Earned Value Management System Description

Fermi Research Alliance

operating
Fermi National Accelerator Laboratory
for the
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Contact Information

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This manual is presented in two parts. Part I is the Systems Description that provides an overview of the EVMS, establishes requirements for its use, defines system components, and describes the interface between these components. Part II contains procedures for implementing and performing the EVMS component processes described in Part I.

Attachment A includes a table documenting where each of the thirty-two Earned Value criteria contained in the American National Standards Institute Electronic Industries Alliance (ANSI/EIA)-748 EVMS standard are addressed in this manual.

Signature Page

1/11/10

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for 12-Jan-2010

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Change History Log

Rev Number	Revision Date	Sections Affected	Description of Change
0	28-July-2006	All	Unapproved
1	17-Oct-2008	All	Revised in conjunction with writing procedures and certification review.
2	2-Dec-2008	All	Removed references to funding, added accounting procedure references, changed wording in Section 4.0, removed two Performance Measurement Techniques, and revised title of Procedure 12.PM-003
3	3/27/09	All	Removed "Fermilab" terminology, revised phraseology consistent with "contingency / management reserve", revised "cost account" to chargeable task code , other minor rewording.
4	9/17/09	All	Included provision for performance management on collaborator uncosted labor; revised definitions for contingency and management reserve; included provision for undistributed budget
5	1/12/10	3.6.2 5.1.2.1, 5.2.1, Appendix B	Revised Undistributed Budget definition Revised management reserve/contingency terms

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1.0 Introduction

Fermi Research Alliance, LLC (FRA) is a Universities Research Association (URA) and University of Chicago (UChicago) limited liability corporation, created specifically to manage and operate Fermi National Accelerator Laboratory (Fermilab) for the Department of Energy (DOE). This FRA Earned Value Management System Description provides the requirements, procedures, authorities, and responsibilities for implementing an Earned Value Management System (EVMS) on projects subject to U.S. Department of Energy (DOE) Order 413.3A, *Program and Project Management for the Acquisition of Capital Assets.* This system description also applies to large and/or high-risk projects that have been determined by management to require EVMS project management controls. The assigned Project Manager has the primary responsibility for implementing the EVMS and for ensuring projects are planned and executed consistent with the requirements and processes defined in this system description. The Office of Project Management Oversight (OPMO) has the primary responsibility for maintaining the EVMS and maintaining interfaces with existing Fermilab business and management systems.

1.1 CORPORATE POLICY STATEMENTS AND EVMS PRINCIPLES

Fermi National Accelerator Laboratory is a Department of Energy National Laboratory operated under a contract with DOE by Fermi Research Alliance, LLC. Fermilab's mission is to advance the understanding of the fundamental nature of matter and energy by providing leadership and resources for qualified researchers to conduct basic research at the frontiers of high energy physics and related disciplines.

As a DOE Laboratory, projects performed at Fermilab adhere to the requirements in DOE Order 413.3A, *Program and Project Management for the Acquisition of Capital Assets.* For the purposes of this document, we will refer to these projects as "major projects" or "the project." Additionally, DOE Order 413.3A specifies that the EVMS must comply with the industry standard for project control systems described in American National Standards Institute (ANSI) EIA-748, *Earned Value Management Systems.*

This Earned Value Management System Description documents the project management processes essential to effective planning, organization, control and surveillance of major projects. It is written to comply with:

- ANSI/EIA-748-B, *Earned Value Management Systems, the Industry standard for implementing EVMS*
- DOE Order 413.3A, *Program and Project Management for the Acquisition of Capital Assets*
- Director's Policy 12, *Project Management*

The seven principles of an EVMS as defined by the ANSI standard are:

- Plan all work scope for the project to completion.
- Break down the project work scope into finite pieces that can be assigned to a responsible person or organization for control of the technical, schedule, and cost objectives.
- Integrate the project work scope, schedule, and cost objectives into a performance measurement baseline against which accomplishments may be measured. Control changes to the baseline.
- Use actual costs incurred and recorded in accomplishing the work performed.
- Objectively assess accomplishments at the work performance level.
- Analyze significant variances from the plans, forecast impacts, and prepare an estimate at completion based on performance to date and work to be performed.
- Use EVMS information in management processes.

The basic tenet of the EVMS process is structured around the five ANSI guideline categories, which are: (1) Organization, (2) Planning, Scheduling, and Budgeting (3) Accounting Considerations, (4) Analysis and Management Reports, and (5) Revisions and Data Maintenance.

1.2 PURPOSE AND OBJECTIVE

The purpose of this system description is to present policies and procedures that define the FRA approach to an Earned Value Management System. The objective is to provide Project Managers with tools that facilitate optimal planning, accurate reporting, and effective control through the standardization of processes used for project scope, schedule, and budget management. The ANSI principles are integrated and organized by the guidelines into a comprehensive system that develops and maintains the baseline; tracks project cost, schedule, and scope; and provides for the generation of timely performance measurement data and reports. Performance measurement reports provide management with objective project information critical to monitoring progress, identifying significant issues, and implementing corrective actions as needed.

Compliance with the EVMS Description policies and processes described in the implementing procedures are required for all activities performed within the project approved baseline.

1.3 TAILORING THE EVMS PROCESS

The application of EVMS requirements can be tailored among project elements depending on customer requirements and project risk. A fundamental premise of the process is that all projects can be managed through the application of a graded approach to project management and controls. Thus, elements are assessed, and a graded approach is applied to the application of the project management requirements, which verifies that adequate, but not excessive, controls are applied. Additional control processes for the project may be implemented

when required by the customer or sponsor. The Office of Project Management Oversight has ultimate responsibility to ensure that tailoring of any EVMS process does not violate the intent of ANSI/EIA-748-B and the FRA certified EVMS. Verification of EVMS compliance is confirmed during the individual project EVMS surveillance process, overseen by the Office of Quality and Best Practice.

All applicable projects will consistently follow the process outlined in this document. Although tailoring to a project's specific needs is appropriate and expected, an EVMS must be applied in a consistent and formally documented process commensurate with the project's budget, scope, and risk. Implementing, monitoring, controlling, and self-auditing the process assures the highest level of project performance.

Tailoring of any requirement or process is only permitted as described in this Earned Value Management System Description document or associated implementing procedures, and must be documented in the project's Federal Project Execution Plans (PEP) or Fermilab-prepared Project Management Plans (PMP). Customization of reporting or approval thresholds different from those established in this manual must also be documented in these project-specific management plans cited above.

2.0 Organization

Project organization is the first and one of the most important functions of project management. It ensures that the work is adequately defined, identifies the organizations responsible for performing the work, and assigns responsibilities for managing and performing the work to the appropriate internal or external organization.

An initial level of project organization must be established early in a project's life cycle. At a minimum, the Project Manager and the customer or DOE Federal Project Director are selected along with a core team to begin project planning and defining customer requirements, including what constitutes project completion. The Project Manager and the first members of the Integrated Project Team (IPT) are selected during the justification of Mission Need and Initial Planning phase. The IPT is lead by the customer's project director, which on DOE projects is known as the Federal Project Director.

The Project Manager reports to the appropriate Associate Director, or to the Director. The organizational structure is described in the Project Execution Plan (PEP). The Project Manager has the authority and the responsibility to execute the project within the scope, budget, and schedule agreed to with the customer. The Project Manager delegates the same responsibility to the Control Account Managers (CAMs) for the control accounts assigned to them.

During the project initiation phase, prior to CD-0 on DOE projects, the team begins the development of an initial Work Breakdown Structure (WBS) and an initial approximation of the project's budget and schedule. At this stage of the project, summary level planning (i.e., design, construction, etc) is being developed in a conceptual sense.

Project Managers need to continue to assess the organization of the project throughout the project's life cycle. This includes refining the structure of the WBS and ensuring staff are properly trained to fulfill their assigned roles and responsibilities. Planning the work scope for the project from initiation to completion is essential to control "scope creep." All stakeholders must unilaterally accept the project scope fairly early in the planning process and prior to Final Design. Once the Performance Measurement Baseline (PMB) is determined, a final Project Execution Plan is issued, outlining the scope, budget, and schedule for the project, which is then reviewed and updated at all major phases of the project. The IPT charter and membership can change as the project evolves throughout the execution phase.

Project WBS, OBS, and RAM (EVMS Procedure 12.PM-001) describes the formal process of organizing and structuring project work scope. The WBS provides the framework for cost estimating, scheduling, budgeting, authorizing, tracking, costing and reporting of project work. The procedure includes guidelines and instructions for development of the Work

Breakdown Structure, the Work Breakdown Structure Dictionary, the Organizational Breakdown Structure, and the Responsibility Assignment Matrix.

2.1 WORK BREAKDOWN STRUCTURE

The Work Breakdown Structure (WBS) is a product-oriented, hierarchical depiction of all work elements required to accomplish the entire work scope of the project. Each descending level is a subdivision of the work above, with increasingly detailed definition/division of the work. The WBS is the structure for integrating the scope, schedule, and budget for all project work. It is used as a framework for assigning and defining work, developing schedules, estimating and budgeting, managing funds, and controlling changes. The WBS is used by management throughout the lifecycle of a project to identify, assign, and track the project's total work scope. Each element is assigned a unique code to identify it in all project documents. The WBS is detailed in the PEP or attached as an appendix. An example of a WBS is in *Project WBS, OBS and RAM* (EVMS Procedure 12.PM-001).

2.2 WBS DICTIONARY

All projects operating under EVMS are required to develop a WBS Dictionary. The WBS Dictionary is a set of specific definitions that describe how work is carried out to develop, design, construct, equip, and manage the project. It defines each element to at least the control account (CA) level in terms of the content of the work to be performed. An example of a WBS Dictionary format is found in *Project WBS, OBS and RAM* (EVMS Procedure 12.PM-001). The WBS Dictionary serves as the scoping document in the control account plans and control account agreement documents that support the work authorization process.

2.3 ORGANIZATIONAL RESPONSIBILITY

2.3.1 Organizational Breakdown Structure

The Organizational Breakdown Structure (OBS) is a project organization framework for identification of accountability, responsibility, management, and approvals of all authorized work scope. It is a direct representation and description of the hierarchy and organizations that will provide resources to plan and perform work identified in the WBS. The OBS helps management focus on establishing the most efficient organization, by taking into consideration the availability and capability of management and technical staff, including subcontractors, to achieve project objectives. The organizational breakdown structure for each project is found in the PEP. An example of an OBS is in *Project WBS, OBS and RAM* (EVMS Procedure 12.PM-001).

Throughout the WBS, all project work scope is defined to a level where unique organizational and personal responsibilities are established. The individual assigned responsibility for accomplishing work at the control account level is designated as the Control Account Manager (CAM). Control accounts are divided into smaller, discrete scopes

of work called work packages, and a Work Package Manager can be assigned to each work package.

2.3.2 Control Accounts

A control account is a management control point at which budgets (resource plans) and actual costs are accumulated and compared to an objective measurement of work performed for management control purposes. The control account is the minimum level in the WBS structure where project cost and schedule performance is compared. A control account is a natural management point for planning and control since it represents the work assigned to one responsible organizational element for one WBS element, which is the point at which the WBS and OBS intersect. The control accounts are determined by the scope of the management tasks. A single CAM is assigned to one or more of these control accounts and is responsible for the planning and control within their control account(s) and the identification, analysis, and reporting of significant variances that may occur during project execution.

2.3.3 Work Packages

Work packages are a subdivision of a control account and consist of a discrete or level of effort task that has been planned and budgeted in detail. The budget for each is segregated into elements of cost (resources). Work packages constitute the basic building blocks used in planning, measuring accomplishment, and controlling project work. Each work package must have a minimum of at least one schedule activity. Work package characteristics are detailed in *Control Accounts, Work Packages, Planning Packages* (EVMS 12.PM-002).

2.3.4 Planning Packages

Planning packages are created to describe work within a control account that will occur in the future. Planning packages must have a work scope, schedule, and time-phased budget. Planning packages are normally larger (scope, schedule, and budget) than individual detailed work packages, but planning packages must still relate to a specific work scope. Individual planning packages do not require the detail of work packages in the schedule. When planning packages are converted into work packages, they are defined in greater detail. See also the procedure Control Accounts, Work Packages, Planning Packages (EVMS 12.PM-002).

2.4 PROJECT EXECUTION PLAN

The Project Execution Plan (PEP) must be developed for each project and is the primary vehicle that correlates project objectives with a plan for accomplishment. It also serves as the agreement between the customer, senior management, and the project's management on how the project will proceed.

The PEP summarizes the mission need and justification for the project, describes the responsibilities of the organizations involved in the project, provides a general overview of the project, and outlines cost and schedule data. In addition to summarizing all management structures, the resource plan, and the environmental, safety, and health (ES&H)

requirements, the PEP establishes the customer change control thresholds and the technical, cost, and schedule baselines The major elements required in a DOE project's Project Execution Plan are stated in DOE Order 413.3A and DOE Manual 413.3-1.

On DOE projects, the Federal Project Director develops the PEP with input from the project management team (the Project Director/Manager, Deputy Director/Manager, etc). This team will be referred to in this document as "project management." After obtaining concurrence from the Fermilab Site Office (FSO), the PEP is formally approved by DOE headquarters. For all projects, the Project Execution Plan is placed under configuration control.

In addition to the PEP, FRA projects will also develop a Project Management Plan (PMP), authored by the Project Manager. This plan describes how areas such as risk, quality, resources, interfaces, and configuration control will be managed.

2.5 RESPONSIBILITY ASSIGNMENT MATRIX

The Responsibility Assignment Matrix (RAM) is an element of the project plan that integrates the Organizational Breakdown Structure with the Work Breakdown Structure. This integration identifies key control points at the intersections of the WBS and OBS. Control accounts are created at these key control points, facilitating the linkage between planning, scheduling, budgeting, work authorization, cost accumulation, and performance measurement processes. Using the RAM and OBS, every person and organization responsible and accountable for every element of the WBS and Statement of Work (SOW) are identified. An example of a RAM is in *Project WBS, OBS and RAM* (EVMS Procedure 12.PM-001).

