

*Fermi National Accelerator Laboratory (Fermilab)*

*A Department of Energy National Laboratory*



**Earned Value Management  
System Description**

## Change History Log

<b>Rev Number</b>	<b>Revision Date</b>	<b>Sections Affected</b>	<b>Description of Change</b>
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## Introduction

Fermi National Accelerator Laboratory (Fermilab) is a Department of Energy National Laboratory operated under a contract with DOE by Universities Research Association, Inc. 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 Earned Value Management Systems (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 O 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 (EVMS) 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.

These principles are integrated 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.

The Fermilab EVMS is designed 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.

This document is organized into six (6) sections and two (2) appendices. The details of the EVMS, as it relates to the 32 ANSI/EIA-748-A guidelines, are discussed in these core chapters.

The Appendices include:

- A – ANSI/EIA-748-A Guideline Crosswalk
- B – Abbreviations, Acronyms, and Glossary of Terms

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## Section 1

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# Project Organization and Preliminary Planning

### 1.1 PROJECT STRUCTURE

#### 1.1.1 Objective

Each of Fermilab's major projects must develop a Project Execution Plan (PEP). The PEP summarizes the mission need and justification of the project, its objective and scope, the Department of Energy (DOE) management structure, the resource plan, and the environmental, safety, and health (ES&H) requirements. Additionally, it establishes the technical, cost, and schedule baselines. DOE Baseline Change Control thresholds are also established in this document.

#### 1.1.2 Project Execution Plan

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

The PEP describes the responsibilities of the Fermilab and DOE organizations involved in the project, defines roles and restates the mission need, provides a general overview of the project, and outlines cost and schedule data. For the purposes of this document, the project management team (Project Director/Manager, Deputy Director/Manager, etc.) will be referred to as "project management". Each project's specific structure, roles, and responsibilities are defined in the PEP for that project. 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.

The Federal Project Director develops the PEP, with input from project management. After obtaining concurrence from the Fermilab Site Office (FSO), the PEP is formally approved by DOE headquarters. The Project Execution Plan is under configuration control.

#### 1.1.3 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, schedule development,

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.

#### **1.1.4 WBS Dictionary**

Each project develops a WBS dictionary. The WBS dictionary is a set of specific definitions that describe the scope of each work element identified in the WBS. It defines each element to at least the control account level in terms of the content of the work to be performed.

#### **1.1.5 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 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.

#### **1.1.6 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 then created at these key control points and they facilitate the linkage between the planning, scheduling, budgeting, work authorization, cost accumulation, and performance measurement processes. The control accounts are determined by the scope of the management tasks. A single control account manager (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. Using the RAM and OBS, the project is able to identify the person/organization responsible and accountable for every element of the WBS and Statement of Work (SOW).

## **1.2 PROJECT SCHEDULE**

### **1.2.1 Objective**

The project schedule is used to plan and control the interdependencies of all the activities and resources needed to execute the project. The project employs a scheduling tool that maintains the baseline schedule, supporting control milestones in the baseline, and the current schedule used to accumulate and report current schedule status.

### **1.2.2 Schedule Development**

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 the various disciplines participate in these 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.

#### **BASELINE**

The baseline schedule 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 in the context of other projects at Fermilab.

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 DOE, Fermilab management, and project management. The baseline schedule is maintained under configuration management and may not be revised without proper authorization as detailed in the Baseline Change Control Thresholds table documented in the PEP and change control processes described in the project's configuration management plan.

#### **CURRENT**

The current 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. This network approach provides the ability to relate the project's time-phased activities in their logical sequence using predecessor-successor relationships and timing. The current schedule also enables the determination of the critical path and an evaluation of the effects of the current schedule performance status on activities and milestones scheduled to be accomplished in the future. The current schedule includes detailed input from all CAMs and provides the ability to relate activities and milestones between different levels of schedules. The current schedule includes all project milestones identified in the baseline schedule.

The current schedule employs the approved baseline schedule to relate progress. The current 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. It is used by the project management team for analysis, including issue identification and resolution.

## **SUPPLEMENTAL**

The project team may employ supplemental schedules that are not part of the baseline schedule hierarchy. They are often used for day-to-day operational planning and management, and as the name suggests, supplement the baseline and current schedules, but are not under configuration control.

### **1.3 PLANNING AND BUDGETING**

#### **1.3.1 Objective**

Planning and budgeting establish the time-phased budget used to measure project performance.

#### **1.3.2 Performance Measurement Baseline**

The performance measurement baseline (PMB) is the time-phased budget plan used to measure project performance. In earned value management, the assignment or allocation of budgets to scheduled segments of work produces a plan against which actual performance is compared.

