

# Earned Value Management System Description



*operating*  
*Fermi National Accelerator Laboratory*  
*for the*  
*U.S. Department of Energy*

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## **Contact Information**

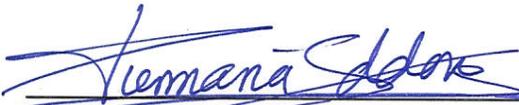
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This manual is presented in two parts. Part I is the Systems Description that provides an overview of the EVMS, establishes requirements for its use, defines system components, and describes the interface between these components. Part II contains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

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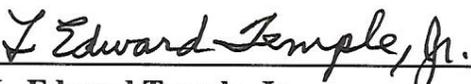
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## Change History Log

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

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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. This FRA Earned Value Management System Description provides the requirements, procedures, authorities, and responsibilities for implementing an Earned Value Management System (EVMS) on Fermilab 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 Fermilab management to require EVMS project management controls. The assigned Fermilab 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 Fermilab 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 (Fermilab) 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, Fermilab adheres to the requirements in DOE Order 413.3A, *Program and Project Management for the Acquisition of Capital Assets*, and its accompanying guidance manual, DOE Manual 413.3-1. DOE Order 413.3A mandates the use of EVMS for projects with Total Project Costs (TPC) of \$20M or more. 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 at Fermilab. It is written to comply with:

- ANSI/EIA-748-A, *Earned Value Management Systems, the Industry standard for implementing EVMS*

- DOE Order 413.3A, *Program and Project Management for the Acquisition of Capital Assets*
- DOE Manual 413.3-1, *Project Management for the Acquisition of Capital Assets*
- Fermilab's 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, each element of a project is assessed and a graded approach is assigned 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. At Fermilab, 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-A and the FRA certified EVMS. Verification of EVMS compliance is confirmed during the individual project EVMS surveillance process.

The EVMS process ensures that all federal Line Item and Major Items of Equipment 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.

Deviations from any requirement or process as described in this Earned Value Management System Description document or associated implementing procedures must be documented in 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 project-specific management plans.

## 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 Fermilab Associate Director, or to the Fermilab Director. The organizational structure is described in the Project Execution Plan (PEP). The Project Manager has authority and the responsibility to execute the project within the scope, budget, and schedule agreed to between Fermilab and 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, measuring, 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 Appendix B of *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 Appendix C of *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 Appendix D of *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 found in work packages. When planning packages are converted into work packages, they are defined in greater detail.

## **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 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 Appendix E of *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 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, a contingency/management reserve is established. Work authorizations are prepared for both external and internal suppliers 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. As the project progresses, new information and insights allow the Project Manager to continuously refine the identified risks and mitigation strategies or remove the risk from consideration once it is no longer applicable. The risk mitigation strategy for all projects utilizing an EVMS includes the establishment of an adequate contingency budget, and a schedule contingency to reasonably ensure successful project completion.

Project managers are required to establish budget objectives, which are defined to some degree by the maximum level of acceptable risk. Risks in achieving both performance and budget goals must be clearly recognized and actively managed through the continual review of cost-, performance-, and schedule- versus-risk tradeoff; identification of key performance and project uncertainties; and the demonstration of solutions before project activities are initiated.

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

<b>Technical Baseline Basis Document By Project Phase</b>	<b>DOE Critical Decision</b>
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 project schedule is used to plan and control the interdependencies of all the activities and resources needed to execute the project. Schedules address how the work is to be performed and identify the approach or methodology to accomplish the project objectives. Schedules also address how long it takes to complete an activity based on the duration of the task and the resources available. Not all work can be completed simultaneously and not all work is accomplished serially. Schedule concurrency is inherent in all projects, so a project schedule is adjusted by balancing the available resources in conjunction with the available budget, resource constraints, and the capacity of the work site, among other factors. Schedules that are based on unrealistic availability of budget or time are doomed to fail.

The project employs a scheduling tool that maintains the Project Schedule, comprised of the baseline schedule and supporting control milestones. The working schedule accumulates data to report the current schedule status.

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. Technical leads from various disciplines participate in the early iterations to identify the constraints and interfaces. The CAMs expand these schedules into the detail needed to identify the activities that will be performed in executing their assigned control account responsibilities. The Project Schedule is structured and numbered consistent with the project Work Breakdown Structure.

*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

The baseline schedule is used to measure performance. It contains the list of control milestones that are generally negotiated with the DOE and are identified in the Project Execution Plan. Project management supplements these milestones with other events in a hierarchical structure deemed sufficiently important to be in the baseline. The logic and activity relationships are established in the baseline schedule such that they support the timely accomplishment of the control milestones.

The baseline schedule is assembled by the project management team. Project management has the responsibility to ensure that all parts of the baseline schedule properly mesh and phase with each other. The baseline schedule should be consistent with constraints imposed externally, internally, by resource limitations, or by other concurrent projects.

The baseline schedule is approved and fixed consistent with DOE Order 413.3A. The baseline schedule constitutes the official plan against which schedule performance is measured and reported to the customer, senior management, and project management. It is maintained under configuration management and may not be revised without proper authorization, as detailed in the change control thresholds table and documented in the PEP the project's configuration management plan.