2.6 TRAINING

All personnel involved in planning or implementing the EVMS process, including existing staff and on-site contractor personnel, new hires, and transfers, are trained at the level applicable to their roles and responsibilities. At a minimum, EVMS training requires that Project Managers and Control Account Managers read the current version of this Earned Value Management System Description document and complete EVMS training when first associated with a project. These individuals may also be required to read additional EVMS reference materials or addendums as identified by specific project requirements. Refresher training for those involved in active projects will be required on an annual basis.

Training is delivered through on-site or web-based training sessions and may be customized to meet project specific requirements. Formal training is given at various levels of rigor, thus allowing training modules to be tailored specifically for each role. For example, accountable Program Managers and division/center/section heads need only to receive an overview of the EVMS processes, while Project Managers, project controls staff, and CAMs receive a more systematic and thorough presentation of roles, responsibilities, and techniques as outlined in this System Description and the implementing procedures.

3.0 PLANNING, SCHEDULING, AND BUDGETING

This chapter discusses how the project planning outputs discussed in Chapter 2 (WBS, OBS, PEP, and RAM) are used to develop the project schedule, from preliminary schedules to the definitive detailed project schedule. Project planning, scheduling, and budgeting involves organizing and documenting the approach and effort required to complete the approved scope of work based on dependencies, interfaces, constraints, and other factors. These are organized into a time-phased sequence that fits within the boundaries established by the customer's schedule and budget objectives. A schedule and cost range is developed from the preliminary WBS, and as the WBS becomes more refined through design criteria developed in the conceptual phase of the project, so does the project schedule.

Project Managers must balance customer requirements with the customer budget for their projects and must ensure this is reflected in their schedules. Budgeting begins with a rough order-of-magnitude cost range. As estimates are refined, contingency and management reserve budgets are established. Work authorizations are prepared for both external and internal participants throughout the life cycle of the project. Preliminary planning information evolves into the fully-integrated, resourced-loaded Performance Measurement Baseline (PMB), which supports establishing the project baseline at CD-2. Through final design, construction, and closeout, the PMB, Work Packages, Control Accounts, and contingencies/management reserves are maintained, updated, and logged to accurately track the project's performance and status.

3.1 BASELINE DEVELOPMENT PROCESS

Baseline development or baseline planning can be defined as making decisions today with a view towards the future. Planning considers the "who," "what," "why," "when," and "where" for a particular effort today, while trying to anticipate its effect at some future date. This future-oriented process involves setting objectives, gathering and organizing information, determining feasible courses of action, selecting and implementing courses of action, and monitoring the results to ensure accomplishment of the objective. Planning is often performed in the absence of perfect information; however, decisions and assumptions do need to be made. Although planning is rarely perfect, good planning involves making and documenting assumptions using the best information available.

The planning process consists of the following steps:

- Establish a set of goals that are required to achieve the desired result (on DOE projects, the desired result is defined in the Mission Need Statement at CD-0)
- Assess project risk and develop actions to minimize risk events.
- Formulate the plans for completing the work.

- Implement the plans (e.g., do the work).

A product of the planning process is the development of an integrated baseline which is used to measure and control project work activities throughout the project life cycle. The project integrated baseline consists of three components:

- The technical component of the baseline describes the work scope and technical specifications that the project must meet.
- The schedule component is the time-phased, logical relationship of interdependent activities required to complete the project.
- The budget component is a time-phased, planned, and approved budget to complete the project's work scope based on the project baseline schedule.

Each of these baseline components evolve and change through the refinement of the project's technical objectives and during major project design and construction phases. All changes to the integrated baseline are documented through the project change control process (See Section 6.0).

3.2 RISK MANAGEMENT

Effective risk management is an essential element of every project. The risk management process is based on the principles that risk management must be analytical, forward-looking, structured, informative, continuous, and dynamic. Risk management is a prospective process initiated and fully integrated with the baseline planning process. As work scope is defined and scheduled, individuals responsible for planning and performing the work apply core elements of risk management. The activities and their logic-driven interdependencies are evaluated for possible risks that could preclude successful completion within established technical, schedule, and budget constraints.

The risk management process is comprised of four key areas – (1) Planning, (2) Assessment (including risk identification and analysis), (3) Handling, also referred to as risk mitigation, and (4) Monitoring/Improving. The overriding objective of the process is to identify potential project risks, incorporate risk management strategies into the plan, and implement actions that mitigate their impact.

Risk assessments are performed as early as possible in a project's life cycle and identify critical technical, performance, schedule, and budget risks. Once risks are identified, appropriate risk mitigation strategies and actions are developed and documented. Management reserve is developed bottoms-up during project planning based on the risk assessment and mitigation strategies. The risk mitigation strategy for all projects utilizing an EVMS includes the establishment of an adequate management reserve and contingency budgets , and a schedule contingency to reasonably ensure successful project completion.

As the project progresses, new information and insights allow the Project Manager to refine the identified risks and mitigation strategies or remove the risk from consideration once it is no longer applicable. This is accomplished through regular review of project risks by Control Account Managers (CAM) as they analyze cost and schedule variances, develop corrective actions, and execute the corrective actions to completion. In addition, risks are considered during the development of Estimates to Complete (ETC) by the CAM.

A risk management plan and a risk assessment are required for DOE projects per DOE Order 413.3A. The risk management process and results from the risk assessment can either be included as part of the Project Execution Plan or as a standalone document depending on the significance of project risks.

3.3 TECHNICAL BASELINE

The technical element of the project baseline contains work scope definition, technical specifications, objectives, and assumptions. It structures the project's technical work to verify required objectives are defined and establishes a framework to identify and organize all elements of work into the project WBS. The technical element of the project baseline continues to evolve throughout the design phases of the project. Table 3.1 shows the technical baseline evolution process and Critical Decision stage planned for a typical project.

Table.1. Technical Baseline Evolution

Technical Baseline Basis Document By Project Phase	DOE Critical Decision
Mission Need Approval Document	CD-0
Conceptual Design Report	CD-1
Technical Design Report	CD-2
Final Design Report	CD-3

The technical objectives for projects are implemented by conforming to specific design standards. These standards provide the basis for the design and implementation of projects. Design reviews are conducted to verify the design meets the technical and functional requirements. A configuration management process is applied throughout the project life cycle. Design changes are documented and formally approved in accordance with their impact on the project and integrated with the change control processes as described in *Change Control.* (EVMS Procedure 12.PM-007).

Technical performance is measured against controlled technical performance indicators, quantitative and qualitative, throughout the project execution phase. The technical element of the baseline is integrated with the schedule and budget components of the baseline to monitor technical performance in relation to schedule and cost performance.

3.4 PLANNING AND BASELINE SCHEDULING

3.4.1. Project Schedule

The development of the Project Schedule is the responsibility of the entire project team and may involve multiple iterations in order to reach a workable plan for accomplishing the work scope. The Control Account Managers (CAMs) are responsible for the content and accuracy of their respective schedules. The project schedule is structured and numbered consistent with the project Work Breakdown Structure.

The project schedule is used to plan and control the interdependencies of all the activities and resources needed to execute the project. Schedules address both how and when the work is to be performed by identifying all activities necessary to accomplish the project scope and time phasing these activities using activities using activity durations and schedule logic. Each activity's duration is determined by understanding the effort involved in performing the activity as well as the resources needed to accomplish it. These resources can be both labor and material.

The time phased labor resource needs of all tasks are compared to availabilities for each required resource category to arrive at durations and time phasing of the work that is supported by current and projected staffing levels. In addition, a fiscal year funding profile, provided by the customer, establishes the availability of funds for the project. The time phasing of the schedule activities, combined with applying labor and material (M&S) resource requirements to each task produces a profile of budget needs for the life cycle of the project. Management reserve and contingency needs are then added to this time phased budget to produce a fiscal year profile for the budget needs of the project. This profile must fall within the funding projection from the customer.

The time phasing mentioned above involves applying schedule logic to each task which identifies the key relationships between the activities that determine their proper sequencing. Not all work can be completed simultaneously and not all work is accomplished serially. With input from control account managers and their subordinates, the proper logic ties are created.

In addition to the budgeted activities, the project schedule will also contain summary level activities which represent successively higher levels in the WBS for reporting purposes. No resources, M&S of schedule logic will be applied to these summary activities. They represent the accumulated information from the detail activities up through the lower level summary tasks. Finally, milestones will be included at various levels in the schedule to reflect the start or completion of significant events. They are linked to their associated tasks with logic ties such that when the scope of that activity is accomplished, the milestone will reflect that accomplishment. These milestones will be coded to reflect their level of significance and are listed in the Project Execution Plan (PEP).

Project Scheduling (EVMS Procedure 12.PM-004) describes the formal process for implementing the planning and scheduling requirements defined in this EVMS description. The procedure defines the scheduling system structure and the requirements and responsibilities for projects subject to DOE Order 413.3A and on projects where an EVMS is deemed appropriate.

3.4.2 Baseline Schedule

When the project schedule described in section 3.4.1 has gone through the necessary number of iterations and is deemed complete and accurate by the CAMs and the Project Manager, it is ready to be baselined. The approval for this is obtained from the customer as part of the CD-2 process, consistent with DOE Order 413.3A. The schedule will be reviewed by the customer, or their representatives, for completeness with respect to technical scope and for adequate labor resources and material dollars for material purchases and contracts. It will also be reviewed for conformance with the customer funding profile. Once approved and baselined, the dates, resource hours, material dollars and activity descriptions are no longer subject to any changes unless these changes are part of a documented and approved change control process. This process is documented in the PMP and is driven by change control thresholds also in the PMP.

The baseline schedule represents the approved plan against which the project's actual performance with respect to accomplishing the work scope contained within each detail activity is measured. This baselined information will be integrated with performance reporting software to obtain planned value (BCWS) and when combined with actual performance (see below), will be the basis for a formal performance reporting system. This performance will be reported to the customer, senior management, and project management.

3.4.3 Working Schedule

Once the baseline schedule has been established and described in section 3.4.2, it will be necessary to update actual progress on a per-period and cumulative basis and compare it to the baseline plan. For FRA, the update period is monthly, with the cutoff date being the last day of each month.

The process of statusing the schedule will involve:

a) Project controls personnel issuing "turnaround" reports to the CAMS near the end of each reporting period.
b) CAMS returning progress information in the form of actual dates and/or new schedule forecast information for each activity in the report. The reports typically address all activities within a time window that looks ahead six-months beyond the current reporting period.
c) CAMS providing data for each in-progress activity that allows updating its physical percent complete.
d) Project controls personnel vetting the information supplied by the CAMS and then incorporating it into the working schedule to obtain an updated forecast schedule. It is important to note that progress information is not used to modify dates in the baseline schedule except through the baseline change control process.

Since the schedule activities are logically tied together, applying actual and updated forecast information to activities within a near-term window can have a "ripple" effect throughout the schedule, causing the forecast dates for other downstream activities to be delayed or advanced. These delays/advances may also affect future milestones that may be part of the monthly reporting cycle. The updated forecasts, when compared with the baseline dates, provide management with an indication of the schedule performance for the overall project. In addition, the information obtained from the statusing effort will be integrated with other performance reporting software to obtain earned-value information for formal performance reports.

Finally, write-access to the project schedule, necessary for updating baseline and status information, is restricted to the project controls staff.

3.5 COST ESTIMATING AND BASELINE BUDGET

Cost estimates are prepared in a clear, consistent, and comprehensive format that facilitates review of details and assumptions throughout the cost estimate review process. Activities to be estimated are identified in sufficient detail to support the cost estimate methodology used. Cost estimating is the fundamental process used to create the budget element of the project baseline.

Cost Estimating (EVMS Procedure 12.PM-005) describes the process for developing the cost estimating and baseline budget requirements defined in this System Description. This procedure defines the structure, requirements, and responsibilities for developing a baseline budget for projects where DOE Order 413.3A is required or on projects where an EVMS is deemed appropriate.

3.5.1 Cost Estimating

Cost estimating is a key component of the project baseline budget development process. Estimates are developed and maintained from project initiation through project completion. Cost estimates are created with sufficient levels of detail to identify Control Account resources and to take into consideration schedule activity durations. The cost estimate is prepared at the lowest level of the WBS and is activity based, consistent with the schedule and technical elements of the baseline scope of work. Estimates may be prepared for planning purposes to support hypothetical exercises or to evaluate potential pricing changes. These estimates are not incorporated into the baseline without formal change approval.

A consistent approach to cost estimating verifies that cost estimates meet all requirements, are based on standard requirements, are accurate, are traceable to technical requirements, and are consistent with generally accepted and sound industry cost estimating practices. Cost estimates also solidify the scope of work, providing a documented reference for identifying changes in scope and addressing future cost variances.

Cost estimates support the development of the project baseline budget and use a bottom-up, activity-based estimating methodology. In addition to reflecting the project's Total Project Cost (TPC), estimates must also include the following minimum requirements:

- work scope description
- explanation of the assumptions made to develop the budget
- quantification of risk through application of contingency per activity
- labor hours
- non-labor units
- quantity and cost
- basis for the estimate
- type of estimate

The basis of estimate provides a narrative explanation of the rationale behind the estimating and pricing of the work scope. It contains a documented summary of planning assumptions and resource requirements necessary to perform the project scope of work. For example, the basis of estimate describes why a certain number of labor hours were assigned to a given task or why a certain dollar amount was assigned to specific non-labor costs. In each case, the basis of estimate helps answer the question, "Why are the costs this way?"

The basis of estimates varies. In some cases, the estimator may simply rely on past experience of actual costs for similar work. In this case, there is a reference to the basis for selecting the number of labor hours or quantities of non-labor items based on estimator judgment and experience of prior tasks. An explanation is then provided to support the resources identified.

The use of a benchmark tool (RS Means, prior cost experience, estimating databases, etc.) is noted and modified to more adequately reflect the specific conditions for the estimate. These modifications could include adjustments for:

- facility / facility component fit
- geographic location
- timeframe and escalation
- market conditions
- labor market
- site conditions
- project delivery options (fast track, phased construction)
- general requirements
- ongoing operations
- life-cycle costs
- quality level
- construction costs versus project costs
- management reserve allocation

Project Managers are responsible for cost estimates of work scope under their direction. Project Managers are also responsible for establishing estimate type based on known scope (requirements and deliverables), schedule, pricing basis, and customer or sponsor requirements. Project estimates are classified according to DOE Guide 430.1-1, *DOE Cost Estimating Guide for Program and Project Management* into one of five categories. These classifications are based on the Association for the Advancement of Cost Engineering (AACE) Recommended Practice No. 18R-97. Generally, most cost estimates are classified as Class 5 (Order of Magnitude), Class 3 (Preliminary), or Class 1 (Definitive). These classifications will help ensure that the quality of the cost estimate is appropriately considered when applying escalation and contingency.