The performance measurement baseline is finalized with Critical Decision-2 (CD2), Approve Performance Baseline. Figure 1-1 presents the DOE acquisition management development cycle. The relationship of individual work tasks to the time-phased resources necessary to accomplish them is established at the control account level. All control accounts and related work packages should be planned to the end of the project. Fermilab does not use the planning package approach for developing the PMB.

The performance measurement baseline is the summation of the time-phased budgets for all of the control accounts, plus applicable indirect budgets. The performance measurement baseline is a representation of current program plans. Proper maintenance of the baseline will prevent performance measurement against an outdated or unauthorized plan.

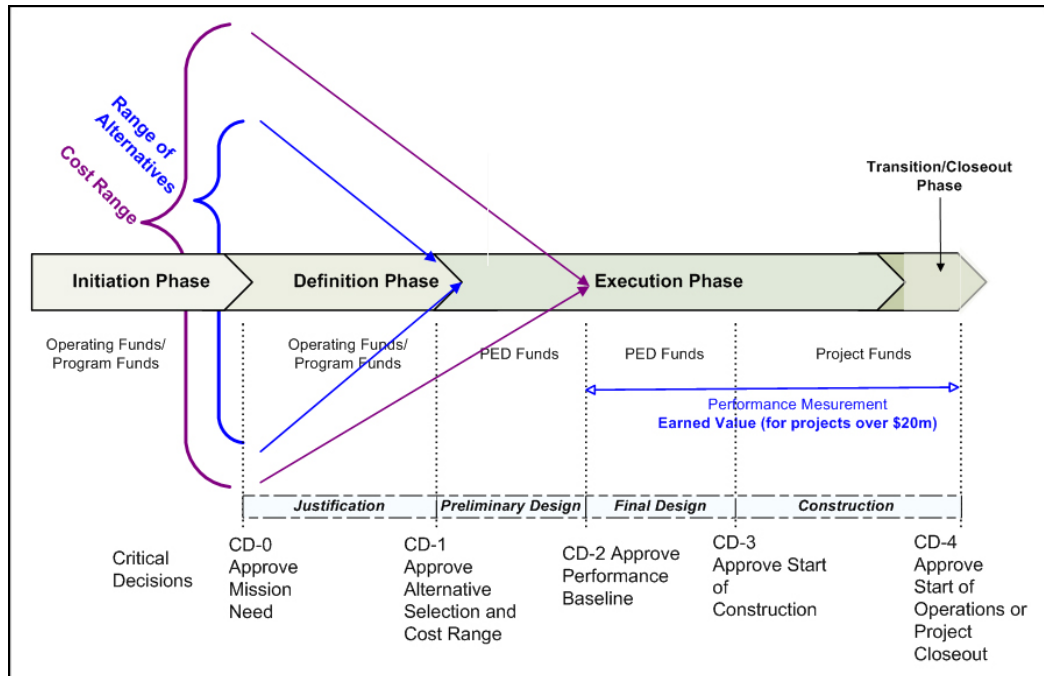


Figure 1-1. DOE Acquisition Management System

### 1.3.3 Control Accounts

A control account is a management control point at which budgets (resource plans) and actual costs are accumulated and compared to earned value for management control purposes. 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.

Within Fermilab’s financial accounting system (Oracle Project Accounting - PA), cost collection is performed at the control account level. Control accounts roll up into summary level accounts, which in turn roll up to an overall project summary account. No charges are directly charged or recorded at any summary level account. Control accounts are called tasks in PA and the task number is generally the WBS number of the control account activity in the schedule. Individual or related groups of work packages may feed into a control account. While multiple control accounts tasks may roll up into a summary control account task, a single work package task is never divided among multiple control accounts. In all cases, the control account has a unique task number.

### 1.3.4 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.

Control account budgets are a summation of the budgets for all of the work packages assigned to the control account. Each work package's 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 Planned Value (PV) or 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 PV 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 an individual work package. Control account budgets in the EVMS are governed by the following guidelines:

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

### **1.3.5 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. A work package has the following characteristics:

- Represents units of work at levels where work is performed.
- Clearly distinguishable from all other work packages by a descriptive title & a unique activity ID.
- Assignable to a single organizational element responsible for ensuring the work is completed.
- Has scheduled start and completion dates and, as applicable, interim milestones – all of which represent physical accomplishment.
- Has a budget or an assigned value expressed in terms of dollars. Indirect costs are allocated based on the appropriate base per the applicable financial practices disclosures.