#### **3.4.3 Working Schedule**

The working schedule is used to manage the project and is developed by logically networking the project activities. The schedule is an integrated-network, logic-based schedule, which provides the ability to relate the project's time-phased activities in their logical sequence using predecessor-successor relationships and timing. The working schedule also enables the determination of the critical path and the estimation of the schedule's effects on future scheduled activities and milestones. The working schedule includes detailed input from all CAMs, provides the ability to relate activities and milestones between different levels of schedules, and includes all project milestones identified in the baseline schedule.

The working schedule employs the approved baseline schedule to relate progress. The working schedule shows the actual status of the project or program at the current point in time by reflecting the work performed and the milestones accomplished. This makes it a useful tool for analyzing the project, identifying issues and determining resolutions. Access to the working schedule for changes is limited to project controls staff.

#### **3.4.4. Supplemental Schedule**

The project team may employ supplemental schedules that are not part of the formal Project Schedule hierarchy. These are not under configuration control but are often used for day-to-day operational planning and management and to supplement the baseline and current schedules.

### **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 and an integral element in the establishment of annual funding requirements. 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
- contingency 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 430.1-1X, *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 contingency 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.

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

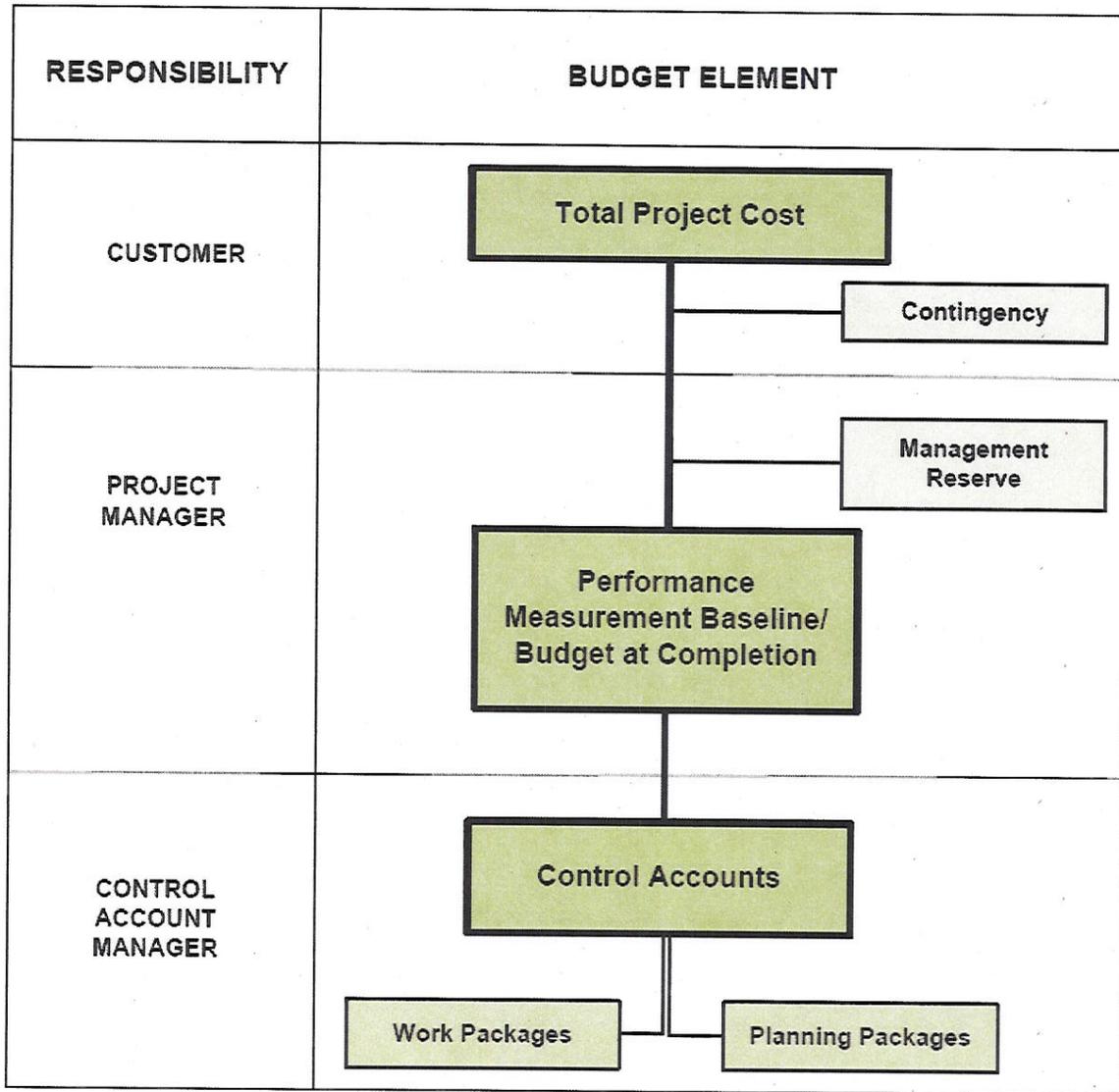
The project baseline budget establishes the estimated cost of executing the project in accordance with the scope and schedule elements of the baseline. The baseline budget is also referred to as the Total Project Cost (TPC) and includes estimates for Management Reserve and Contingency to manage unforeseen 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 operating costs associated with the project, including engineering studies, conceptual design, construction, startup, and costs to complete transition and facility occupancy. Tailoring strategies may be employed regarding operating costs to most effectively use project funds. (See Fig. 4.1 for additional information.)
- **Contingency:** The portion of the project budget that the customer holds in reserve to accommodate unknowns regarding requirements and uncertainty that is outside the scope of the contractor baseline, but is within the scope of the project. Contingency 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 a part of the Performance Measurement Baseline (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, any undistributed budget, plus the contractor's management reserve. The Budget at Completion equals the Performance Measurement Baseline.