Project Managers and CAMs are responsible for identifying and documenting risk and management reserve estimates as part of the baseline planning process. During the baseline planning process, risks and uncertainties are identified. To the extent possible, mitigation strategies are incorporated into the baseline budget and schedule to minimize project impacts.

Management reserve estimates are identified outside the baseline budget and schedule, and are based on likelihood and severity of the uncertainty. Management reserve is derived against individual work elements (product and activities) regardless of funding type using appropriate development techniques.

Project Managers are responsible for identifying the type of work and funding source in order to correctly apply labor rates and indirect burden for the resource estimates. Labor and non-labor costs are stated in current FY rates and include overhead rates to arrive at fully burdened dollars. Future year escalated rates are developed consistent with Fermilab Finance Section guidance and applied based on the time frame that future schedule activities are performed. Projects may elect to alternatively evaluate escalation in specific areas outside the given rates and document those in their project plans.

Standard rates for performing organizations are used unless an alternative explanation is provided. Management reserve is derived at the activity level within the body of the estimate (but not retained within the WBS, control account, or work package). Fiscal year project/program management activities are estimated to the same level of detail as the project they support.

The development of the cost estimate is closely coordinated among the performing organizations. Concurrence by performing organizations is obtained at the Work Package level for performance of specified work scope as detailed in the schedule and cost estimates. Project cost estimates are prepared for the life cycle of the project and evolve as definitive design and construction information is established.

3.5.2 Baseline Budget

The project baseline budget establishes the estimated cost of executing the project in accordance with the scope and schedule elements of the baseline. The baseline budget is also referred to as the Total Project Cost (TPC) and includes estimates for management reserve for known risks and contingency to manage unforeseen conditions and uncertainties. The

project baseline budget excluding management reserve or contingency is referred to as the Performance Measurement Baseline (PMB). This is graphically shown in Figure 3.1. Other terms and components of the baseline budget and TPC include:

- **Total Project Cost (TPC)**: The total project cost consists of all costs associated with a project, including contingency and management reserve. It is the sum of all capital costs and the other project costs associated with the project, including engineering studies, conceptual design, construction, startup, and costs to complete transition and facility occupancy. (See Fig. 4.1 for additional information.)

- **Management Reserve:** The portion of the project budget that is held by the project in reserve to accommodate known risks. It is developed bottoms up and tied to risks. It is not part of the Performance Measurement Baseline (PMB). (See Section 3.6 for additional information)

- **Contingency:** The portion of the project budget that the customer holds in reserve to accommodate unknown risks that are outside the scope of the contractor baseline, but within the scope of the project. It may be used for additional scope and work that is necessary to meet current project mission requirements, but was inadvertently omitted but required. It is not part of the PMB. (See Section 3.6 for additional information)

- **Budget at Completion, (also called Contract Budget Base):** The sum of all project budgets, any summary level planning, and any undistributed budget. The Budget at Completion equals the Performance Measurement Baseline.

- **Performance Measurement Baseline (PMB):** The Performance Measurement Baseline is the time-phased budget plan against which project performance is measured. The performance measurement baseline is the sum of all budgets distributed to the project, summary level planning, plus undistributed budgets. The PMB is altered only through the change control process.

- **Control Account budgets:** Distributed budgets planned in detail and allocated to specific Control Accounts. Through the life of the project, the baseline budget is eventually distributed and planned in detail within Control Accounts. The Control Account budget is the sum of the budgets for Work Packages and Planning Packages within each Control Account.

- **Work Package budgets:** Natural subdivision of Control Account budgets that constitute the basic building blocks in planning, controlling, and measuring project performance. Work Package budgets are directly traceable to activities and tasks planned in detail to support specific scopes of work.

- **Planning Package budgets:** Those portions of a project Control Account for future work that is not yet practicable to plan at the Work Package level. Planning Packages are

time-phased in accordance with known schedule requirements for resource planning and are refined as detailed requirements become clearer and the time to begin work draws nearer.

- **Distributed budget:** Work Package and Planning Package budgets allocated as part of a project Control Account.

- **Undistributed budget:** Budget associated with specific work scope or contract changes that have not been assigned to a control account or summary level planning package.

- **Authorized Unpriced Work -** Any change to the contract statement of work that has been authorized by the customer and is being worked on, but for which no price has yet been negotiated.

The time-phased baseline budget plus time-phased contingency and management reserve, must match the customer-provided funding profile for the project. For projects that include significant third party subcontractors (i.e. A/E or General Construction Contracts), annual budget requirements are time phased so that the project can maintain adequate schedule progress.

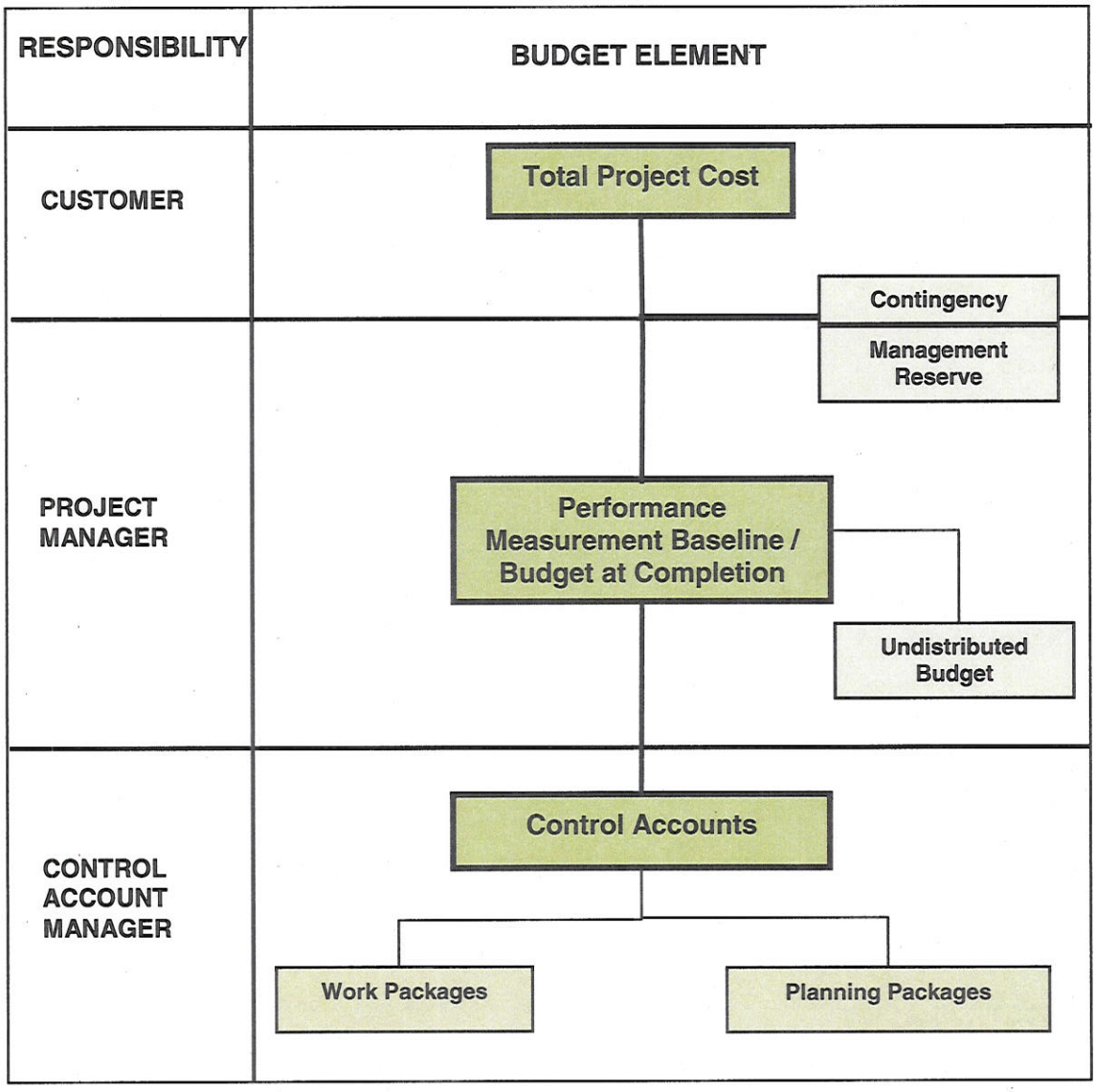


Fig 3.1 Project Baseline Budget Hierarchy

3.5.3 Control Account Planning

Control account planning consists of those efforts needed to establish time-phased budgets for each control account identified for project execution. The CAM has the primary responsibility for developing and managing the control account budget. Project management provides CAMs with budget guidance and a common planning capability to perform resource costing, indirect rate applications, and other calculations. This is done in conjunction with the project controls staff.

Control account budgets are a summation of the budgets for all of the work packages and planning packages assigned to the control account. Each work package budget in dollars is calculated by applying each resource's rate to the resource level (e.g., hours or other units of

effort or dollars for materials and other direct costs), factoring in escalation to actual year dollars and then applying the appropriate indirect burdens. Project management and the CAM come to agreement on the work scope to be accomplished as well as the accompanying budget and schedule necessary to support the required effort. Once these budgets have been developed, the amount of budget associated with each monthly accounting period is referred to as the Budgeted Cost of Work Scheduled (BCWS). The total budget with respect to any given grouping of work is called Budget at Completion (BAC).

Although records can be kept at lower levels of detail, the lowest required level of detail for maintaining the BCWS and the BAC is by resource, within the work packages of the control account.

Control account budgets may be further subdivided into one or more work packages and/or planning packages in the project schedule. The CAM selects the performance measurement technique (PMT) – the method for measuring the work performed for each work package. Only a single PMT may be used on each work package. Control account budgets in the EVMS are governed by the following guidelines:

- The sum of budgets for work packages equals the control account BAC value.
- The CAM must be able to provide the basis for the budgets of all work packages.
- The start and completion dates for each work package fall within the scheduled start and completion dates of the control account to which the work package is assigned.
- Retroactive changes to budgets for completed efforts are prohibited except for the explicit correction of errors.
- Replanning future portions of open and unopened work packages requires formal change approval, consistent with the project's PEP change management requirements.

3.5.4 Acquisition Planning

Projects often subcontract with external suppliers, contractors, and collaborators for work associated with projects. Examples include architecture/engineering (A/E) firms, general and specialty contractors, other national laboratories, research institutions, and consultants. These subcontracts may be executed through Firm-Fixed Price (FFP), Time and Material, or Level of Effort (LOE) support type contracts. The contracting vehicle type is determined based on the nature of the work to be subcontracted as well as its complexity, risk, and cost. At Fermilab, all acquisitions are made in accordance with the requirements of Fermilab's prime contract with DOE and where applicable, Fermilab policies and Illinois state law.

3.5.5 Overhead Budgets

At Fermilab, the financial management system has a documented process and the Finance Section is the identified organization responsible for managing, monitoring, and distributing overhead costs. Indirect costs and overhead rates are for common Laboratory activities that cannot be identified specifically for a project and are budgeted and controlled separately at

the Laboratory level, and approved annually by the DOE. Approved forward pricing rates and projected overhead rates beyond the current year are also maintained within the Fermilab financial management system.

3.6 CONTINGENCY, MANAGEMENT RESERVE, AND UNDISTRIBUTED BUDGET

3.6.1 Contingency and Management Reserve

Management reserve and contingency are elements of the approved Total Project Cost (TPC) that are identified early in the project development and provide budget that covers future known risks (management reserve) and unknown risks (contingency) of the project, but are not part of the Performance Measurement Baseline.
The management reserve budget is identified by the customer and the project for managing known risks. Risks are identified per the project's Risk Management Plan and the budget is established based on the cost associated with implementing risk mitigation for the identified risks. The release of this budget is managed through the change control process and determined by approval thresholds defined in the PEP and PMP. Management reserve is not part of the Performance Measurement Baseline. Also, when budget is released from management reserve due to risks being retired or reduced, that budget is moved to contingency.

The contingency budget identified by the customer and the project, for managing unknown risks and directed scope changes. The amount may be set at the direction of the customer, or jointly between the customer and the Project Manager. It will be identified as a separate budget line in the EVMS reporting. When a risk outside the risk register is encountered, and budget is required to mitigate that risk, contingency will be used. The release of contingency budget is managed through the change control process and determined by approval thresholds defined in the PEP and PMP.

When management reserve budget is released through reduction or retirement of risk, the budget value is moved to the contingency budget. This will allow the Project Manager and customer to easily identify how much budget is available for contingency planning. Contingency is calculated as contingency = TPC – EAC – MR.

The customer will determine the final disposition of any unused contingency or management reserve as the project comes to completion.

3.6.2 Undistributed Budget

Undistributed Budget (UB) is budget applied to contractually authorized effort that cannot be identified to specific Work Breakdown Structure (WBS) or organizational elements in a timely manner. The establishment of UB may be necessary when project changes are authorized too late in an accounting month to be distributed in that month. UB is used to accommodate temporary situations where time constraints prevent adequate budget planning or where contract effort can only be defined in very general terms. UB should be allocated into control accounts in the current or the following accounting period, or as soon as

practical. For authorized work that has not been negotiated, the project may maintain budgets in the UB account until negotiations have been concluded, allocating budget only to authorized related work that will start in the near term.

In order to assure that budget for newly authorized efforts remains tied to the associated scope during the initial planning process, UB is a short term holding account. Once the responsible organization(s) has been identified, the budget will transfer from UB to the appropriate control account(s). This ensures budget and scope will not be transferred independently. One use of UB is to account for authorized changes for which there has not been adequate time to plan the changes in detail at the control account level (Authorized Unpriced Work). Undistributed Budget is tracked in the Project Baseline Log and reported in the monthly report.

3.7 WORK AUTHORIZATION

Work authorization ensures that all work performed on the project has been contractually authorized and properly planned prior to its execution.