- Uses a single PMT.
- Has a limited duration within a reasonably short time span.
- Reflects the way in which work is planned and has meaningful products, or is a management-oriented subdivision of a higher-level element of work.
- Uses objective indicators/milestones as much as possible to minimize in-process work evaluation and to provide an accurate assessment of progress.
- Contains time-phased budgets that are used for planning, reporting, and control. When learning curves are used, time-phased budgets and schedules reflect this learning.
- Level of effort should only be used on a work package where no definable deliverable or work products exist as a consequence of the work package.

### **1.3.6 Planning Packages**

Fermilab does not use the planning package approach for defining projects. All work is planned in detail through to the end of the project prior to setting the PMB. As time progresses and better methods for accomplishing the scope of work are identified, CAMs may update the work package details (activities, resources assigned, and/or durations) in the schedule using the project's formal change control process.

### **1.3.7 Acquisition Planning**

Fermilab 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. 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.

### **1.3.8 Management Reserve/Contingency and Undistributed Budget**

The management reserve/contingency is an amount of the approved Project Budget Base that project management sets aside at the start of the project. The management reserve/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 management reserve/contingency is not assigned to specific segments of work.

Each Fermilab project's change control procedures provide the process for control of management reserve/contingency. Project management establishes the management reserve/contingency based on a risk analysis of the project work scope. The factors affecting the amount of management reserve/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. As the level of risk is reassessed on the project, the budget for management reserve/contingency can change.

Management reserve/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 management reserve/contingency whenever the work scope, and therefore the allocated budget, is decreased. Management reserve/contingency transactions are documented in the project baseline change control log. These transactions are identified in the EVMS reports to DOE. At the present time, Fermilab projects do not employ undistributed budget as described in the NDIA Intent Guide.

## **1.4 WORK AUTHORIZATION**

### **1.4.1 Objective**

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

### **1.4.2 Contractual Authorization**

A work authorization cannot be officially initiated until the formal work authorization and funding is received from DOE. Project management will request and the Fermilab Budget Office will authorize the allocation of a project number and associated tasks in the Fermilab Oracle Project Accounting system. The opening of the project and tasks officially initiates the project and allows project setup to begin.

### **1.4.3 Work Authorization Document**

With the completion of the control account planning process for each control account, the total authorized work is released to the responsible organizations based on the approved control accounts. Project management delegates work down to the CAMs within the authority provided in the work authorization statement. 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. The approved control account can only be changed through the project's formal change control process.

The approved control account is project management's vehicle to delegate responsibility for budget, schedule, and scope requirements to the CAM. 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.

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## Section 2

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# Earned Value Analysis and Progress Reporting

### 2.1 EARNED VALUE

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.

#### 2.1.1 Requirements for Employing Earned Value Methodology

Work packages are established during planning and opened when the Planned Value (PV), or 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) will 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.

#### 2.1.2 Performance Measurement Techniques (PMT)

*(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.

The performance of separate and distinct work effort that is related to the completion of specific and tangible end products or services, and which 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*, and support-type activity that does not produce definitive end products is referred to as *level of effort*.

The Control Account Managers specify the performance measurement technique for each of the work packages they manage.

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.
- **100-0** — All of the value is earned as soon as the work package is started. 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 (E). 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.
- **Apportioned** — The work package budget is earned in direct proportion to the amount earned on another related work package. This method can be applied to any work package if the referenced work package does not itself use the apportioned or the level of effort PMT, and if the scheduled dates are the same for both work packages. This PMT is generally used when the activity itself is difficult to measure, but it is closely related to a more readily measured work package. Quality assurance is a typical example of this type of work package.
- **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.

### 2.1.2.1 Discrete Effort

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

### 2.1.2.2 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.

## 2.2 STATUS AND EARNED VALUE CALCULATION

### 2.2.1 Objective

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.

### 2.2.2 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:

- Planned Value (PV) or 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.
- Earned Value (EV) is a measurement of the work completed. As work is actually completed, budget associated with this work is "earned" as Budgeted Cost of Work Performed (BCWP). BCWP is synonymous with "Earned Value."
- Schedule Variance (SV) 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.
- 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, have consulted 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.

- Cost Variance (CV) 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.
- 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.
- Estimate to Complete (ETC) is the latest revised estimate for the remaining work scope.
- Estimate at Completion (EAC) is project management's latest revised cost estimate for a given work scope and is calculated by adding the cumulative ACWP to ETC.
- Variance at Completion (VAC) is calculated by subtracting EAC from BAC ( $BAC - EAC = VAC$ ). The 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.

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

### 2.2.3 Evaluation of Planned Value

The time-phased budget Planned Value (PV) 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 PV 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 EV is achieved in the same manner as the PV 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.