- **Management Reserve:** That portion of the approved contingency budget assigned by the customer or the Federal Project Director (on DOE Projects) to the Project Manager for management control purposes. (See Section 3.6 for additional information.)
- **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 through the change control process.
- **Undistributed budget:** That budget identified for an approved scope of work but not yet specifically allocated to a Control Account. Undistributed budget can result from a baseline change request being approved or a proposed modification not yet budgeted in detail and extended to the Control Account. Undistributed budget is included as part of the PMB. At the present time Fermilab projects do not employ undistributed budget as described in the NDIA Intent Guide.
- **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.

The time-phased baseline budget, plus time-phased contingency, are used to communicate and establish annual funding requirements for the project. For projects that include significant third party subcontractors (i.e. A/E or General Construction Contracts), annual incremental or full funding requirements are time phased so that sufficient funding is identified and allocated to the project to maintain adequate schedule progress. Funding authorization may be required significantly earlier than when the actual costs are incurred.

The project must ensure that sufficient funding is authorized by the customer to cover planned actual cost and subcontract commitments in advance of the completion of project work scope.



**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 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 package subsets of the control account.

Control account budgets may be further subdivided into one or more work 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 lowest level activity. 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.
- Unopened work packages maybe replanned without change control if the start/end dates remain the same and deliverables are not delayed.

#### **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 rates. 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 MANAGEMENT RESERVE, CONTINGENCY, AND UNDISTRIBUTED BUDGET**

### **3.6.1 Contingency**

Contingency is an amount of the approved Total Project Cost (TPC) that is identified at the start of the project. The contingency is established to provide budget coverage for future uncertainties (risks) that are within the scope of the project but are not funded in the control account budgets. The contingency is developed at the work package level, but is not assigned to specific segments of work. Contingency is under the control of the customer, or on DOE projects, the Federal Project Director.

Project management establishes the contingency based on a risk analysis of the project work scope for all elements of the project after CD-0. The factors affecting the amount of contingency established may include: technical risk, schedule issues, and/or possible shortages in a critical resource area (i.e., labor, material, timely appropriations, or support services), direct and indirect rate changes, etc. Contingency is normally developed “bottoms-up” from a risk assessment of individual work elements within the project WBS. This contingency is then extracted from the individual WBS elements and summed into a project contingency account. Prior to baselining, as the level of risk is reassessed on the project, the budget for contingency can change.

Contingency is released to provide a budget for risk mitigation within the project work scope. Conversely, budget from the control accounts is returned to the contingency whenever the work scope, and therefore the allocated budget, is decreased. Contingency transactions are executed through the project change control system, and documented in the project change control log. These transactions are identified in the EVMS reports to management and to the customer.

Since the customer controls the contingency, he determines the final disposition of any unused contingency as the project comes to completion.

### **3.6.2 Management Reserve**

Management reserve is the portion of project contingency specifically assigned to the Project Manager for the management of changes within his approval authority. The Federal Project Director on DOE funded projects, or the customer on non-DOE projects, may chose to

periodically allocate a portion of the contingency budget to the Project Manager as management reserve. Use of management reserve is controlled and documented like contingency, per the change control process. These transactions are addressed in the EVMS monthly progress reports to the customer. Management reserve shall not be used to fund additional scope outside of the authorized baseline technical scope.

### 3.6.3 Undistributed Budget

At the present time, Fermilab projects do not employ undistributed budget as described in the NDIA Intent Guide.

## 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 project work scope related to Federal Line Item constructed facilities and major DOE programmatic research 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 Fermilab 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. This may be represented by use of applicable attachments to clearly identify work scope, budget, resource commitments, control account, WBS Dictionary, authorized funding, 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. For collaborator purchase orders, payment will be made based on the terms of the MOU, typically for items produced or labor expended. 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.

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.

### 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 cost collection account, and control account, for specific items of work.

The Project Office submits a request to Finance to open a control account in the financial accounting system for collecting actual costs. This ensures that actual costs are recorded at the control account level. Control accounts will be closed when the work is complete.

All direct labor, material, subcontracts, and other direct costs (ODC) are charged directly to the control accounts that are assigned at the job or task level. Indirect charges also accumulate in the control account, 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 FRA 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 hours or percent effort are 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, procedures are in place to allow for accruals 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 invoice is paid after invoices have been approved by the PO requestor. The actual cost (ACWP) reported for these subcontracts may require that an accrual be made for costs estimated to have been incurred in addition to the actual costs recorded. This accrual is added to previously invoiced costs and then reversed and re-accrued each month until an invoice has been received. 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-A 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-A 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 control account level and then summarized up 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.