External Work Authorization: On DOE projects, the DOE Federal Project Director is responsible for granting authority to perform projects. Work authorization for non-DOE projects follows customer specific authorization processes. On DOE projects, documentation is prepared for review by DOE representatives prior to each Critical Decision to support the work authorization process. Upon successful completion of this review, the DOE Acquisition Executive (AE) issues a Critical Decision approval and a written authorization for FRA to perform work consistent with the approved baseline plan. Once an external customer work authorization is received, and funding allocations are made, project work is performed consistent with the integrated baseline technical, schedule, and budget elements.

Internal Work Authorization: The objective of the internal work authorization process is to ensure that all defined project work is authorized by the Project Manager and formally communicated to the appropriate and responsible CAM. The work authorization process involves management approval of the expenditure of project resources, by a responsible individual, to accomplish a specified scope of work within agreed to budget, schedule, and technical objectives. The work authorization process utilizes the products of the baseline development process to provide specific direction to the performers of the work. It assures that work assigned to responsible individuals, time-phased budget estimates, and work schedules are all integrated with each other and are related to the WBS within the funding limitations on the project. Formal work authorization provides a means for effective internal coordination, communication, and a process to obtain the required management approvals before work begins.

The total authorized work scope, budget, funding, and contractual commitments are released to the CAMs through the use of Control Account Plan/Work Authorizations, a sample of which is included in *Work Authorization* (EVMS Procedure 12.PM-003). Formal work authorization with signed documentation begins at the same time as earned value reporting. For DOE projects, this will be sometime between CD-1 and CD-2.

The Project Manager delegates work down to the CAMs within the authority provided in Control Account Plan/Work Authorization form. The work authorization provided in each control account includes the relationship to the WBS element or elements, responsible organization identification, control account task description, schedule, and time-phased budget in dollars or hours. This may be represented by use of applicable attachments to clearly identify work scope, budget, resource commitments, control account, WBS Dictionary, and schedule. All project work scope is planned and formal work authorization occurs before expenditure of any project funding is allowed. All work and expenditure authorizations are managed by the Project Manager. The signing of a work authorization document by all parties represents a multilateral commitment to authorize and manage the work within the budget and agreed-upon schedule. The approved control account plan/work authorization agreement can only be changed through the project's formal change control process.

3.8 SUBCONTRACTOR AND COLLABORATOR PLANNING

When substantial effort associated with large and complex projects is obtained through subcontracts or partnering with collaborating laboratories and universities, the subcontracts and purchase orders must be written in such a way that information required for earned value management may be readily obtained from the subcontractor/collaborator. The request for proposal for subcontracts or Memorandums of Understanding (MOU) for collaborators must include a full description of the reporting requirements.

3.8.1 Subcontracts with Flow-Down

Contracts that have high dollar value and high-risk may require reporting of earned value as part of contract performance. These subcontracts require careful planning prior to solicitation and award. The solicitation (Request for Proposal) and ultimately the contract must include the full description of the monthly earned value and performance reporting requirements from the subcontractor to the project.

3.8.2 Subcontracts without Flow-Down

The method of payment to non-EV flow-down subcontractors and to collaborators will generally drive the planning for receipt of cost and schedule information required to perform earned value management. For most subcontracts, payment will be made based either on the achievement of planned milestones or, for design and construction, the percentage of completion of those milestones, or on the basis of cost reimbursement for labor hours expended and materials consumed. Information provided by the subcontractor with requests for payment must be sufficiently detailed that accurate cost information can be incorporated in the earned value reporting.

For collaborator purchase orders, payment will be made based on the terms of the MOU, typically for items produced or labor expended. If collaborator work includes uncosted labor, then monthly reporting of hours expended will be required in order to perform earned value analysis.

An EV flow-down requirement is not mandatory for collaborators or for any of the following types of subcontracts:

- Firm Fixed Price (FFP)
- Time and material
- Support subcontracts that are primarily level of effort (LOE)

4.0 ACCOUNTING CONSIDERATIONS

For FRA projects at Fermilab, financial data accumulation and management for projects is performed within the established financial systems. All financial transactions are documented, approved, and recorded properly in the financial accounting system on a consistent and timely basis in accordance with Generally Accepted Accounting Principles (GAAP), DOE Orders, FRA contract requirements, and applicable Cost Accounting Standards. Any change in Fermilab's accounting practices that may have a material impact on the financial data must be approved by the Laboratory's Chief Financial Officer (CFO). In accordance with Fermilab practice, the CFO is delegated the authority to direct and monitor adherence to generally accepted accounting principles to ensure compliance with all applicable laws, regulations and contractual requirements.

Fermilab's Revised "Cost Accounting Standards Disclosure Statement" dated August 4, 2006 (CAS Disclosure Statement) and approved by DOE, describes the methodology for handling various actual costs. Specifically, Parts II, III, IV and VI address the methodology for direct and indirect costs.

Some projects may include labor effort at $0 cost, if directed to do so by the customer. In order to do earned value management on this effort, analysis and reporting will be performed on hours for those resources. Actual hours for those resources will be accumulated at the chargeable task code level and brought into the cost processor. In the processes described in Section 4.0, the term "costs" will generally refer to both dollar costs and hours.

4.1 ACCOUNTING PROCESSES

The comparison of actual costs and the work accomplished with baseline plans generated during the planning and budgeting phase is included in internal and external reports. Forecasts of future costs and schedule dates are made, and corrective actions are initiated when problems are identified.

4.1.1 Objective

The objective of the accounting process is to provide accurate and timely recording and reporting of the actual costs associated with all project work.

4.1.2 Cost Code Structure

The cost code structure for each project is developed in conjunction with the development and integration of planning, scheduling, and assignment of work scope/task to the responsible organization. Subsequently, these planning tasks lead to the creation of control account

numbers (projects and tasks) in the financial accounting system that identify the correct chargeable task code, and control account, for specific items of work.

The Project Office submits a request to Finance to open a chargeable task code in the financial accounting system for collecting actual costs. See Control Accounts, Work Packages, Planning Packages (EVMS Procedure 12.PM-002) for more details.

All direct labor, material, subcontracts, and other direct costs (ODC) are charged directly to the chargeable task codes associated with the control accounts that are assigned at the job or task level. Indirect charges also accumulate in these codes, applied as rates to the appropriate direct charges. The established project cost code structure will ensure that actual costs are collected so that direct comparison with associated budgets can be made at the appropriate WBS level(s). The selected account assignment scheme will assure that:

- Direct and indirect costs are recorded in a manner consistent with the budgets.
- Direct and indirect costs can be summarized from control accounts into the WBS without allocation of a single control account to more than one WBS element.
- Direct and indirect costs can be summarized by the project's organizational elements without allocation of a single control account to more than one organizational element.

4.1.3 Cost Accumulation

Actual costs are processed through various subsystems and are accumulated in Fermilab's Oracle Project Accounting (PA) system. The direct costs are identified by control account expenditure types, and the indirect costs are allocated via pre-approved indirect rates. All costs reported in the PA system are transferred into the earned value management system as the ACWP or actual cost. After transferring actual costs into the earned value management system, project costs are reconciled to PA.

4.1.4 Direct Costs

A direct cost is any cost that is specifically identifiable with or attributable to a particular project. Therefore, direct costs include any costs identifiable with the assigned tasks of a specific project. These costs include labor, travel, subcontract, and procurement costs or any other costs directly associated with a specific project.

All labor, materials, and other applicable costs are charged directly to final cost objectives to the maximum extent practical. Costs are accounted for as direct cost and charged to final cost objectives according to Cost Accounting Standard guidelines as documented in the Fermilab Cost Accounting Disclosure Statement.

Each direct labor employee allocates their time worked on a periodic basis via FRA's time and effort reporting system. The effort is recorded, direct labor dollars are charged to the project control accounts, and reports are available monthly from the financial system.

4.1.5 Material Cost and Accounting

Encumbrances are recognized at the point an approved order is placed. Equipment and material costs enter the general ledger through the accounts payable system. When an invoice is received the accounts payable group applies the invoice to the appropriate purchase order (PO) and the cost is recorded. If further approvals are required, or if receipt of goods has not been entered into the system, the invoice is placed on hold. Once the receiving department has recorded receipt in the procurement system, or the PO requestor acknowledges physical receipt of materials by signing the invoice or sending electronic approval, invoices are approved for payment. The hold is then released and the payment is processed by the accounts payable group. The receipt of materials in the procurement system provides the system with information needed so that monthly accruals are automatically recorded for items that have been received but not invoiced. Additionally, Fermilab accounting procedures are in place to record receipt of material not physically received at Fermilab. This allows project management to record estimated actual costs in cases where value has been earned but invoices have not yet been received.

4.1.6 Subcontract Cost

Subcontract costs are entered into Fermilab's project accounting system via the accounts payable system when an invoice is received and applied to a specific PO. The same procedures referred to in the Material Cost and Accounting section are used to record monthly accruals for uninvoiced subcontract costs.

4.1.7 Accounting Adjustments

Retroactive adjustments to a previous period's reported actual costs are prohibited. Adjustments are recorded in the current accounting period. Redistribution of indirect variances is done at year end, but the incremental change is recorded in the current accounting period. Prior accounting periods are not restated.

4.2 INDIRECT COST PLANNING AND CONTROL

4.2.1 Objective

Fermilab maintains a cost accounting system that allocates indirect costs to projects and tasks. Indirect costs are collected in discrete cost pools and distributed to the individual project beneficiaries via published rates that are formally reviewed and approved by the CFO. The CAS Disclosure Statement identifies all indirect cost pools with a discrete and specific set of cost objectives or beneficiaries.

4.2.2 Indirect Cost Pools

As described in 4.2.1 above, the CAS Disclosure Statement identifies all indirect cost pools and defines how these cost pools are distributed to the final or benefiting cost objectives. Some of the larger cost pools (relative to the total mix of indirect cost pools) at Fermilab are labor burdens, program support burden, materials and services burden, common site support,

and the general and administrative cost (G&A). The current CAS Disclosure Statement may be obtained from the CFO.

4.2.3 Allocation of Indirect Costs to Projects

Indirect costs are allocated using individual rates that are applied to the base cost of discrete and specified resources (labor, procurements, services, etc). The basis of each cost allocation is reviewed annually by the CFO to assure that each indirect cost pool is appropriately identified with the correct set of beneficiaries. As explained in 4.2.1 and 4.2.2, the composition of each indirect cost pool and the beneficiaries associated with each indirect cost pool are fully disclosed within the CAS disclosure statement.

4.2.4 Revisions to Indirect Rates

On a few occasions, new program, project, or business requirements present themselves in the current year that could not be anticipated when rates were estimated. Accordingly, revisions to current-year rates and out-year rate projections may be necessary. Fermilab strives to conduct current-year operations to reduce or eliminate revisions to current year rates. Revisions to current-year pricing structures are reviewed for compliance with Cost Accounting Standards (CAS). Rates are adjusted at least annually to fully redistribute variances.

Significant changes to the indirect allocation methodology require revision of the CAS Disclosure Statement and approval by DOE.

4.3 MATERIAL ACCOUNTING

ANSI/EIA-748-B Guideline 20 applies to manufacturing processes. FRA projects are generally research and development projects, and therefore do not need to implement procedures for unit cost, equivalent unit cost, or lot costs, because they do not produce identical products for multiple customers. ANSI/EIA-748-B Guideline 21 also applies to manufacturing processes. Most projects do not bulk order material for project work, and therefore do not need to implement procedures for residual inventory tracking. Each project will determine whether either of these principles apply and, if so, will address them in their Project Management Plan document.

4.4 BURDENED COSTS

Direct costs and any associated indirect burdens are typically budgeted at a work package level. Direct costs and any associated burdens are collected at the chargeable task code level and then summarized up to control accounts through the project WBS. The combination of direct costs and the associated indirect costs is referred to as burdened costs. In accordance with standard accounting practices, costs are segregated into two categories – Capital and Expense.

Capital costs include the more tangible and obvious elements of a project such as buildings, structures, infrastructure, and equipment. It also includes final project design, cost of land

and improvements, certain software/hardware and development costs, special and standard equipment, major computer systems, site services, and project management. Fermilab follows DOE policy of capitalizing assets with a useful life of 2 years or more and a cost of $50,000 or greater.

Expense costs include all costs incurred during conceptual planning of a project such as Mission Needs Requests, Demolition and Decontamination (D&D), writing the CDR, preparing ESH&Q and NEPA documentation, and other project support functions through the life cycle of the project. It also includes R&D, commissioning and pre-operating costs.

Figure 4.1 illustrates some of the major categories that fall within each portion of the budget.