### 2.2.4 Current Schedule Progress Evaluation

The baseline schedule maintains 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.

## 2.3 PERFORMANCE ANALYSIS

### 2.3.1 Objective

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 Fermilab projects: specifically variance analysis, corrective action, and updating Estimates at Completion (EAC).

### 2.3.2 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.

### 2.3.3 Variance Thresholds

Variance analysis is conducted if any cumulative SPI or CPI is less than 0.9 or greater than 1.10 at the project level. Project management may establish lower thresholds to respond to the project's needs.

### 2.3.4 Performance Indices

The control account manager(s) 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** (solid) line is the PV

(BCWS), the planned work as defined in the current Earned Value Management Baseline. The **top** (dotted) line, the AC (ACWP), shows a higher than estimated project cost. The **bottom** (dashed) line, the EV (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.

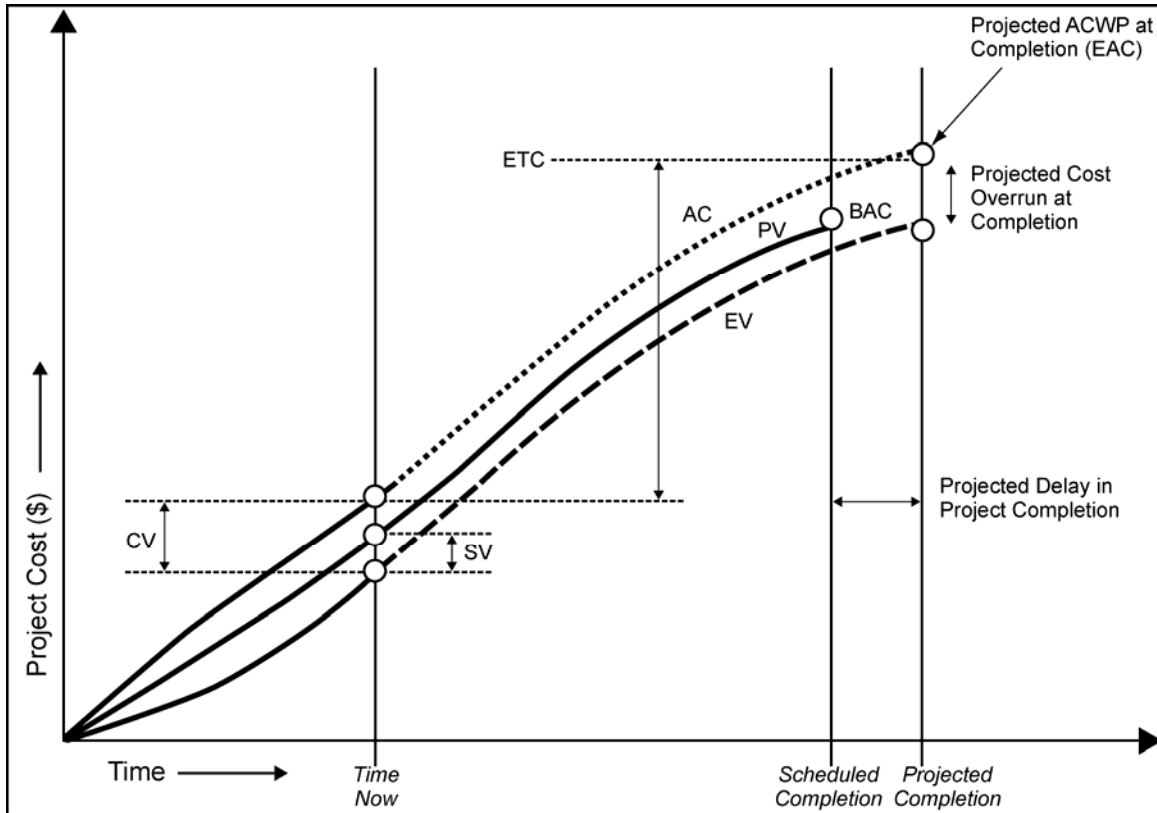


Figure 2-1. Earned Value Data Elements

### 2.3.5 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.

### 2.3.6 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.

### **2.3.7 Monthly Project Status Calculations and Forecasts**

On a monthly basis, project management updates the EAC at level two of the WBS to account for all changes from the baseline that have been identified. The EAC update reflects a current analysis of project risks. The EAC is calculated by using a standard cost and schedule performance formula ( $PF=1/(a*CPI+b*SPI)$ ), where “a” and “b” are weighted factors describing an assessment of cost and schedule risk) and adding the proposed Change Requests.