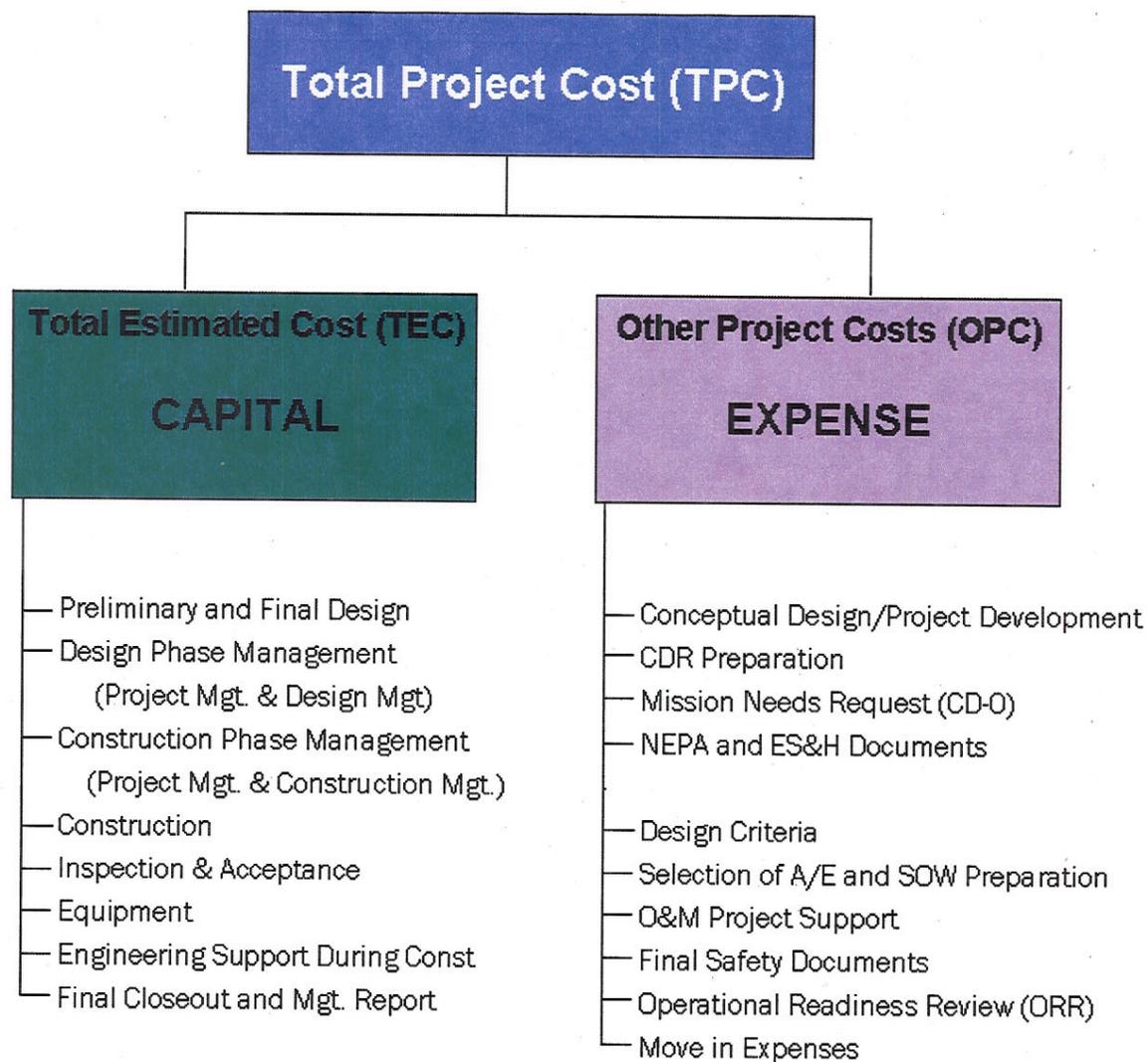


Figure 4. 1 Project Cost Categories

## 5.0 ANALYSIS AND MANAGEMENT REPORTS

The Performance Measurement Baseline is used to measure and analyze cost and schedule status and to evaluate project performance. Project variance thresholds provide the parameters for monthly project variance reporting. The Monthly Report identifies project performance parameters (as both time-phased and as a “snapshot” in time) based on variance analysis. The report may also recommend corrective actions, as appropriate. Management actions (e.g., requesting a change and applying or returning contingency/management reserve) 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 Statusing and 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.

### 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.

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 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 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 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.

#### 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. 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.
- **Budget at Completion (BAC)** is the total budget for a given work scope. The BAC for the total project plus management reserve/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 discrete control account, the inclusion of LOE activities should be avoided and kept to a minimum in order to prevent any distortion of the performance measurement data. When unavoidable and LOE work is combined with discrete work within the same control account, segregated work packages are established for the discrete and LOE portions, as appropriate.

#### 5.1.2.3 Current Schedule Statusing

The baseline schedule maintains the original agreed-upon 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 following the processes described in the project's Project Management Plan, 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.
- Earned value flow-down subcontracts have provisions in their contracts that require the 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.
- Non-earned value flow-down subcontractors have provisions in their contracts that require them 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 procedures described in the project's 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 the 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/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