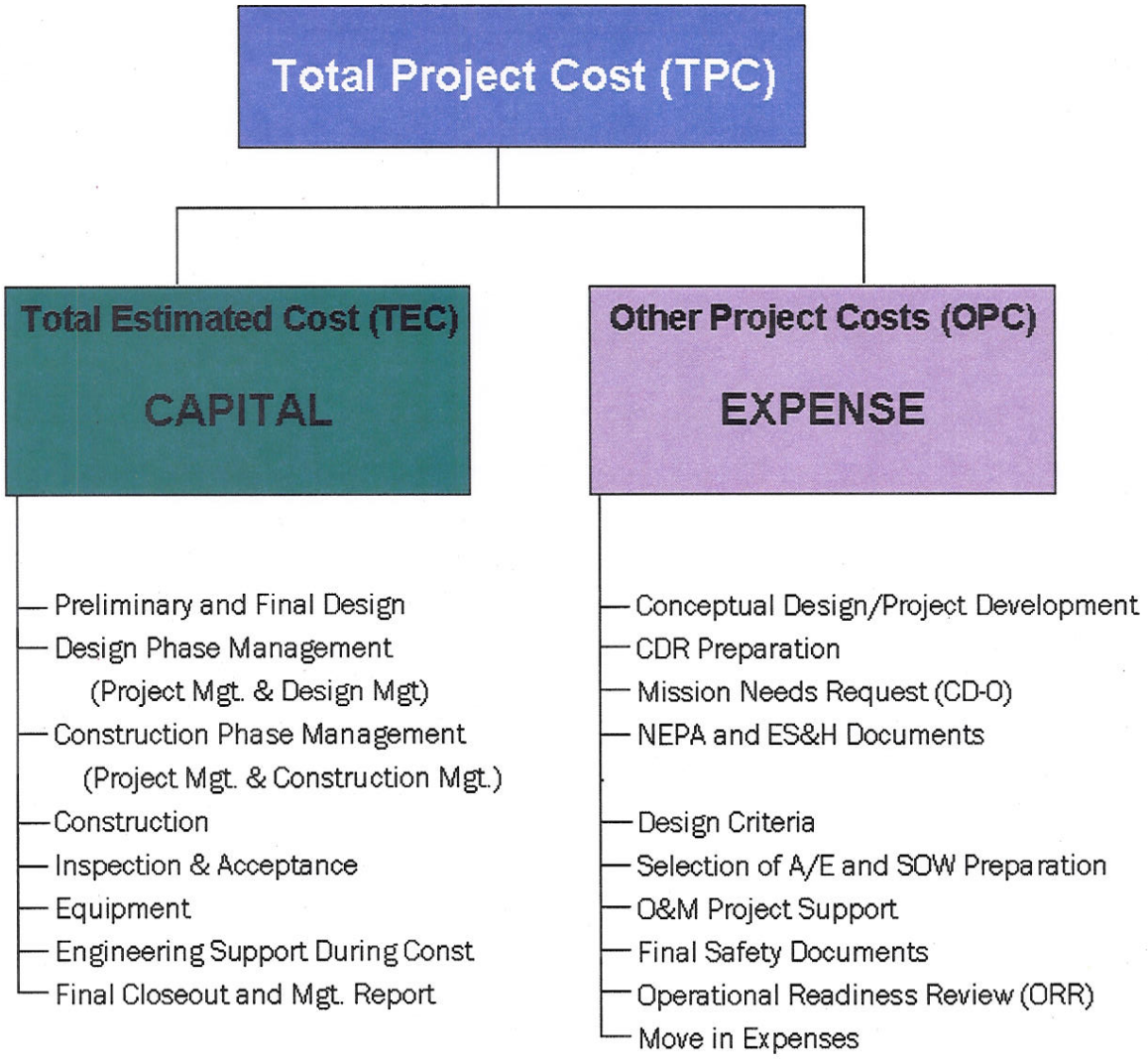


Figure 4. 1 Project Cost Categories

5.0 ANALYSIS AND MANAGEMENT REPORTS

The Performance Measurement Baseline is used to measure, analyze, and evaluate project performance. Project variance thresholds provide the parameters for monthly project variance reporting. The Monthly Report identifies both current period and cumulative project performance parameters based on variance analysis. The report may also recommend corrective actions, as appropriate. Management actions related to change control are implemented as prescribed in DOE Order 413.3A or through other customer reporting requirements.

The performance analysis and reporting process consists of comparing the planned budget, schedule, and technical progress to actual cost, schedule, and technical performance effectiveness. This process is designed to: (1) identify technical or performance issues which could result in the project's inability to meet performance or scope objectives; (2) identify positive and/or negative cost and schedule variances; (3) identify the causes of meaningful variances; and (4) update cost at completion estimates. *Monthly Status Reporting* (EVMS Procedure 12.PM-006) describes how performance information is analyzed and reported by the project manager to document cost, schedule, and technical performance.

Some projects may include labor effort at $0 cost, if directed to do so by the customer. In order to do earned value management on this effort, analysis and reporting will be performed on hours for those resources. In the accounting system, actual hours for those resources will be accumulated at the chargeable task code level and brought into the cost processor. In the processes described in Section 5.0, the term "costs" will generally refer to both dollar costs and hours.

5.1 PERFORMANCE MEASUREMENT

(Excerpt from the Project Management Institute Practice Standard for Earned Value Management, 2005.)

Earned Value is a measure of work performed. Techniques for measuring work performed are selected during project planning and are the basis for performance measurement during project execution and control. Performance measurement techniques should be selected based on key attributes of the work, primarily the duration of the effort and the tangibility of its product.

Work packages are established during planning and opened when the Budgeted Cost of Work Scheduled (BCWS), is expected to occur. Each work package uses one Performance

Measurement Technique (PMT) to track work progress. The PMT is specified by the CAM and adheres to the following:

- **Stability:** One PMT is chosen for each work package. The selected technique and milestone(s) should not be changed after the work package is opened.
- **Objectivity:** Completion of an event (for discrete work) is based upon predetermined criteria or tangible product.
- **Ability to audit:** The procedure and criteria for evaluation will facilitate audit of the Earned Value (EV), or Budgeted Cost of Work Performed (BCWP) reported.

5.1.1 Performance Measurement Techniques (PMT)

The Control Account Managers specify the performance measurement technique for each of the work packages they manage. PMTs should be consistently applied to similar work packages across a project.

The performance of separate and distinct work efforts that are related to the completion of specific and tangible end products or services and can be directly planned and measured is called discrete effort. In comparison, effort applied to project work that is not readily divisible into discrete efforts for that work, but which is related in direct proportion to measurable discrete work efforts, is called apportioned effort. Support-type activity that does not produce definitive end products is referred to as level of effort.

PMTs on already opened work packages cannot be changed. For unopened work packages, PMTs can be changed only through the change control process.

There are a variety of PMTs available:

- **Milestone**: Milestones are defined, and relative weights are assigned to them. At any point, the value earned is the original work package budget multiplied by the combined weight of the completed milestones and divided by the total weight of all milestones. This method can be applied to any work package and is generally the preferred method for work packages that span more than two fiscal periods.
- **Percent Complete**: The CAM determines percent complete, preferably based on some sort of objective measurement of work completed and remaining.
- **Units Complete**: This PMT is applicable to any work package that comprises a predefined number of similar tasks. The value earned at any point in time is simply the work package budget multiplied by the number of these tasks completed and divided by the total number to be done. Use of this PMT assumes that budgets are based on the units being measured.
- **50-50**: 50% of the value is earned as soon as the work package is started, and the rest is earned when it is completed. This PMT should be used only for work packages that

span a maximum of two fiscal accounting periods since value cannot be earned in any intervening periods.

- **0-100**: No value is earned until the work package is completed; at which point, the entire budget is earned. This method should be used only if the work package is scheduled to start and finish in the same fiscal accounting period.
- **User-Defined %**: A variation of the 50-50 PMT. The percentage earned at the start of the work package (1 to 99%) is defined in advance by the user. The remaining percentage is earned when the work package is completed. This method should be used only for work packages whose schedule dates span a maximum of two fiscal accounting periods.
- **Level of Effort**: If the work package is started, it is assumed to progress (and thus earn value) according to the original budget without deviation. This PMT is most suitable for only a small number of work packages that are by their nature immeasurable. By definition, the value earned by an open work package using this PMT is equal to its to-date budget. BCWP is earned through the passage of time equal to the BCWS for that time frame.

5.1.1.1 Discrete Effort

Work performance is measured and reported monthly. Whenever possible, objective methods are used to determine work performance. For example, units completed compared to total planned units provides an objective measurement of percent complete.

5.1.1.2 Level of Effort (LOE)

Some project activities do not produce tangible outcomes that can be measured objectively. Examples include project management, operating a project technical library, and the like. These activities consume project resources and should be included in EVMS planning and measurement. In these cases, the level of effort (LOE) technique is used for determining *earned value*. A *planned value* is assigned to each LOE task for each measurement period. This *planned value* is automatically credited as the earned value at the end of the measurement period.

LOE activities will never show a schedule variance. Consequently, the technique biases the project data toward an on-schedule condition. LOE should be used conservatively and should be considered *only* when the task does not lend itself to a more objective measurement technique.

5.1.2 Status and Earned Value Calculation

Performance status is determined during the implementation of the project plan. On a monthly basis, actual project work, schedule and cost data are collected and then compared to the Performance Measurement Baseline using an earned value methodology. Ensuring the collected data are valid and accurate is crucial to producing credible progress status reports. This knowledge of the project status aids all levels of project management in taking proper

corrective action when deviations to the project plan surface. The objective of measuring schedule progress and calculating earned value is to accumulate, analyze, and report the project's actual compared to planned performance for the current period and the cumulative-to-date costs based on the amount of work performed.

5.1.2.1 Performance Measurement Data

The cost/schedule performance measurement information provides visibility into the project cost/schedule status as it relates to completed work and forecasted work remaining. This information is accumulated monthly for each control account and is summarized directly through the WBS structure in order to obtain the cost/schedule status at any level of the structure. The primary sources of this information are:

- **Budgeted Cost of Work Scheduled (BCWS)** is the time-phased budget that represents the value of work to be accomplished through a given period of time.
- **Budgeted Cost of Work Performed (BCWP)** is a measurement of the work completed. As work is actually completed, budget associated with this work is "earned"
- **Actual Cost of Work Performed (ACWP)** is the cost for work that has been completed or partially completed (actual cost plus accruals). Actual costs are accumulated in Fermilab's Oracle Project Accounting system by control account, or rolled up to the control account level if collected at lower level chargeable task codes. Accruals are routinely added through Fermilab's accounting system when the control account manager and/or project management determine that some accomplished work has not been invoiced in the month earned, through consultation with affected parties and with accounts payable. Accruals and other adjustments to actual costs must originate in Fermilab's accounting system using the Lab's established procedures. For projects where uncosted labor is utilized, actual hours of effort for those resources will be collected.
- **Budget at Completion (BAC)** is the total budget for a given work scope. The BAC for the total project plus management reserve and contingency equals the total project cost (TPC). The BAC for lower-level WBS elements, control accounts, and work packages equals the cumulative BCWS up to and including the last period to which it is assigned.

5.1.2.2 Evaluation of Planned Value

The time-phased budget (BCWS) represents the plan against which performance is measured. At the control account level, the baseline is the result of assigning the necessary resources to the scheduled tasks (work packages) as part of the process of detail planning for the control account. The process includes identifying the tasks, scheduling the tasks, identifying the resources, and determining the PMT. Work to be accomplished in a control account must be performed in a logical, consistent manner to help provide consistency in determining the baseline and accomplishing the work. To avoid unrealistic variances, the BCWS is established according to the control account manager's decision on how the work is to be accomplished, and the PMT is selected to ensure that BCWS is achieved in the same manner as the BCWS was planned.

Accuracy of determining actual performance is directly related to the ability to objectively determine progress within a given work package or control account. Consequently, level of

effort (LOE) tasks should only be used in those work packages where no deliverables or other material means of determining actual progress exists. The earned value of LOE only documents the passage of time and not actual project progress. Consequently, within a control account, the mixing of LOE activities with discrete effort activities should be minimized to prevent distortions of the performance measurement data at the control account level. When unavoidable and LOE work is combined with discrete work within the same control account, segregated work packages should be established for the discrete and LOE portions.

5.1.2.3 Current Schedule Statusing

The baseline schedule maintains the original agreed-upon work package and milestone dates unless altered in accordance with the project's formal change control procedures. Current status of the project is compared to the baseline for progress measurement and analysis. Progress and status are maintained on the current schedule, which also reflects the current forecast of activity durations, activity start and finish dates, and milestone dates.

The current schedule represents the remaining work and will be archived periodically.

- The current schedule is used for internal project management and DOE reporting purposes. A comparison of the current and baseline schedules indicates the extent to which the project is ahead of or behind schedule. This comparison also identifies the specific activities and events that are the source of current schedule variances or impending problems.
- Every month, each control account manager will determine the status of each open or scheduled activity in the current schedule for which they are responsible and the schedule will be updated accordingly. Various methods are used to assess the status for different kinds of activities to ensure that progress is being determined objectively.
- Subcontracts subject to earned value provisions require subcontractors to submit an earned value report at least monthly. Such subcontractors are required to provide quantitative data that can be used to assess the status of their work activities.
- Subcontracts not subject to earned value provisions have requirements for subcontractors to develop a schedule that supports the details in the project schedule. The control account managers are responsible for ensuring that the methods used to status these schedules result in an objective measurement of progress.

The status for current schedules is developed to provide the following information:

- Progress to the DOE and to project management, focusing particularly on those areas of greatest impact on, or potential risk to, key milestones and project completion.
- Progress as compared to the baseline schedule.
- Basis for forecasts of future events, milestones, activities, and project completion.

Status information, which is collected at the detail schedule level, includes the following information:

- Actual start dates for activities begun during the status period.
- Actual finish dates for activities completed during the status period.
- Actual occurrence dates for milestones accomplished during the status period.
- Percentage complete and/or remaining duration of activities started but not complete.
- Forecast completion dates for activities previously started but not yet completed.
- Forecast duration, start, and finish dates for activities – and occurrence dates for milestones – that are currently scheduled in the future and for which a change is foreseen.

The schedule is updated to reflect the current status in accordance with the Processes developed and documented by each project. These are included in (or at least referenced in) the Project Management Plan.

5.2 PERFORMANCE ANALYSIS

Analysis of performance measurement data will allow project management to identify and document the cost, schedule, and work scope conditions that may require management attention, assess the impact of these conditions on the baseline and future work, and develop and implement corrective actions as necessary. This subsection establishes the minimum requirements and guidance for performance analysis for projects: specifically, variance analysis, corrective action, and updating Estimates at Completion (EAC).

5.2.1 Variances

Schedule Variance (SV) compares the value of the work completed (BCWP) to the value of the work scheduled (BCWS), and is calculated by subtracting BCWS from BCWP, providing a dollar value for schedule variance (BCWP – BCWS = SV). Care must be exercised in drawing inferences from either favorable or unfavorable schedule variances because of the influence of high-value work performed out of sequence. Crosschecks must be made using the scheduling system to determine the true status of the schedule. However, a positive schedule variance may indicate the work is being performed ahead of schedule, and a negative schedule variance that the work is behind schedule.

Cost Variance (CV) represents the difference between the budgeted value of the work completed (BCWP) and its actual cost (ACWP), and is calculated by subtracting ACWP from BCWP (BCWP – ACWP = CV). A positive cost variance indicates that work was performed for fewer dollars than planned. Conversely, a negative variance indicates that work was performed for more dollars than planned.

Estimate at Completion (EAC) provides an estimate of the total final cost of a project. It is project management's latest revised cost estimate for a given work scope and is calculated by adding the cumulative ACWP to ETC.

Estimate to Complete (ETC) is the latest revised estimate for the remaining work scope, generally performed by the CAMs.

Variance at Completion (VAC) is the amount of under run or overrun forecast for the work scope being considered, without regard to the use of management reserve or contingency. It is calculated by subtracting EAC from BAC (BAC – EAC = VAC).

When appropriate, project management judgment will supplement or supplant the ETC and EAC calculated values.