## **2.4 REPORTING**

### **2.4.1 Objective**

The objective of the reporting process is to provide accurate and timely reports needed by Fermilab, the project, and DOE 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.

### **2.4.2 General Reporting**

Project management will provide regular reports to DOE and Fermilab management on project status. The level of reporting will be defined in the Project Execution Plan (PEP). Once the project has obtained Critical Decision-2 approval, the reporting cycle will be at least monthly. Reports will be sent to the appropriate management levels as defined in the PEP.

Project management regularly reviews the project status and develops corrective actions as required. Management review may include any or all of the following:

- Project cost/schedule performance rolled-up to a level appropriate to the overall risks of the project.
- Variance analysis and suggested corrective actions.
- Critical path activity performance.
- Project personnel and staffing.
- Project baseline change performance.
- Management reserve/contingency (used and remaining).
- Risk strategies.

Project management addresses variances that are outside of the threshold ranges and implements appropriate corrective actions. 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.

### 2.4.3 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 monthly reporting cycle is based on the accounting month. The Fermilab accounting calendar ends on the last day of each calendar month and is used as the basis for the reporting cycle on the project. <This will be changing @ start of FY2007 based on info from CAO at the FFM meetings.>

Project management generates earned value monthly reports after Critical Decision-2 is achieved. The purpose of the monthly report is to provide project management, Fermilab 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)

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## Section 3

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# Accounting

### 3.1 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.

#### 3.1.1 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.

#### 3.1.2 Cost Accounting Policy

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) 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 and regulations.

#### 3.1.3 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 Accounting to open a control account to enable costs to be recorded in the financial accounting system. 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 account numbers that are assigned at the job or task level as appropriate for the specific control account. 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.

#### **3.1.4 Cost Accumulation**

Actual costs are accumulated and processed by Fermilab's Oracle Project Accounting system. The direct costs are identified by control account cost elements, 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.

#### **3.1.5 Direct Labor Cost**

Direct labor charges are recorded by each direct labor employee in a uniform manner via an institutional time and effort reporting system on a monthly basis. The hours or percent effort are recorded, direct labor dollars are charged to the project control accounts, and are available monthly from the financial system.

#### **3.1.6 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. Once the receiving department has recorded receipt in the procurement system, or after the control account manager acknowledges physical receipt of materials by signing the invoice or sending electronic approval, invoices are approved for payment and 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 items or services 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.

#### **3.1.7 Subcontract Cost**

Subcontract costs are entered into Fermilab's project accounting system via the accounts payable system after invoices have been approved by the control account manager or his/her designee. 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 in the next month's data when the new cost is added. The same procedures referred to in the Material Cost and Accounting section are used to record monthly accruals for uninvoiced subcontract costs.

### **3.1.8 Other Direct Cost**

Other direct costs (ODC) are costs other than direct labor and material. Principal items included in this category are travel and other services.

### **3.1.9 Indirect Cost Accumulation**

Indirect costs are allocated monthly to project control accounts. Indirect costs are applied to each project at the current approved annual rates. The CASB disclosure statement explains in detail the process concerning the collection and reporting of indirect costs. See Section 3.2.1 for more information regarding the CASB statement.

### **3.1.10 Accounting Adjustments**

Retroactive adjustments to previously reported actual costs are prohibited. Adjustments are reported monthly, consistent with GAAP.

## **3.2 INDIRECT COST PLANNING AND CONTROL**

### **3.2.1 Objective**

Fermilab maintains a cost accounting system that allocates indirect costs to final cost objectives (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 “Cost Accounting Standards Board Disclosure Statement” (CASB) identifies all indirect cost pools with a discrete and specific set of cost objectives or beneficiaries.

### **3.2.2 Indirect Cost Pools**

As described in 3.2.1 above, the CASB disclosure 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 the laboratory are payroll burdens, program support burden, materials and services burden, common site support, and the general and administrative cost (G&A). The current CASB may be obtained from the CFO.

### **3.2.3 Allocation of Indirect Costs to Projects**

Indirect cost pools are allocated based on causal-beneficial relationships to the final cost objectives (i.e., project and task). Indirect costs are distributed 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 3.2.1 and 3.2.2, the composition of each indirect cost pool and the beneficiaries associated with each indirect cost pool are fully disclosed within the CASB disclosure statement.

### **3.2.4 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 in prior years. 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 Federal Cost Accounting Standards (CAS) and are fully disclosed by the CFO.

### **3.3 MATERIAL ACCOUNTING**

EVMS Guideline 20 applies to manufacturing processes. Fermilab 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. EVMS 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.