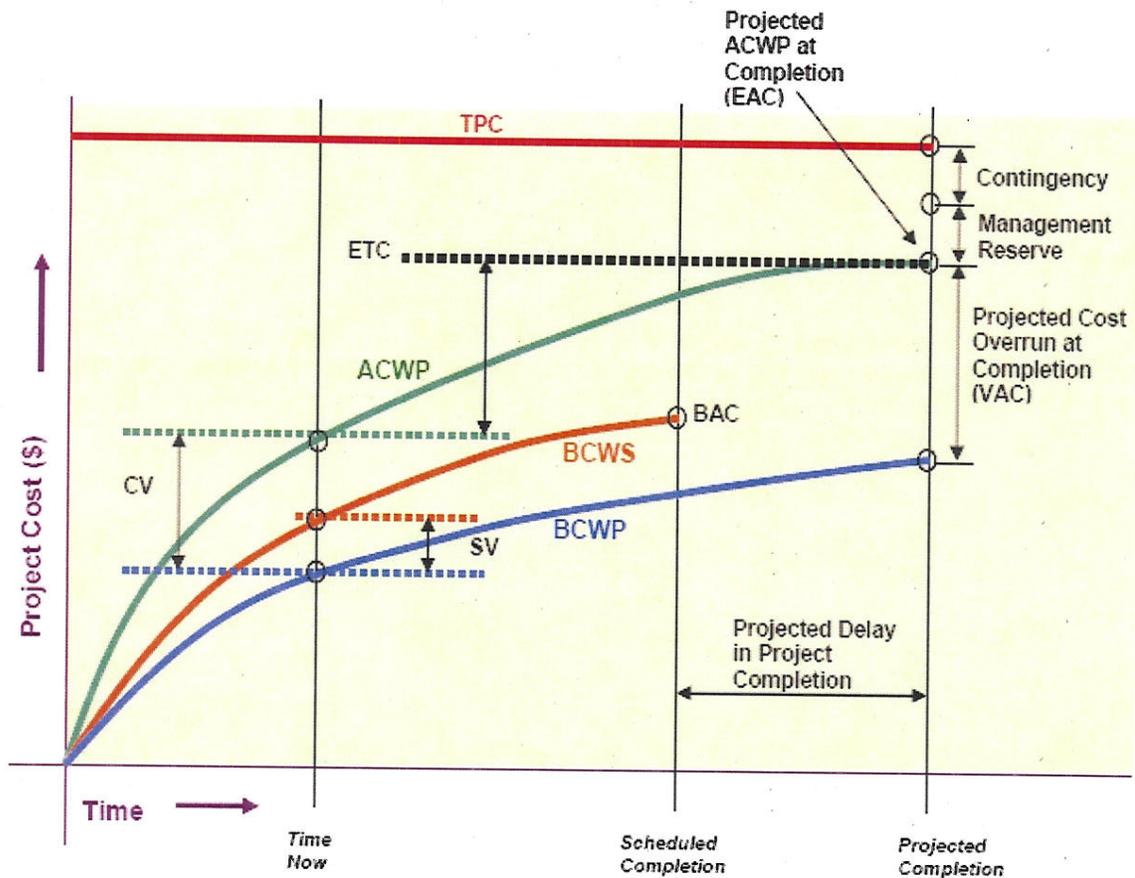
Variance analyses allow control account managers to identify and communicate cost, schedule, and EAC divergences from the performance measurement baseline. Root-cause analysis is performed at the control account level at a minimum. The control account structure is integral to the WBS and will accurately 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 both time-phased and “snapshot” in nature. 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 time-phased metrics to look for control account performance trends. “Snapshot” 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 2-1 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 2.1 Earned Value Data Elements

#### **5.2.4 Variance Thresholds**

Variance analysis is conducted if any cumulative SPI or CPI is outside the thresholds established in the Project Execution 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 EAC 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.

#### 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/contingency are documented and reported to DOE, 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 request 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 authorized contract. These replanning actions may be appropriate to compensate for cost, schedule, and technical problems that cause the original plan to become unrealistic, require reorganization of work or personnel to increase the efficiency of accomplishing the effort, 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 replanning effort of 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 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-A 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

Through 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 Fermilab Office of Quality and Best Practices on an annual basis for

the overall EVMS. On new projects, the Fermilab 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 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-A 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, under the oversight of the Office of Project Management Oversight.

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## Appendix A

### ANSI/EIA-748-A Guideline Crosswalk

ANSI/EIA-748-A Guidelines	FRA Earned Value Management System (EVMS) Implementation
<b>Organization</b>	
<b>Guideline 1:</b> 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 – <ul style="list-style-type: none"> <li>• Section 2.1 - Work Breakdown Structure</li> </ul> Procedures: 12.PM-001 <i>Project WBS, OBS, RAM</i>
<b>Guideline 2:</b> 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 – <ul style="list-style-type: none"> <li>• Section 2.3.1 – Organizational Breakdown Structure</li> <li>• Section 2.4 - Project Execution Plan</li> <li>• Section 2.5 - Responsibility Assignment Matrix</li> </ul> Procedures: 12.PM-001 <i>Project WBS, OBS, RAM</i>
<b>Guideline 3:</b> 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 – <ul style="list-style-type: none"> <li>• Section 2.1 - Work Breakdown Structure</li> <li>• Section 2.3.1 - Organizational Breakdown Structure</li> <li>• Section 2.5 – Responsibility Assignment Matrix</li> <li>• Section 3.1 - Baseline Development Process</li> <li>• Section 3.4 - Planning and Baseline Scheduling</li> <li>• Section 3.7 - Work Authorization</li> </ul> Procedures: 12.PM-001 <i>Project WBS, OBS, RAM</i>
<b>Guideline 4:</b> Identify the company organization or function responsible for controlling overhead (indirect costs).	EVMS Systems Description Document – <ul style="list-style-type: none"> <li>• Section 4.2 – Indirect Cost Planning and Control</li> </ul>
<b>Guideline 5:</b> 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 – <ul style="list-style-type: none"> <li>• Section 2.1 - Work Breakdown Structure</li> <li>• Section 2.3.1 - Organizational Breakdown Structure</li> <li>• Section 2.5 - Responsibility Assignment Matrix</li> <li>• Section 3.1 - Baseline Development Process</li> <li>• Section 3.4 - Planning and Baseline Scheduling</li> </ul> Procedures: 12.PM-001 <i>Project WBS, OBS, RAM</i> 12.PM-002 <i>Control Accounts, Work Packages, Planning Packages</i>
<b>Planning, Scheduling, and Budgeting</b>	
<b>Guideline 6:</b> 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 – <ul style="list-style-type: none"> <li>• Section 2.3.1 - Organizational Breakdown Structure</li> <li>• Section 3.2 - Risk Management</li> <li>• Section 3.3 - Technical Baseline</li> <li>• Section 3.4 - Planning and Baseline Scheduling</li> <li>• Section 3.7 - Work Authorization</li> </ul>