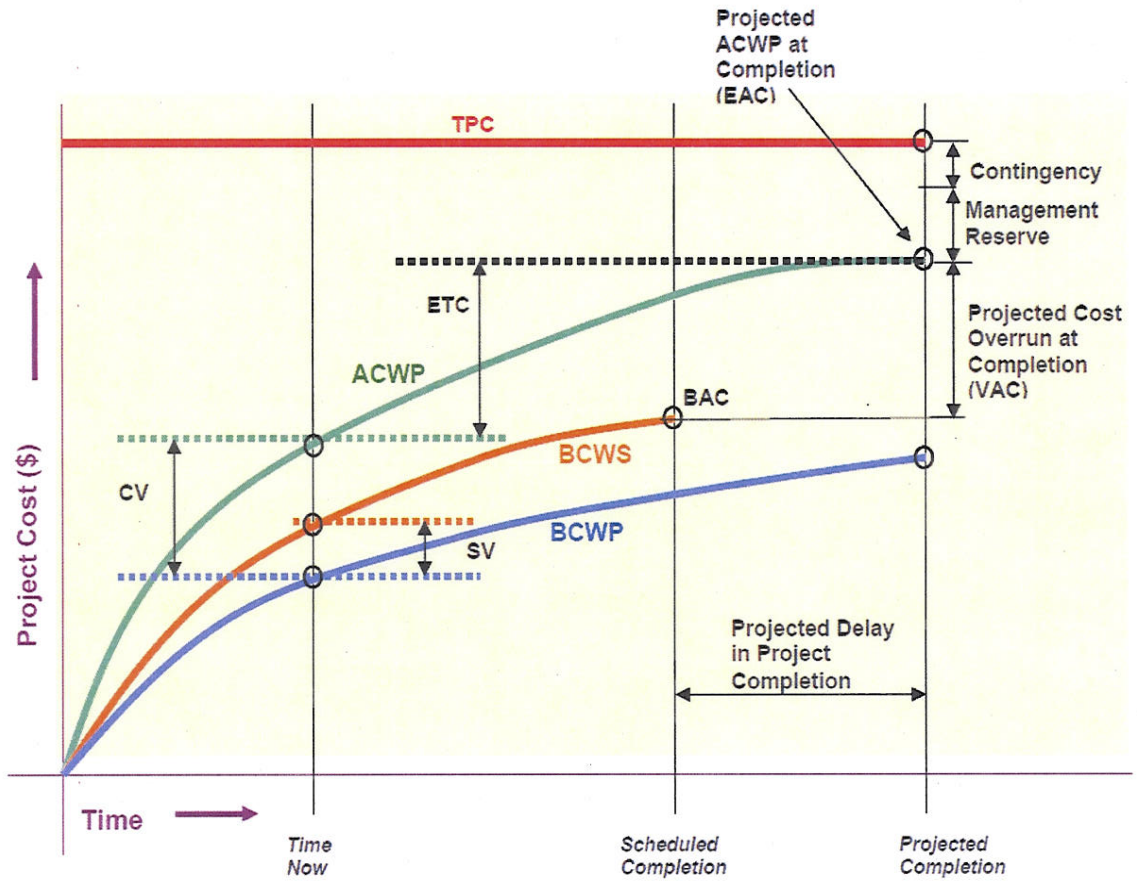
5.2.2 Variance Analysis

Variance analyses allow control account managers to identify and communicate cost, schedule, and EAC divergences from the performance measurement baseline. Root-cause analysis is performed at the control account level at a minimum. The control account structure is integral to the WBS and will accurately summarize budgets, earned value, actual costs, and the associated variances up through both the WBS and the project organization. Variance analysis at levels above the control account may be performed in support of internal management needs and DOE requirements.

5.2.3 Performance Indices

The control account managers will apply various metrics to assess the performance of their assigned control accounts. These performance metrics will provide additional insight and a basis for the CV and SV analysis. All metrics will be updated at least monthly. The metrics employed should be for both current and cumulative performance. Time-phased metrics include a Cost Performance Index (CPI=BCWP/ACWP) and a Schedule Performance Index (SPI=BCWP/BCWS). The control account manager will assess the cumulative metrics to look for control account performance trends. Other metrics include cost variances and schedule variances. Graphics are used to aid in displaying trends associated with project performance. Performance graphs are useful in communicating project performance objectives and in displaying progress toward meeting those objectives.

Figure 5.1 shows an example of a commonly used graphic for projects that illustrates EVMS metrics. The trend lines are all expressed in project dollars. The **middle** (orange) line is the BCWS, the planned work as defined in the current Earned Value Management Baseline. The **top** (green) line, the ACWP, shows a higher than estimated project cost. The **bottom** (blue) line, the BCWP, shows the actual work accomplished for the given time period. As illustrated on the graph, the schedule variance SV is the difference between BCWP and BCWS; the cost variance CV is the difference between BCWP and ACWP.



Performance Formulas

CV = BCWP – ACWP
SV = BCWP – BCWS

CPI = BCWP / ACWP
SPI = BCWP / BCWS

VAC = BAC – EAC

Overall Status

Percent Complete = $BCWP_{CUM}$ / BAC

Percent Spent = $ACWP_{CUM}$ / BAC (OR EAC)

Definitions

ACWP – Actual Cost of Work Performed
BCWP – Budgeted Cost of Work Performed
BCWS – Budgeted Cost of Work Scheduled
BAC – Budget at Completion
CPI – Cost Performance Index
CV – Cost Variance
EAC – Estimate at Completion
ETC – Estimate to Complete
SPI – Schedule Performance Index
SV – Schedule Variance
VAC – Variance at Completion

Figure 5.1 Earned Value Data Elements

5.2.4 Variance Thresholds

Variance analysis is conducted if any current period or cumulative SV or CV is outside the thresholds established in each project's Project Management Plan. *Monthly Status Reporting* (EVMS Procedure 12.PM-006) provides minimum thresholds that projects must use. Project management may establish more stringent thresholds to respond to the project's needs.

5.2.5 Control Account Performance Analysis

The control account managers prepare variance analysis statements or explanations for each control account exceeding established variance thresholds. The control account managers are responsible for determining the cause of the variance and its impact on the control account and the related activities and milestones, developing a corrective action plan (as appropriate), and including this information in the appropriate sections of the monthly report.

Control account managers periodically (at least annually) develop a comprehensive ETC at the control account level using all available information to arrive at the best possible estimate.

5.2.6 Project Performance Analysis

Project performance analysis is an ongoing process that includes routine and ad hoc analyses of problem causes, corrective actions, risk analysis, and cost savings opportunities. The process is formalized via the monthly report, which includes a review of cost and schedule performance information, identification of significant problem areas, and the status of corrective actions.

5.2.7 Monthly Project Status Calculations and Forecasts

As part of the monthly project status report, project management updates the EAC and analyzes it at the cost account level to account for all changes from the baseline that have been identified. The EAC update reflects a current analysis of project risks and includes all proposed change requests.

5.3 PERFORMANCE REPORTING

The objective of the reporting process is to provide accurate and timely reports needed by senior management, the project, and external customer management to manage the cost, schedule, and work scope on the project. Project management shall define a project-specific reporting calendar that is consistent with the project's monthly reporting cycle.

5.3.1 EVMS Reporting

Project management will provide regular reports to the customer and senior management on project status. The level, frequency, and distribution of reporting will be defined in the Project Execution Plan (PEP). EVMS reporting shall begin several months before baselining

(on DOE projects, this is Critical Decision-2 approval), in order to demonstrate the EVMS system is in place and effective. The report is generated from schedule status information, cost status from the financial system, and internal monthly narrative progress reports prepared by the CAMs. The focus of this report is exception reporting. Significant problems or issues are highlighted, along with corrective actions taken or needing to be taken.

Once the project has received an approved performance measurement baseline (at Critical Decision-2), monthly DOE reports are generated by project management as specified in DOE Order 413.3A. In addition, project management supports the Federal Project Director in preparing quarterly reports and presentations to the DOE Acquisition Executive.

5.3.2 Monthly Reporting Cycle

After Critical Decision-2, reports generated from the EVMS are updated and published monthly. The large amount of data, number of people providing input, processing time, and other considerations require that an orderly process is used to collect, review, report, and use the data generated by the system.

The purpose of the monthly report is to provide project management, senior management, and DOE a periodic assessment of each project by which to monitor and manage the project. These project status reports contain the following information:

- Financial summary
- Status of key milestones
- Progress narrative
- Baseline change control log actions
- Project management comments
- EVMS data
- Variance explanations (if required)

6.0 CHANGE CONTROL

Change control ensures that any project changes are identified, evaluated, coordinated, controlled, reviewed, approved, and documented in a manner that best serves the project. This process is discussed in the *Change Control* (EVMS Procedure 12.PM-007).

6.1 CHANGE-CONTROL PROCESS

6.1.1 Objective

Change control has the following objectives:

- Delineates the methods used to ensure the integrity of the project's cost, schedule, and work-scope baseline.
- Enables the implementation of timely and auditable changes to the baseline.
- Ensures that no work is performed without prior authorization.

DOE Manual 413.3-1, and other DOE guidance documents, establish change control requirements for DOE projects. All major projects will implement similar requirements in project procedures for change control. Change control processes begin after CD-1 for design activities (scope/budget/schedule) and between CD-1 and CD-2 for the working baseline. Change control processes continue when the performance measurement baseline is approved, and are in effect through CD-4.

6.1.2 Change Documentation

Full control and accountability must be maintained over the performance measurement baseline (PMB). A detailed change log is maintained to record all changes to authorized work and to reconcile original budgets and schedules with all changes for the WBS elements.

All change requests to the performance measurement baseline made as a result of contractual changes, formal reprogramming, internal replanning, or the use of the management reserve or contingency are documented and reported to the customer, as required.

6.1.3 Change Implementation

Change control thresholds are defined in the Project Execution Plan. All changes are recorded and tracked through the change control process. Each change is identified and assigned a unique change control number. The process for initiating a baseline change request is found in *Change Control* (EVMS Procedure 12.PM-007).

6.1.4 External (Directed) Changes

An external change is one that is imposed on the project, generally by the customer, with a directive to implement. Such a change affects one or more baseline elements (scope, cost, or schedule) and may include, but is not limited to:

- Customer directed and approved funding changes.
- DOE Program Secretarial Officer direction.
- New or revised DOE policy directives.

For changes proposed by the project manager that would alter the project scope, the req3uest would be made through the change request process. Upon approval by the appropriate customer authority, a directed change would be made from the customer to the project.

Typically for DOE projects, the DOE Federal Project Director will provide a written notice of the external or directed changes to project management. Unless specifically authorized in the written instruction, the change will be acted upon in accordance with the Project Execution Plan configuration management process.

6.1.5 Internal Changes

The objective of an internal change is to reflect a more accurate, realistic project plan. It is sometimes necessary to perform replanning actions that are within the scope of the project. These replanning actions may be appropriate for future work, when lessons are learned from completed actions. Such lessons may include reorganization of work or personnel to increase the efficiency of accomplishing the work, or require different engineering or construction approaches.

Internal replanning is intended for in-scope changes that relate to future work. All changes to the baseline are documented in a change request (CR) and retained in project files. Approved changes are incorporated into the performance measurement baseline in a timely manner, usually before the end of the next reporting period.

Details on types of internal replanning activities and methods of implementation are found in *Change Control* (EVMS Procedure 12.PM-007).

6.1.6 Formal Rebaselining

The formal rebaseline process is a comprehensive effort to reschedule and rebudget the remaining work on the project. A rebaseline occurs when there is recognition by the customer and the project manager that in order for the project baseline to continue to be a useful management tool, significant changes are necessary. Common reasons for a formal rebaseline to the PMB include substantial changes to funding profiles, subcontract bids being significantly higher or lower than budgeted, significant additional or changes to work scope that affects the budget and schedule of a project, or delays to schedules because of insufficient timeframes for acquiring approvals. Rebaselining can only occur with the future PMB and is to be avoided if at all possible.

7.0 SURVEILLANCE AND MAINTENANCE

System surveillance and maintenance are the processes of reviewing the health of FRA's Earned Value Management System (EVMS) and making changes to actual implementation practices and procedures to ensure continued compliance with ANSI/EIA-748-B guidelines and the approved FRA Earned Value Management System Description. Surveillance is monitoring and assessing, while maintenance is the effective administration of the improvements and corrective actions identified through surveillance.

7.1 SURVEILLANCE AND MAINTENANCE PROCESSES

7.1.1 Objectives

As a result of effective surveillance and maintenance, two types of changes are anticipated: (1) changes that result from a need to correct shortcomings, and (2) changes that represent opportunities for improvement. Surveillance and maintenance will be accomplished primarily through self assessment and implementation.

7.1.2 System Surveillance

The objective of system surveillance is to provide a process for assessing the implementation of the FRA Earned Value Management System Description on required projects. Surveillance ensures that the system continues to fulfill the following functions:

- Provide valid, timely information that depicts actual conditions and trends.
- Provide timely indications of actual or potential project issues.
- Maintain baseline integrity.

7.1.3 System Maintenance

The objectives of system maintenance are to:

- Provide a process that will continuously improve the operation of the EVMS
- Ensure that all changes to the system are in conformance with FRA and DOE requirements
- Ensure that system documentation impacted by system changes is kept current

7.2 SELF ASSESSMENT FOR SYSTEM SURVEILLANCE AND MAINTENANCE

FRA self assessment is executed through a continuous quality control monitoring process and through periodic surveillance by knowledgeable and independent individuals. This process will be conducted by the Office of Quality and Best Practices on an annual basis for the

overall EVMS. On new projects, the Office of Project Management Oversight will provide assessment at the time of project baselining.

Continuous self assessment is performed by each project's management and project control personnel, who are trained in the correct use of the FRA EVMS and are held accountable for proper implementation. Issues identified by project personnel are brought to the attention of Fermilab's Office of Project Management Oversight (OPMO). Issue resolution is coordinated by the OPMO if the issue involves changes to the FRA Earned Value Management System Description or supporting Fermilab procedures.

The self assessment and surveillance process will include the following specific activities:

- Projects will be reviewed with respect to EVMS compliance during Director's Critical Decision-2 reviews. The Office of Project Management Oversight is responsible for these reviews.
- The EVMS system will be periodically, but not less than annually, reviewed against the ANSI/EIA-748-B Guidelines. The Office of Quality and Best Practices is responsible for these reviews.
- Recommendations from users to improve the Earned Value Management System will be evaluated and implemented as appropriate, by the Office of Project Management Oversight.