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## Section 4

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# Subcontract Management

When substantial effort associated with large and complex projects is obtained through subcontracts, the subcontracts must be written in such a way that information required for earned value management may be readily obtained from the subcontractor. The scope, complexity (risk), criticality, and cost of the subcontracted work may warrant including an earned value flow-down provision in the subcontract. Project management, working with Fermilab Procurement, will determine on a case by case basis whether an earned value flow-down provision should be included in each sub-contract.

### 4.1 SUBCONTRACTS WITH EV FLOW-DOWN

The earned value flow-down subcontracts are generally high dollar value and high-risk subcontracts. These subcontracts require careful planning prior to solicitation and award. The solicitation (RFP) or Memorandum of Understanding (MOU) must include the proper language. The contract must include the appropriate contract clauses, including full description of the reporting requirements. The reporting requirements should include monthly earned value and performance reporting from the subcontractor to the project. Requirements for reporting should be described in the Request for Proposal (RFP) and formalized in the contract.

### 4.2 SUBCONTRACTS WITHOUT EV FLOW-DOWN

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

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

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

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## Section 5

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# Change Control

Change control ensures that all project changes are identified, evaluated, coordinated, controlled, reviewed, approved, and documented in a manner that best serves the project. Fermilab's major projects must prepare a Configuration Management document that supplements the change control threshold information in the PEP and defines the project's change control procedures in detail.

### 5.1 CHANGE-CONTROL PROCESS

#### 5.1.1 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. Fermilab major projects implement DOE requirements in project procedures for change control.

#### 5.1.2 Change Documentation

The project budget base and the performance measurement baseline are two important budget entities for which full control and accountability must be maintained. 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 changes 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. Changes that impact the performance measurement baseline are formally controlled, and are documented through the formal configuration management process.

### 5.1.3 Change Request

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.

### 5.1.4 External and Directed Changes

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

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

Typically, 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.

### 5.1.5 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:

- Have caused the original plan to become unrealistic.
- Require a reorganization of work or personnel in order to increase the efficiency for accomplishing the effort.
- Require different engineering or construction approaches.

Internal replanning is intended for in-scope changes that relate to future budgets. All budget changes to the baseline are documented in a baseline change proposal 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.

#### 5.1.5.1 Internal Replanning Restrictions

The following restrictions apply to any type of internal replanning:

- Retroactive changes to the previously reported PV, EV, and AC are prohibited, except for the correction of errors.
- Only the future portion of open work packages may be changed.
- Minor modifications to work packages are discouraged and, in most cases, should not be implemented.

- The time phasing of the PV may be changed in open work packages, as long as the following two conditions apply: (1) the changes only affect future budgets/efforts; and (2) the work packages continue to support key milestones in the schedules after the changes are implemented.
- A budget transfer from one control account to another is prohibited unless the accompanying work is also transferred. This transfer is accomplished by returning the budget to the management reserve/contingency, and then releasing the management reserve/contingency to the control account where the work will be performed.
- An internal change must be approved before a budget revision can be formally incorporated into the performance measurement baseline and its associated work executed.
- Internal changes and plans are reviewed to ensure that replanning does not result in the application of budget intended for future work to a near-term effort.

#### **5.1.5.2 Changes within Control Accounts**

Replanning within the established control-account scope, schedule, and BAC parameters are considered “internal to the control account” in that they do not affect the control account scope or BAC, nor do they violate the control milestones. Review and approval of the revised plan by project management or designee, and the control account manager, are required to ensure that the planning procedures are followed, and that resources are available to support the revised plan. An internal change process is used to document the rationale and approval for all internal changes. The typical change in this class is change to the work approach within the control-account scope and BAC.

#### **5.1.5.3 Other Internal Replanning**

Due to unplanned cost, schedule, and/or technical problems (realized risks), the existing plan might become unrealistic, and revisions could be necessary. These plan revisions would result in reorganizing future work or changing the methods and approaches from those originally planned. These revisions could be identified as a result of the normal variance analysis process or while developing a comprehensive EAC. Internal replanning may cover a single control account or multiple control accounts. All changes are governed by the thresholds established in the Project Execution Plan. Impact and justification for all budget changes are documented in the change request, and all internal changes used to authorize internal replanning are recorded in the change log. Typical internal changes are:

- Scope and budget transfers between control accounts (e.g., make vs. buy).
- Changes to the work approach that change the control account scope or the BAC.
- Management reserve/contingency transfers.
- Future rate changes significant enough to warrant replanning.
- Funding revisions that affect resource availability.
- Adjusting subcontract budget values to reflect negotiated values.
- Adjusting material budgets to reflect modifications to material lists after design phases.

