about, and oversight of, indirect cost should be assigned to the Assistant Secretary with a forceful directive to train and assist EM project managers—at HQ and in the field—to properly manage indirect-cost activities. Meeting the intent of the indirect cost POCs should be the responsibility of an EM staff organization as directed by the Assistant Secretary for EM.

C.7.1 Knowledge of Indirect Cost Methodologies

POC

The DOE/EM personnel responsible for managing and monitoring indirect cost have a working knowledge of legal and regulatory requirements pertaining to indirect cost methodologies. At a minimum, this includes

the concepts of allowability, allocability, and reasonableness of costs chargeable to DOE/HQ EM activities and/or contracts.

DOE Order 2200.13; FAR 31.201-2, 31.201-3, and 31.201-4

Observations, Discussion, and Recommendations

The intent of the POC is not met.

None of the personnel interviewed took organizational ownership of responsibility for the management of indirect cost, nor did they exhibit any in-depth knowledge of the subject. Some program managers obtain information on the indirect cost activities that support their particular task assignments. However, this collection of information is highly individualized and, therefore, inconsistent across EM-50 projects.

It is recommended that EM-50 be assigned the responsibility for managing indirect cost chargeable to EM-50 projects. EM-50 should coordinate with, and assist, HQ/EM or others at the Departmental level in the development of indirect-cost management procedures.

C.7.2 Indirect Cost Management Resources and Guidance

POC

Within the framework of DOE policies, program management provides additional guidance to the Operations Offices for managing and monitoring indirect cost processes for DOE/HQ EM activities and/or contracts.

DEAR 970.0901 and 970.3102-1

Observations, Discussion, and Recommendations

The intent of the POC is not met.

The personnel interviewed were not aware of any specific guidance related to indirect-cost management issued by EM-50 to the Operations Offices.

It is recommended that EM-50 program management ensure that the Operations Offices receive guidance for the proper management of indirect-cost activities that effect EM-50 activities or contracts.

C.7.3 Indirect Cost Oversight Process

POC

DOE/HQ EM has reporting and review processes to provide adequate information for proper management of indirect-cost functions (e.g., security, personnel, legal, accounting) from the DOE/HQ level through the Operations Offices and contracts.

DOE/HQ EM personnel interact with other DOE organizations to ensure that program execution is consistent with and promotes compliance with

DEAR, DOE Orders (e.g., DEAR 970.0901, DEAR 970.3102-1, DOE Order 2200.13), and guidance from the Office of the Chief Financial Officer.

Observations, Discussion, and Recommendations

The intent of the POC is not met.

Interviewees stated that as a part of the management process, some program managers obtain information on the indirect-cost activities supporting their particular assignments. However, this collection of data varies by individual program manager and is inconsistent across EM-50 projects.

It is recommended that specific roles and responsibilities be assigned to EM-50 program managers to ensure that appropriate mechanisms and systems are in place to properly review and manage indirect-cost activities. These systems must accurately compile and adequately report information to DOE HQ regarding indirect-cost activities at all levels of EM-50, from HQ through Operations Offices and contracts.

APPENDIX A: INTERVIEWEES

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Bardin, Vicki A.	EM-531
Biansosine, David L.	EM-551
Booth, Steven	LANL
Boyd, Gerald	EM-53
Brancosmo, David	EM-55
DesChamps, Floyd	EM-522
Einam, Steve	EM-532
Evans, Thomas	EM-533
Fryberger, Theresa B.	EM-542
Harison, Jeff	
Hyde, Jerry M.	EM-551
Keller, Bill	EM-532
Kramer, Robert	EM-532
Lankford, John M.	EM-55
Lurk, Paul W.	EM-552
Marthers, John	EM-55
Mathur, S.P.	EM-55
Miller, Don	BDM
Mohiuddin, Jaffer	EM-552
Newberry, William R.	EM-563
Prestwich, Susan	EM-52
Schieber, Robert J.	EM-532
Schupe, Melvin W.	EM-541
Schutte, William C.	EM-54
Simpson, James E., Jr.	EM-531
Sink, Clair	EM-521
Thorpe, Rich	SAIC
Toth, William S.	SAIC
Vogel, Larry	SAIC
Watson, Barbara C.	EM-531
Weber, Susan C.	EM-541
Wengle, John L.	EM-532
Zier, Robert	SAIC

APPENDIX B:
DOCUMENTS REVIEWED

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**APPENDIX C:
TEAM MEMBERS**

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APPENDIX D:
ACRONYMS AND ABBREVIATIONS

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ACRONYMS AND ABBREVIATIONS

ADS	activity data sheet
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CQMA	Cost Quality Management Assessment
DEAR	Department of Energy Acquisition Regulation
DOE	Department of Energy
DQO	data quality objective
EM	Office of Environmental Restoration and Waste Management
EM-1	Assistant Secretary for Environmental Restoration and Waste Management
EM-10	Office of Planning and Resource Management
EM-24	Office of Engineering and Cost Evaluation
EM-3	Office of the Executive Assistant
EM-30	Office of Waste Management
EM-4	Office of Policy and Program Information
EM-40	Office of Environmental Restoration
EM-50	Office of Technology Development
EM-52	Office of Technical Integration and Environmental Education and Development
EM-54	Office of Research and Development
EM-55	Office of Demonstration, Testing and Evaluation
EM-60	Office of Facility Transition and Management
EPA	Environmental Protection Agency
ERWM	environmental restoration and waste management
FAR	Federal Acquisition Regulation
FINPLAN	<i>Financial Plan</i>
FY	fiscal year
FYP	<i>Five-Year Plan</i>
HQ	[DOE] Headquarters
KD	key decision
LANL	Los Alamos National Laboratory
M&O	Management and Operation [contractor]
MSA	Major System Acquisition
PEG	Program Execution Guidance
POC	Performance Objectives and Criteria
PTS	Progress Tracking System
QA	quality assurance
R&D	Research and Development
RCRA	Resource Conservation and Recovery Act
SEN	Secretary of Energy Notice
SOP	Standard Operation Procedure
TADS	technical activity data sheet
TPO	Technical Program Officer
TTP	Technical Task Plan

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