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Appendix A

ANSI/EIA-748-B Guideline Crosswalk

ANSI/EIA-748-B Guidelines	FRA Earned Value Management System (EVMS) Implementation
Organization	
Guideline 1: Define the authorized work elements for the program. A Work Breakdown Structure (WBS), tailored for effective internal management control, is commonly used in this process.	EVMS Systems Description Document – • Section 2.1 - Work Breakdown Structure Procedures: 12.PM-001 *Project WBS, OBS, RAM*
Guideline 2: Identify the program organizational structure including the major subcontractors responsible for accomplishing the authorized work, and define the organizational elements in which work will be planned and controlled.	EVMS Systems Description Document – • Section 2.3.1 – Organizational Breakdown Structure • Section 2.4 - Project Execution Plan • Section 2.5 - Responsibility Assignment Matrix Procedures: 12.PM-001 *Project WBS, OBS, RAM*
Guideline 3: Provide for the integration of the company's planning, scheduling, budgeting, work authorization and cost accumulation processes with each other, and as appropriate, the program work breakdown structure and the program organizational structure.	EVMS Systems Description Document – • Section 2.1 - Work Breakdown Structure • Section 2.3.1 - Organizational Breakdown Structure • Section 2.5 – Responsibility Assignment Matrix • Section 3.1 - Baseline Development Process • Section 3.4 - Planning and Baseline Scheduling • Section 3.7 - Work Authorization Procedures: 12.PM-001 *Project WBS, OBS, RAM*
Guideline 4: Identify the company organization or function responsible for controlling overhead (indirect costs).	EVMS Systems Description Document – • Section 4.2 – Indirect Cost Planning and Control
Guideline 5: Provide for integration of the program work breakdown structure and the program organizational structure in a manner that permits cost and schedule performance measurement by elements of either or both structures, as needed.	EVMS Systems Description Document – • Section 2.1 - Work Breakdown Structure • Section 2.3.1 - Organizational Breakdown Structure • Section 2.5 - Responsibility Assignment Matrix • Section 3.1 - Baseline Development Process • Section 3.4 - Planning and Baseline Scheduling Procedures: 12.PM-001 *Project WBS, OBS, RAM* 12.PM-002 *Control Accounts, Work Packages, Planning Packages*
Planning, Scheduling, and Budgeting	
Guideline 6: Schedule the authorized work in a manner, which describes the sequence of work and identifies significant task interdependencies required to meet the requirements of the program.	EVMS Systems Description Document – • Section 2.3.1 - Organizational Breakdown Structure • Section 3.2 - Risk Management • Section 3.3 - Technical Baseline • Section 3.4 - Planning and Baseline Scheduling • Section 3.7 - Work Authorization

ANSI/EIA-748-B Guidelines	FRA Earned Value Management System (EVMS) Implementation
	Procedures: 12.PM-003 *Work Authorization* 12.PM-004 *Project Scheduling*
Guideline 7: Identify physical products, milestones, technical performance goals, or other indicators that will be used to measure progress.	EVMS Systems Description Document – • Section 3.3 - Technical Baseline • Section 3.4 - Planning and Baseline Scheduling • Section 5.1 – Performance Measurement Procedures: 12.PM-004 *Project Scheduling*
Guideline 8: Establish and maintain a time-phased budget baseline, at the Control Account level, against which program performance can be measured. Budget for far-term efforts may be held in higher-level accounts until an appropriate time for allocation at the Control Account level. Initial budgets established for performance measurement will be based on either internal management goals or the external customer negotiated target cost including estimates for authorized but undefinitized work. On government contracts, if an over target baseline is used for performance measurement reporting purposes; prior notification must be provided to the customer.	EVMS Systems Description Document – • Section 3.4 - Planning and Baseline Schedule • Section 3.5 - Cost Estimating and Baseline Budget • Section 3.7 - Work Authorization • Procedures: 12.PM-002 *Control Accounts, Work Packages, Planning Packages* 12.PM-005 *Cost Estimating*
Guideline 9: Establish budgets for authorized work with identification of significant cost elements (labor, material, etc.) as needed for internal management and for control of subcontractors.	EVMS Systems Description Document – • Section 2.3.1 - Organizational Breakdown Structure • Section 2.5 - Responsibility Assignment Matrix Section • Section 3.5 – Cost Estimating and Baseline Budget • Section 3.8 – Subcontractor and Collaborator Planning Procedures: 12.PM-005 - *Cost Estimating*
Guideline 10: To the extent it is practical to identify the authorized work in discrete Work Packages, establish budgets for this work in terms of dollars, hours, or other measurable units. Where the entire Control Account is not subdivided into Work Packages, identify the far term effort in larger Planning Packages for budget and scheduling purposes.	EVMS Systems Description Document – • Section 2.3 - Organizational Responsibility • Section 3.4 - Planning and Baseline Scheduling • Section 3.5 - Cost Estimating and Baseline Budget Procedures: 12.PM-002 - *Control Accounts, Work Packages, Planning Packages* 12.PM-004 - *Project Scheduling* 12.PM-005 – *Cost Estimating*
Guideline 11: Provide that the sum of all Work Package budgets plus Planning Package budgets within a Control Account equals the Control Account budget.	EVMS Systems Description Document – • Section 3.4 - Planning and Baseline Scheduling • Section 3.5 - Cost Estimating and Baseline Budget Procedures: 12.PM-002 – *Control Accounts, Work Packages, Planning Packages* 12.PM-004 - *Project Scheduling* 12.PM-005 – *Cost Estimating*
Guideline 12: Identify and control level of effort activity by time-phased budgets established for this purpose. Only that effort which is immeasurable or for which measurement is impractical may be classified as level of effort.	EVMS Systems Description Document – • Section 3.4 - Planning and Baseline Scheduling • Section 3.5 - Cost Estimating and Baseline Budget • Section 5.1 – Performance Measurement

ANSI/EIA-748-B Guidelines	FRA Earned Value Management System (EVMS) Implementation
	Procedures: 12.PM-004 - *Project Scheduling* 12.PM-005 – *Cost Estimating*
Guideline 13: Establish overhead budgets for each significant organizational component of the company for expenses, which will become indirect costs. Reflect in the program budgets, at the appropriate level, the amounts in overhead pools that are planned to be allocated to the program as indirect costs.	EVMS Systems Description Document – • Section 4.2 – Indirect Cost Planning and Control • Section 4.4 – Burdened Costs Procedures: 12.PM-005 – *Cost Estimating*
Guideline 14: Identify management reserves and undistributed budget.	EVMS Systems Description Document – • Section 3.5 - Cost Estimating and Baseline Budget • Section 3.6 – Management Reserve, Contingency, and Undistributed Budget • Section 5.3 - Performance Reporting Procedures: 12.PM-005 – *Cost Estimating*
Guideline 15: Provide that the program target cost goal is reconciled with the sum of all internal program budgets and management reserves.	EVMS Systems Description Document – • Section 3.4 - Planning and Baseline Scheduling • Section 3.5 - Cost Estimating and Baseline Budget • Section 3.6 – Management Reserve, Contingency, and Undistributed Budget • Section 5.3 - Performance Reporting Procedures: 12.PM-005 – *Cost Estimating*
Accounting Considerations	
Guideline 16: Record direct costs in a manner consistent with the budgets in a formal system controlled by the general books of account.	EVMS Systems Description Document – • Section 4.1 – Accounting Processes Procedures: Budget to Close Process Cycle Procure to Pay Process Cycle HR to Payroll Process Cycle Finance website: Policies & Procedures (CAS)
Guideline 17: When a work breakdown structure is used, Summarize direct costs from Control Accounts into the work breakdown structure without allocation of a single Control Account to two or more work breakdown structure elements.	EVMS Systems Description Document – • Section 2.1 - Work Breakdown Structure • Section 2.3 - Organizational Responsibility • Section 4.1 – Accounting Processes • Section 5.3 - Performance Reporting Procedures: 12.PM-002 – *Control Accounts, Work Packages, Planning Packages* 12.PM-006 – *Monthly Status Reporting* Project/Task Structure Accounting Summary Reports Finance website: Policies & Procedures (CAS) Expenditure Type Glossary

ANSI/EIA-748-B Guidelines	FRA Earned Value Management System (EVMS) Implementation
Guideline 18: Summarize direct costs from the Control Accounts into the contractor's organizational elements without allocation of a single Control Account to two or more organizational elements.	EVMS Systems Description Document – • Section 2.1 - Work Breakdown Structure • Section 2.2 - Organizational Responsibility • Section 2.5 - Responsibility Assignment Matrix • Section 4.1 – Accounting Processes • Section 5.3 - Performance Reporting Procedures: 12.PM-006 – *Monthly Status Reporting* Project/Task Structure Accounting Summary Reports Finance website: Policies & Procedures (CAS) Expenditure Type Glossary
Guideline 19: Record all indirect costs, which will be allocated to the contract.	EVMS Systems Description Document – • Section 2.1 - Work Breakdown Structure • Section 4.1 – Accounting Processes • Section 4.2 - Indirect Cost Planning and Control Procedures: 12.PM-006 – *Monthly Status Reporting* Finance website: Policies & Procedures (CAS & Indirect Methodology)
Guideline 20: Identify unit costs, equivalent unit costs, or lot costs when needed.	EVMS Systems Description Document – • Section 4.1 – Accounting Processes
Guideline 21: For EVMS, the material accounting system will provide for: (1) Accurate cost accumulation and assignment of costs to Control Accounts in a manner consistent with the budgets using recognized, acceptable, costing techniques. (2) Cost performance measurement at the point in time most suitable for the category of material involved, but no earlier than the time of progress payments or actual receipt of material. (3) Full accountability of all material purchased for the program including the residual inventory.	EVMS Systems Description Document – • Section 3.5 - Cost Estimating and Baseline Budget • Section 4.3 - Material Accounting • Section 5.3 - Performance Reporting • Section 4.1 – Accounting Processes Procedures: 12.PM-006 – *Monthly Status Reporting* Budget to Close Process Cycle Procure to Pay Process Cycle Finance website: Policies & Procedures (CAS)
Analysis and Management Reports	
Guideline 22: At least on a monthly basis, generate the following information at the Control Account and other levels as necessary for management control using actual cost data from, or reconcilable with, the accounting system: (1) Comparison of the amount of planned budget and the amount of budget earned for work accomplished. This comparison provides the schedule variance. (2) Comparison of the amount of the budget earned the actual (applied where appropriate) direct costs for the same work. This comparison provides the cost variance.	EVMS Systems Description Document – • Section 5.1 - Performance Measurement • Section 5.2 - Performance Analysis • Section 5.3 - Performance Reporting Procedures: 12.PM-006 – *Monthly Status Reporting*

ANSI/EIA-748-B Guidelines	FRA Earned Value Management System (EVMS) Implementation
Guideline 23: Identify, at least monthly, the significant differences between both planned and actual schedule performance and planned and actual cost performance, and provide the reasons for the variances in the detail needed by program management.	EVMS Systems Description Document – • Section 5.1 - Performance Measurement • Section 5.2 - Performance Analysis • Section 5.3 - Performance Reporting Procedures: 12.PM-006 – *Monthly Status Reporting*
Guideline 24: Identify budgeted and applied (or actual) indirect costs at the level and frequency needed by management for effective control, along with the reasons for any significant variances.	EVMS Systems Description Document – • Section 3.5 - Cost Estimating and Baseline Budget • Section 4.2 - Indirect Cost Planning and Control • Section 5.1 - Performance Measurement • Section 5.2 - Performance Analysis • Section 5.3 - Performance Reporting Procedures: 12.PM-006 – *Monthly Status Reporting*
Guideline 25: Summarize the data elements and associated variances through the program organization and/or work breakdown structure to support management needs and any customer reporting specified in the contract.	EVMS Systems Description Document – • Section 5.2 - Performance Analysis • Section 5.3 - Performance Reporting Procedures: 12.PM-006 – *Monthly Status Reporting*
Guideline 26: Implement managerial actions taken as the result of earned value information.	EVMS Systems Description Document – • Section 5.3 - Performance Reporting Procedures: 12.PM-006 – *Monthly Status and Reporting*
Guideline 27: Develop revised estimates of cost at completion based on performance to date, commitment values for material, and estimates of future conditions. Compare this information with the performance measurement baseline to identify variances at completion important to company management and any applicable customer reporting requirements including statements of funding requirements.	EVMS Systems Description Document – • Section 5.2 - Performance Analysis • Section 5.3 - Performance Reporting Procedures: 12.PM-006 – *Monthly Status Reporting*
Revisions and Data Maintenance	
Guideline 28: Incorporate authorized changes in a timely manner, recording the effects of such changes in budgets and schedules. In the directed effort prior to negotiation of a change, base such revisions on the amount estimated and budgeted to the program organizations.	EVMS Systems Description Document – • Section 3.6 – Management Reserve, Contingency, and Undistributed Budget • Section 6.1 - Change Control Process Procedures: 12.PM-006 – *Monthly Status Reporting* 12.PM-007 - *Change Control*
Guideline 29: Reconcile current budgets to prior budgets in terms of changes to the authorized work and internal re-planning in the detail needed by management for effective control.	EVMS Systems Description Document – • Section 3.6 – Management Reserve, Contingency, and Undistributed Budget • Section 3.7 - Work Authorization

ANSI/EIA-748-B Guidelines	FRA Earned Value Management System (EVMS) Implementation
	• Section 5.3 - Performance Reporting • Section 6.1 - Change Control Process Procedures: 12.PM-006 – *Monthly Status Reporting* 12.PM-007 - *Change Control*
Guideline 30: Control retroactive changes to records pertaining to work performed that would change previously reported amounts for actual costs, earned value, or budgets. Adjustments should be made only for correction of errors, routine accounting adjustments, effects of customer or management directed changes, or to improve the baseline integrity and accuracy of performance measurement data.	EVMS Systems Description Document – • Section 3.6 – Management Reserve, Contingency, and Undistributed Budget • Section 5.3 - Performance Reporting • Section 6.1 - Change Control Process Procedures: 12.PM-006 – *Monthly Status Reporting* 12.PM-007 - *Change Control*
Guideline 31: Prevent revisions to the program budget except for authorized changes.	EVMS Systems Description Document – • Section 6.1 - Change Control Process Procedures: 12.PM-007 - *Change Control*
Guideline 32: Document changes to the performance measurement baseline.	EVMS Systems Description Document – • Section 6.1 - Change Control Process Procedures: 12.PM-007 - *Change Control*