#### **5.1.5.4 Changes to Actual Direct and Indirect Costs**

Changes to actual costs incurred, whether direct or indirect, are considered retroactive changes and are not permitted. Accounting adjustments must be made in the current month, in accordance with financial accounting procedures.

#### **5.1.5.5 Changes to Budgeted Direct and Indirect Rates**

An indirect-rate analysis is prepared at least annually in conjunction with the release of the revised indirect rates by the CFO. The project must determine whether rate changes are significant enough to warrant internal control-account changes.

#### **5.1.5.6 Changes in Scope or Nature of Work**

Additions to or deletions from the scope or nature of work performed by a control account is an allowable reason for making changes to the budget in that specific control account. For example, internal or DOE-directed design reviews might yield results that make it necessary to revise the technical, schedule, or organizational plans. Whether such changes result from an internal decision or from a decision directed by the DOE, changes to control account budgets are controlled in the same manner. Open work packages are examined by each control account manager to determine the impact. Those open work packages that are directly affected can be replanned using one of the two following methods:

- Close the open work package by setting the cumulative BCWS equal to the cumulative BCWP, and make this value the BAC for the closed work package (the ACWP always remains unchanged). The remaining budget from the former work package (i.e., old BAC – cumulative BCWP) plus unopened work packages become the BAC value for the new replanning effort.
- Leave the affected work package open, and replan the future budget and scope if the PMT that is used can accommodate this type of replanning.

#### **5.1.5.7 Changes in Make-or-Buy Determination**

When warranted, the make-or-buy (self-performed vs. subcontracted) decision made during the proposal phase and implemented at the contract award phase might need to be revised. When this happens, affected control account managers must replan when the resulting dollar amounts are significant. If the revised make-or-buy decision results in a budget that differs from the original budget, the delta budget is taken from (or added to) the management reserve/contingency, and the budget log reflects the change.

#### **5.1.5.8 Changes in Funding Profiles**

If significant changes in contract funding occur, the existing schedules may need to be revised. Under this circumstance, project management and the DOE must come to agreement regarding the scope, schedule, and budget revisions to the remaining contractual effort; the normal change control process is followed.

## **5.2 SCHEDULING CHANGES**

After the baseline schedule is established, changes are made in accordance with the project's Configuration Management procedures. Historical change records provide an audit trail for all revisions to the baseline schedules. Project management maintains a baseline change control log. The log identifies and records each baseline schedule revision, the date and purpose of its incorporation, and the authority for the revision action. Electronic file copies of the baseline schedules, along with all updated schedules, are kept in addition to the log.

## Section 6

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# Surveillance and Maintenance

### **6.1 SURVEILLANCE AND MAINTENANCE PROCESSES**

System surveillance and maintenance are the processes of reviewing the health of Fermilab'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 Fermilab EVMS description. Surveillance is monitoring and assessing, and maintenance is the effective administration of improvements and corrective actions identified through surveillance.

#### **6.1.1 Objectives**

Through effective surveillance and maintenance, Fermilab anticipates two types of changes: (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.

#### **6.1.2 System Surveillance**

The objective of system surveillance is to provide a process for assessing the implementation of the Fermilab EVMS 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.

#### **6.1.3 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 Fermilab and DOE requirements,
- Ensure that system documentation impacted by system changes is kept current.

## **6.2 SELF ASSESSMENT FOR SYSTEM SURVEILLANCE AND MAINTENANCE**

Self assessment is executed through a continuous quality control monitoring process and through periodic surveillance by knowledgeable and independent individuals. Continuous self assessment is performed by each project's management and project controls personnel, who are trained in the correct use of the Fermilab EVMS, and are held accountable for proper implementation. Issues identified by project personnel will be brought to the attention of Fermilab's Office of Project Management Oversight (OPMO). Issue resolution will be coordinated by the OPMO if the issue involves changes to the EVMS or supporting Fermilab procedures. The self assessment and surveillance process will include the following:

- Project baselines will be reviewed during Critical Decision-2 reviews.
- The EVMS system will be periodically, but not less than annually, reviewed against the ANSI/EIA-748-A Guidelines.
- Recommendations to improve the Earned Value Management System will be evaluated and implemented as appropriate.