ANSI/EIA-748-A Guidelines	FRA Earned Value Management System (EVMS) Implementation
	Procedures: 12.PM-003 Work Authorization 12.PM-004 <i>Project Scheduling</i>
<b>Guideline 7:</b> Identify physical products, milestones, technical performance goals, or other indicators that will be used to measure progress.	EVMS Systems Description Document – <ul style="list-style-type: none"> <li>• Section 3.3 - Technical Baseline</li> <li>• Section 3.4 - Planning and Baseline Scheduling</li> <li>• Section 5.1 – Performance Measurement</li> </ul> Procedures: 12.PM-004 <i>Project Scheduling</i>
<b>Guideline 8:</b> 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 – <ul style="list-style-type: none"> <li>• Section 3.4 - Planning and Baseline Schedule</li> <li>• Section 3.5 - Cost Estimating and Baseline Budget</li> <li>• Section 3.7 - Work Authorization</li> </ul> Procedures: 12.PM-002 <i>Control Accounts, Work Packages, Planning Packages</i> 12.PM-005 <i>Cost Estimating</i>
<b>Guideline 9:</b> 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 – <ul style="list-style-type: none"> <li>• Section 2.3.1 - Organizational Breakdown Structure</li> <li>• Section 2.5 - Responsibility Assignment Matrix Section</li> <li>• Section 3.5 – Cost Estimating and Baseline Budget</li> <li>• Section 3.8 – Subcontractor and Collaborator Planning</li> </ul> Procedures: 12.PM-005 - <i>Cost Estimating</i>
<b>Guideline 10:</b> 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 – <ul style="list-style-type: none"> <li>• Section 2.3 - Organizational Responsibility</li> <li>• Section 3.4 - Planning and Baseline Scheduling</li> <li>• Section 3.5 - Cost Estimating and Baseline Budget</li> </ul> Procedures: 12.PM-002 - <i>Control Accounts, Work Packages, Planning Packages</i> 12.PM-004 - <i>Project Scheduling</i> 12.PM-005 – <i>Cost Estimating</i>
<b>Guideline 11:</b> 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 – <ul style="list-style-type: none"> <li>• Section 3.4 - Planning and Baseline Scheduling</li> <li>• Section 3.5 - Cost Estimating and Baseline Budget</li> </ul> Procedures: 12.PM-002 – <i>Control Accounts, Work Packages, Planning Packages</i> 12.PM-004 - <i>Project Scheduling</i> 12.PM-005 – <i>Cost Estimating</i>
<b>Guideline 12:</b> 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 – <ul style="list-style-type: none"> <li>• Section 3.4 - Planning and Baseline Scheduling</li> <li>• Section 3.5 - Cost Estimating and Baseline Budget</li> <li>• Section 5.1 – Performance Measurement</li> </ul>

ANSI/EIA-748-A Guidelines	FRA Earned Value Management System (EVMS) Implementation
	Procedures: 12.PM-004 - <i>Project Scheduling</i> 12.PM-005 – <i>Cost Estimating</i>
<b>Guideline 13:</b> 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 – <ul style="list-style-type: none"> <li>• Section 4.2 – Indirect Cost Planning and Control</li> <li>• Section 4.4 – Burdened Costs</li> </ul> Procedures: 12.PM-005 – <i>Cost Estimating</i>
<b>Guideline 14:</b> Identify management reserves and undistributed budget.	EVMS Systems Description Document – <ul style="list-style-type: none"> <li>• Section 3.5 - Cost Estimating and Baseline Budget</li> <li>• Section 3.6 – Management Reserve, Contingency, and Undistributed Budget</li> <li>• Section 5.3 - Performance Reporting</li> </ul> Procedures: 12.PM-005 – <i>Cost Estimating</i>
<b>Guideline 15:</b> Provide that the program target cost goal is reconciled with the sum of all internal program budgets and management reserves.	EVMS Systems Description Document – <ul style="list-style-type: none"> <li>• Section 3.4 - Planning and Baseline Scheduling</li> <li>• Section 3.5 - Cost Estimating and Baseline Budget</li> <li>• Section 3.6 – Management Reserve, Contingency, and Undistributed Budget</li> <li>• Section 5.3 - Performance Reporting</li> </ul> Procedures: 12.PM-005 – <i>Cost Estimating</i>
<b>Accounting Considerations</b>	
<b>Guideline 16:</b> 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 – <ul style="list-style-type: none"> <li>• Section 4.1 – Accounting Processes</li> </ul> Procedures: <a href="#">Budget to Close Process Cycle</a> <a href="#">Procure to Pay Process Cycle</a> <a href="#">HR to Payroll Process Cycle</a> <a href="#">Finance website: Policies &amp; Procedures (CAS)</a>
<b>Guideline 17:</b> 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 – <ul style="list-style-type: none"> <li>• Section 2.1 - Work Breakdown Structure</li> <li>• Section 2.3 - Organizational Responsibility</li> <li>• Section 4.1 – Accounting Processes</li> <li>• Section 5.3 - Performance Reporting</li> </ul> Procedures: 12.PM-002 – <i>Control Accounts, Work Packages, Planning Packages</i> 12.PM-006 – <i>Monthly Status Reporting</i>  <a href="#">Project/Task Structure</a> <a href="#">Accounting Summary Reports</a> <a href="#">Finance website: Policies &amp; Procedures (CAS)</a> <a href="#">Expenditure Type Glossary</a>