APPENDIX B

Abbreviations, Acronyms, and Glossary of Terms

ACWP — Actual Cost of Work Performed

AE — Acquisition Executive

A/E – Architect/Engineer

ANSI — American National Standards Institute

BAC — Budget at Completion

BCWP — Budgeted Cost of Work Performed

BCWS — Budgeted Cost of Work Scheduled

CA – Control Account

CAM — Control Account Manager

CASB – Cost Accounting Standards Board Disclosure Statement

CBB — Contract Budget Baseline

CD — Critical Decision

CDR — Conceptual Design Report

CFO — Chief Financial Officer

CO — Contracting Officer

CV – Cost Variance

D&D – Demolition and Decommissioning

DOE — U.S. Department of Energy

EAC — Estimate at Completion

EIA – Electronic Industries Alliance

ES&H – Environment, Safety and Health

ETC — Estimate to Complete

EVMS — Earned Value Management System

FFP – Firm Fixed Price

FRA – Fermi Research Alliance

FY — Fiscal Year

G&A – General and Administration

GAAP – General Accepted Accounting Principles

IPT — Integrated Project Team

LOE — Level of Effort

MOU – Memorandum of Understanding

NEPA — National Environmental Policy Act

OBS — Organizational Breakdown Structure

ODC – Other Direct Costs

OECM — Office of Engineering and Construction Management

OPC — Other Project Costs

OPMO – Office of Project Management Oversight

PA – Oracle Project Accounting

PB — Performance Baseline

PED — Project Engineering and Design

PEP — Project Execution Plan

PMB — Performance Measurement Baseline

PMT — Performance Measurement Technique

PMP – Project Management Plan

RAM — Responsibility Assignment Matrix

RFP — Request for Proposal

SOW — Scope of Work

SV — Schedule Variance

TEC — Total Estimated Cost

TPC — Total Project Cost

UB — Undistributed Budget

UChicago – University of Chicago

URA – Universities Research Association

WBS — Work Breakdown Structure

Accrual Method - An accounting method in which: revenue is recognized when earned rather than when collected; expenses are recognized when incurred rather than when paid. Accrual-basis accounting is essential to accurate performance and progress information on contracts.

Acquisition Executive (AE) - The individual designated by the Secretary of Energy to integrate and unify the management system for a program portfolio of projects, and implement prescribed policies and practices.

Acquisition Strategy - An acquisition strategy is a high-level business and technical management approach designed to achieve project objectives within specified resource constraints. It is the framework for planning, organizing, staffing, controlling, and leading a project. It provides a master schedule for activities essential for project success, and for formulating functional strategies and plans.

Authorized Unpriced Work - Any change to the contract statement of work that has been authorized by the customer and is being worked on, but for which no price has yet been negotiated.

Budget at Completion (BAC) - The total authorized budget for accomplishing the scope of work. It is equal to the sum of all allocated budgets plus any undistributed budget. (Management reserve and contingency are not included.) The Budget at Completion will form the Performance Baseline.

Budgeting - The process of translating resource requirements into a funding profile.

Change Order - A bilateral or sometimes unilateral order signed by the government contracting officer that directs the contractor to make a change that the *change clause* authorizes usually with, but sometimes without, the contractor's consent.

Change Request – The documentation that describes a change in scope, cost, or schedule, initiating as a request to the Project Manager, and ultimately resulting in approval or disapproval, with associated appropriate implementation into the PMB.

Collaborator – A university or laboratory partner who participates in a project by providing labor and/or materials through direct funding from the project, or through in-kind contributions.

Conceptual Design - The concept for meeting a mission need. The conceptual design process requires a mission need as an input. Concepts for meeting the need are explored and alternatives considered to determine a set of alternatives that are technically viable, affordable, and sustainable.

Configuration Management – The control, documentation, and reporting of changes to data sets, technical specifications, reports, and documents.

Contingency - The budget identified by the customer and the project, for managing unknown risks. The release of this budget is managed through the change control process and determined by approval thresholds defined in the PEP and PMP. Contingency is different from management reserve, and is not part of the Performance Measurement Baseline.

Contract - A contract is a mutually binding agreement that obligates the seller to provide the specified product and obligates the buyer to pay for it.

Contractor - An individual, partnership, company, corporation, or association having a contract with a contracting agency for the design, development, maintenance, modification, or supply of deliverable items and/or services under the terms of a contract.

Control Account – A key management control point located at the natural intersection point of the WBS and the OBS, where functional responsibility for work is assigned. It represents the point at which budgets (resource plans) and actual costs are accumulated and compared to earned value for management control purposes.

Control Account Manager (CAM) – The member of the project team responsible for the performance defined in a Control Account and for managing the resources authorized to accomplish the tasks.

Cost Estimate - A documented statement of costs estimated to be incurred to complete the project or a defined portion of the project.

Cost Variance - The difference between Earned Value and Actual Cost (CV = BCWP – A CWP.) A positive value indicates a favorable condition, and a negative value indicates an unfavorable condition.

Cost Performance Index (CPI) - The ratio of earned value to actual costs (BCWP/ACWP); a value greater than one denotes favorable performance. CPI is often used to predict the magnitude of possible cost deviations from the baseline.

Critical Decision (CD) – On DOE projects, a formal determination made by the Acquisition Executive and/or designated official at a specific point in a project life cycle that allows the project to proceed. Critical Decisions occur in the course of a project: at determination of Mission Need (CD-0), at the completion of conceptual design (CD-1), at project baselining (CD-2), at the commencement of execution (CD-3), and at turnover (CD-4).

Critical Path - In a project network diagram, the series of logically linked activities that determine the earliest completion date for the project. Generally, it is the longest path through the project. However, a critical path can end, as an example, on a schedule milestone that is in the middle of the project schedule and that has a finish-no-later than imposed date schedule constraint.

Critical Path Method (CPM) - A network analysis technique used to determine the amount of scheduling flexibility (the amount of float) on various logical network paths in the project

schedule network, and to determine the minimum total project duration. Early start and finish dates are calculated by means of a forward pass, using a specified start date. Late start and finish dates are calculated by means of a backward pass, starting from a specified completion date, which sometimes is the project early finish date determined during the forward pass calculation.

Deviation - A deviation occurs when the current estimate of a performance, technical, scope, schedule, or cost parameter is not within the threshold values of the Performance Baseline for that parameter. It is handled as a deviation, not through the normal change control process.

Directed Change - A change imposed on a project(s) that affects the project's baseline. Example of directed changes include, but are not limited to, (1) changes to approved budgets or funding and (2) changes resulting from DOE policy directives and regulatory or statutory requirements.

Duration - The number of work periods (not including holidays or other nonworking periods) required to complete an activity or other project element, and usually expressed as workdays or workweeks.

Estimate at Completion (EAC) - The latest revised cost estimate for a given work scope.

Estimate to Complete (ETC) - Estimate of costs to complete all work from a point in time to the end of the project.

Estimated Cost - An anticipated cost for an applied work scope.

Firm Fixed Price Contract - Fixed price contracts provide for a firm price or, under appropriate circumstances, may provide for an adjustable price for the supplies or services that are being procured. In providing for an adjustable price, the contract may fix a ceiling price, target price (including target cost), or minimum price. Unless otherwise provided in the contract, any such ceiling, target, or minimum price is subject to adjustment only if required by the operation of any contract clause that provides for equitable adjustment, escalation, or other revision of the contract price upon the occurrence of an event or a contingency.

Indirect Costs - Costs that cannot be attributed or assigned to a system as direct cost; may also be referred to as burden or overhead.

Integrated Project Team (IPT) - An IPT is a cross-functional group of individuals organized for the specific purpose of delivering a project to an external or internal customer.

Level of Effort (LOE) - Effort of a general or supportive nature without a deliverable end product; an activity that does not lend itself to the measurement of discrete accomplishment. It is generally characterized by a uniform rate of activity over a specific period of time. Value is earned at the rate that the effort is being expended.

Management Reserve - The budget identified by the customer and the project for managing known risks. Management reserve is developed "bottoms-up" and is tied to risks in the risk registry. The release of this budget is managed through the change control process and determined by approval thresholds defined in the PEP and PMP. Management reserve is different from contingency, and is not part of the Performance Measurement Baseline.

Memorandum of Understanding (MOU) - A bilateral agreement between the project manager and a collaborating institution to perform a specific scope of work for a project. The Statement of Work (SOW) that is part of the MOU details the scope, cost and schedule. MOUs may span an entire project, but SOWs are prepared for each fiscal year. MOUs may be executed as purchase orders or other agreements such as Interentity Work Orders (IWOs).

Milestone - A scheduled event marking the due date for accomplishment of a specified effort (work scope) or objective. A milestone may mark the start, an interim step, or the end of one or more activities.

Network Schedule - A schedule format in which the activities and milestones are represented along with the interdependencies between activities. It expresses the logic (how the program will be accomplished) and the time frames (when). Network schedules are the basis for critical-path analysis, a method for identification and assessment of schedule priorities and impacts.

Office of Project Management Oversight (OPMO) - The organization within Fermilab with the responsibility and authority for Director's Policy 12 (Project Management). The office has the responsibility to oversee management of projects >$5M, conduct Director's Reviews and create and maintain project management-related procedures.

Office of Quality and Best Practices (OQBP) - The organization within Fermilab with the responsibility and authority for Director's Policy 10 (Quality Assurance). The office has the responsibility to oversee quality assurance activities.

Organizational Breakdown Structure (OBS) - A depiction of the project organization arranged to indicate the line-reporting relationships within the project context.

Other Project Costs (OPC) - Costs for engineering, design, development, startup, and operations, which are essential for project execution and are operating-expense funds.

Performance Measurement Baseline (PMB) - The collected key performance, scope, cost, and schedule parameters. The Performance Measurement Baseline defines the threshold and boundary conditions for a project. The PMB is modified in accordance with the change control process.

Performance Measurement Technique (PMT) – A defined method of earning value in relation to the resources expended. Also known as Earned Value Methodology.

Planning Package - A logical aggregate of work, usually future efforts that can be identified and budgeted, but which is not yet planned in detail at the work package or task level.

Program Office - The DOE headquarters organizational element responsible for managing a program.

Project - In general, a unique effort that supports a program mission; has defined start and end points; is undertaken to create a product, facility, or system; and contains interdependent activities planned to meet a common objective or mission. A project is not constrained to any specific element of the budget structure (e.g., operating expense or plant and capital equipment). Construction, if required, is part of the total project. Projects include planning and execution of construction, renovation, modification, environmental restoration, decontamination and decommissioning efforts, and large capital equipment or technology development activities. Tasks that do not include the above elements, such as basic research, grants, ordinary repairs, maintenance of facilities, and operations, are not considered projects.

Project Controls – Project support staff for planning, baseline development, management system plan preparation, as well as for monitoring, assessing, controlling, and reporting progress against the project baseline.

Project Execution Plan (PEP) - The plan for the execution of the project, which establishes roles and responsibilities and defines how the project will be executed. Every project implementing Earned Value management will have a unique project execution plan.

Project Management Plan (PMP) – The project-specific plan that outlines how projects will manage components such as risk, quality, interfaces, resources, and configuration control.

Remaining Duration - The time needed to complete an activity.

Responsibility Assignment Matrix (RAM) - A structure that relates the project organization structure to the work breakdown structure to help ensure that each element of the project's scope of work is assigned to a responsible individual.

Risk - A measure of the potential inability to achieve overall project objectives within defined cost, schedule, and technical constraints, and has two components: (1) the *probability/likelihood* of failing to achieve a particular outcome, and (2) the *consequences/impacts* of failing to achieve that outcome.

Risk Management - The act or practice of controlling risk. An organized process that reduces risk, prevents a risk from happening, or mitigates the impact if it does occur.

Schedule - A plan that defines when specified work is to be done to accomplish program objectives on time.

Schedule Control - Controlling changes to the project schedule and preparing workaround plans to mitigate the impact of adverse results/delays by others.

Schedule Performance Index (SPI) - A schedule performance indicator relating work accomplished to the planned schedule (BCWP/BCWS). A value greater than one denotes favorable performance.

Schedule Variance (SV) - A metric for the schedule performance on a program. It is the algebraic difference between Earned Value and the Budget (Schedule Variance = BCWP – BCWS). A positive value is a favorable condition while a negative value is unfavorable. The SV is calculated in dollars or work units, and is intended to complement network analysis, not to supersede or replace it.

Scope of Work (SOW) - The document that defines the work-scope requirements for a project. It is a basic element of control used in the processes of work assignment (scope) and the establishment of project schedules and budgets.

System - A collection of interdependent equipment and procedures assembled and integrated to perform a well-defined purpose. It is an assembly of procedures, processes, methods, routines, or techniques united by some form of regulated interaction to form an organized whole.

Total Estimated Costs (TEC) - The Total Estimated Cost of a project is the specific cost of the project, whether funded as an operating expense or construction. It includes the cost of land and land rights; engineering, design, and inspection costs; direct and indirect construction costs; and the cost of initial equipment necessary to place the plant or installation in operation, whether funded as an operating expense or construction.

Total Project Cost (TPC) - Total cost for the project, including all costs regardless of sources or type of funds.

Uncosted Labor – Labor accounted for in work package estimates, but at a $0 rate in the budget. Such a rate may be used for scientific effort at the customer's direction.

Undistributed Budget (UB) - Budget associated with specific work scope or contract changes that have not been assigned to a control account.

Work Breakdown Structure (WBS) - A product-oriented grouping of project elements that organizes and defines the total scope of the project. The WBS is a multilevel framework that organizes and graphically displays elements representing work to be accomplished in logical relationships. Each descending level represents an increasingly detailed definition of a project component. Project components may be products or services. It is the structure and code that integrates and relates all project work (technical, schedule, and cost) and is used throughout the life cycle of a project to identify and track specific work scopes.

Work Breakdown Structure Dictionary - A listing of work breakdown structure elements with a short description of the work-scope content in each element.

Work Package - A task or set of tasks performed within a control account. The work package is the lowest level activity to which resources are assigned.