ANSI/EIA-748-A Guidelines	FRA Earned Value Management System (EVMS) Implementation
<p><b>Guideline 18:</b> 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.</p>	<p>EVMS Systems Description Document –</p> <ul style="list-style-type: none"> <li>• Section 2.1 - Work Breakdown Structure</li> <li>• Section 2.2 - Organizational Responsibility</li> <li>• Section 2.5 - Responsibility Assignment Matrix</li> <li>• Section 4.1 – Accounting Processes</li> <li>• Section 5.3 - Performance Reporting</li> </ul> <p>Procedures: 12.PM-006 – <i>Monthly Status Reporting</i>.</p> <p><a href="#">Project/Task Structure</a>  <a href="#">Accounting Summary Reports</a>  <a href="#">Finance website: Policies &amp; Procedures (CAS)</a>  <a href="#">Expenditure Type Glossary</a></p>
<p><b>Guideline 19:</b> Record all indirect costs, which will be allocated to the contract.</p>	<p>EVMS Systems Description Document –</p> <ul style="list-style-type: none"> <li>• Section 2.1 - Work Breakdown Structure</li> <li>• Section 4.1 – Accounting Processes</li> <li>• Section 4.2 - Indirect Cost Planning and Control</li> </ul> <p>Procedures: 12.PM-006 – <i>Monthly Status Reporting</i>  <a href="#">Finance website: Policies &amp; Procedures (CAS &amp; Indirect Methodology)</a></p>
<p><b>Guideline 20:</b> Identify unit costs, equivalent unit costs, or lot costs when needed.</p>	<p>EVMS Systems Description Document –</p> <ul style="list-style-type: none"> <li>• Section 4.1 – Accounting Processes</li> </ul>
<p><b>Guideline 21:</b> For EVMS, the material accounting system will provide for:</p> <ol style="list-style-type: none"> <li>(1) Accurate cost accumulation and assignment of costs to Control Accounts in a manner consistent with the budgets using recognized, acceptable, costing techniques.</li> <li>(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.</li> <li>(3) Full accountability of all material purchased for the program including the residual inventory.</li> </ol>	<p>EVMS Systems Description Document –</p> <ul style="list-style-type: none"> <li>• Section 3.5 - Cost Estimating and Baseline Budget</li> <li>• Section 4.3 - Material Accounting</li> <li>• Section 5.3 - Performance Reporting</li> <li>• Section 4.1 – Accounting Processes</li> </ul> <p>Procedures: 12.PM-006 – <i>Monthly Status Reporting</i></p> <p><a href="#">Budget to Close Process Cycle</a>  <a href="#">Procure to Pay Process Cycle</a>  <a href="#">Finance website: Policies &amp; Procedures (CAS)</a></p>
<p><b>Analysis and Management Reports</b></p>	
<p><b>Guideline 22:</b> 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:</p> <ol style="list-style-type: none"> <li>(1) Comparison of the amount of planned budget and the amount of budget earned for work accomplished. This comparison provides the schedule variance.</li> <li>(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.</li> </ol>	<p>EVMS Systems Description Document –</p> <ul style="list-style-type: none"> <li>• Section 5.1 - Performance Measurement</li> <li>• Section 5.2 - Performance Analysis</li> <li>• Section 5.3 - Performance Reporting</li> </ul> <p>Procedures: 12.PM-006 – <i>Monthly Status Reporting</i></p>

ANSI/EIA-748-A Guidelines	FRA Earned Value Management System (EVMS) Implementation
<p><b>Guideline 23:</b> Identify, at least monthly, the significant differences between both <u>planned</u> and <u>actual</u> schedule performance and <u>planned</u> and <u>actual</u> cost performance, and provide the reasons for the variances in the detail needed by program management.</p>	<p>EVMS Systems Description Document –</p> <ul style="list-style-type: none"> <li>• Section 5.1 - Performance Measurement</li> <li>• Section 5.2 - Performance Analysis</li> <li>• Section 5.3 - Performance Reporting</li> </ul> <p>Procedures: 12.PM-006 – <i>Monthly Status Reporting</i></p>
<p><b>Guideline 24:</b> 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.</p>	<p>EVMS Systems Description Document –</p> <ul style="list-style-type: none"> <li>• Section 3.5 - Cost Estimating and Baseline Budget</li> <li>• Section 4.2 - Indirect Cost Planning and Control</li> <li>• Section 5.1 - Performance Measurement</li> <li>• Section 5.2 - Performance Analysis</li> <li>• Section 5.3 - Performance Reporting</li> </ul> <p>Procedures: 12.PM-006 – <i>Monthly Status Reporting</i></p>
<p><b>Guideline 25:</b> 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.</p>	<p>EVMS Systems Description Document –</p> <ul style="list-style-type: none"> <li>• Section 5.2 - Performance Analysis</li> <li>• Section 5.3 - Performance Reporting</li> </ul> <p>Procedures: 12.PM-006 – <i>Monthly Status Reporting</i></p>
<p><b>Guideline 26:</b> Implement managerial actions taken as the result of earned value information.</p>	<p>EVMS Systems Description Document –</p> <ul style="list-style-type: none"> <li>• Section 5.3 - Performance Reporting</li> </ul> <p>Procedures: 12.PM-006 – <i>Monthly Status and Reporting</i></p>
<p><b>Guideline 27:</b> 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.</p>	<p>EVMS Systems Description Document –</p> <ul style="list-style-type: none"> <li>• Section 5.2 - Performance Analysis</li> <li>• Section 5.3 - Performance Reporting</li> </ul> <p>Procedures: 12.PM-006 – <i>Monthly Status Reporting</i></p>
<b>Revisions and Data Maintenance</b>	
<p><b>Guideline 28:</b> 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.</p>	<p>EVMS Systems Description Document –</p> <ul style="list-style-type: none"> <li>• Section 3.6 – Management Reserve, Contingency, and Undistributed Budget</li> <li>• Section 6.1 - Change Control Process</li> </ul> <p>Procedures: 12.PM-006 – <i>Monthly Status Reporting</i> 12.PM-007 - <i>Change Control</i></p>
<p><b>Guideline 29:</b> 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.</p>	<p>EVMS Systems Description Document –</p> <ul style="list-style-type: none"> <li>• Section 3.6 – Management Reserve, Contingency, and Undistributed Budget</li> <li>• Section 3.7 - Work Authorization</li> </ul>

ANSI/EIA-748-A Guidelines	FRA Earned Value Management System (EVMS) Implementation
	<ul style="list-style-type: none"> <li>• Section 5.3 - Performance Reporting</li> <li>• Section 6.1 - Change Control Process</li> </ul> <p>Procedures:                      12.PM-006 – <i>Monthly Status Reporting</i>                      12.PM-007 - <i>Change Control</i></p>
<p><b>Guideline 30:</b> 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.</p>	<p>EVMS Systems Description Document –</p> <ul style="list-style-type: none"> <li>• Section 3.6 – Management Reserve, Contingency, and Undistributed Budget</li> <li>• Section 5.3 - Performance Reporting</li> <li>• Section 6.1 - Change Control Process</li> </ul> <p>Procedures:                      12.PM-006 – <i>Monthly Status Reporting</i>                      12.PM-007 - <i>Change Control</i></p>
<p><b>Guideline 31:</b> Prevent revisions to the program budget except for authorized changes.</p>	<p>EVMS Systems Description Document –</p> <ul style="list-style-type: none"> <li>• Section 6.1 - Change Control Process</li> </ul> <p>Procedures:                      12.PM-007 - <i>Change Control</i></p>
<p><b>Guideline 32:</b> Document changes to the performance measurement baseline.</p>	<p>EVMS Systems Description Document –</p> <ul style="list-style-type: none"> <li>• Section 6.1 - Change Control Process</li> </ul> <p>Procedures:                      12.PM-007 - <i>Change Control</i></p>

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## APPENDIX B

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### Abbreviations, Acronyms, and Glossary of Terms

<b>ACWP</b>	— Actual Cost of Work Performed
<b>AE</b>	— Acquisition Executive
<b>A/E</b>	— Architect/Engineer
<b>ANSI</b>	— American National Standards Institute
<b>BAC</b>	— Budget at Completion
<b>BCWP</b>	— Budgeted Cost of Work Performed
<b>BCWS</b>	— Budgeted Cost of Work Scheduled
<b>CA</b>	— Control Account
<b>CAM</b>	— Control Account Manager
<b>CASB</b>	— Cost Accounting Standards Board Disclosure Statement
<b>CBB</b>	— Contract Budget Baseline
<b>CD</b>	— Critical Decision
<b>CDR</b>	— Conceptual Design Report
<b>CFO</b>	— Chief Financial Officer
<b>CO</b>	— Contracting Officer
<b>CV</b>	— Cost Variance
<b>D&amp;D</b>	— Demolition and Decommissioning
<b>DOE</b>	— U.S. Department of Energy
<b>EAC</b>	— Estimate at Completion
<b>EIA</b>	— Electronic Industries Alliance
<b>ES&amp;H</b>	— Environment, Safety and Health
<b>ETC</b>	— Estimate to Complete
<b>EVMS</b>	— Earned Value Management System
<b>FFP</b>	— Firm Fixed Price
<b>FRA</b>	— 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.

**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/contingency is 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 amount of the total budget used by the customer and the project for management control purposes. The release of contingency funds is determined by approval thresholds defined in the PEP. Contingency 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 ( $CV = BCWP - ACWP$ .) 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** - An amount of the total project budget held for management control purposes by the project manager. This fund is created with agreement of the customer and project manager by periodic transfer of contingency to the management reserve fund. All

management reserve transactions are traced through change control. Management reserve 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.

**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.