## Appendix A

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

ANSI/EIA-748-A Guidelines	EVMS Implementation	Major Guideline Category	Fermilab Reference
<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.	1.1.1, 1.1.3, 1.1.4	Organization	Fermilab EVMS Description Rev 0 Project-specific Project Execution Plan (PEP)
<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.	1.1.1, 1.1.5, 1.3.5	Organization	Fermilab EVMS Description Rev 0 Project-specific Project Management Plan (PMP)
<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.	1.1.2, 1.1.6, 1.3.3, 1.3.4, 1.3.5, 1.4	Organization	Fermilab EVMS Description Rev 0 Project-specific PMP
<b>Guideline 4:</b> Identify the company organization or function responsible for controlling overhead (indirect costs).	3.2	Organization	CASB DS Part IV, Indirect Costs CASB DS Part 4.4, Treatment of Variances from Actual Cost
<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.	1.1.6, 1.3.3, 1.3.4, 1.3.5, 1.3.6	Organization	Fermilab EVMS Description Rev 0 Project-specific PMP
<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.	1.2.1, 1.2.2	Planning & Budgeting	Fermilab EVMS Description Rev 0 Project-specific PMP
<b>Guideline 7:</b> Identify physical products, milestones, technical performance goals, or other indicators that will be used to measure progress.	1.2.1, 1.2.2, 2.1.1, 2.1.2, 2.2,3	Planning & Budgeting	Fermilab EVMS Description Rev 0 Project-specific PMP

ANSI/EIA-748-A Guidelines	EVMS Implementation	Major Guideline Category	Fermilab Reference
<p><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 un-defined work. On government contracts, if an over target baseline is used for performance measurement reporting purposes; prior notification must be provided to the customer.</p>	1.3.1, 1.3.2, 1.3.4	Planning & Budgeting	Fermilab EVMS Description Rev 0 Project-specific PMP
<p><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.</p>	1.3.1, 1.3.2, 1.3.4, Section 4	Planning & Budgeting	Fermilab EVMS Description Rev 0 Project-specific PMP
<p><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.</p>	1.3.4, Section 4	Planning & Budgeting	Fermilab EVMS Description Rev 0 Project-specific PMP
<p><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.</p>	1.3.4	Planning & Budgeting	Fermilab EVMS Description Rev 0 Project-specific PMP
<p><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.</p>	2.1.1 – 2.1.3	Planning & Budgeting	Fermilab EVMS Description Rev 0 Project-specific PMP
<p><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.</p>	3.1.9, 3.2.2 - 3.2.4	Planning & Budgeting	CASB DS Part IV, Indirect Costs CASB DS Part 4.4, Treatment of Variances from Actual Cost
<p><b>Guideline 14:</b> Identify management reserves and undistributed budget.</p>	1.3.8	Planning & Budgeting	Fermilab EVMS Description Rev 0 Project-specific PMP

ANSI/EIA-748-A Guidelines	EVMS Implementation	Major Guideline Category	Fermilab Reference
<b>Guideline 15:</b> Provide that the program target cost goal is reconciled with the sum of all internal program budgets and management reserves.	1.3.1, 1.3.2	Planning & Budgeting	Fermilab EVMS Description Rev 0 Project-specific PMP
<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.	3.1.2 – 3.1.8 Section 4	Accounting Considerations	CASB DS 2.5 Direct Labor CASB DS 2.1, 2.2, & 2.3 Direct Materials CASB DS 2.7 Other Direct Costs
<b>Guideline 17:</b> <i>(When a work breakdown structure is used)</i> 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.	3.1.3	Accounting Considerations	Fermilab EVMS Description Rev 0 Project-specific PMP
<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.	1.3.3, 3.1.3	Accounting Considerations	Fermilab EVMS Description Rev 0 Project-specific PMP
<b>Guideline 19:</b> Record all indirect costs, which will be allocated to the contract.	3.1.3, 3.1.9, 3.1.10 3.2.2 – 3.2.4	Accounting Considerations	CASB DS Part IV, Indirect Costs CASB DS Part 4.4, Treatment of Variances from Actual Cost
<b>Guideline 20:</b> Identify unit costs, equivalent unit costs, or lot costs when needed.	3.3	Accounting Considerations	N/A
<b>Guideline 21:</b> For EVMS, the material accounting system will provide for: <ul style="list-style-type: none"> <li>• Accurate cost accumulation and assignment of costs to control accounts in a manner consistent with the budgets using recognized, acceptable, costing techniques.</li> <li>• 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>• Full accountability of all material purchased for the program including the residual inventory.</li> </ul>	3.1.6, 3.3	Accounting Considerations	CASB DS 2.1, 2.2, & 2.3 Direct Materials
<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: <ul style="list-style-type: none"> <li>• Comparison of the amount of planned budget and the amount of budget earned for work accomplished. This comparison provides the schedule variance.</li> <li>• Comparison of the amount of the budget earned to the actual (applied where appropriate) direct costs for the same work. This comparison provides the cost variance.</li> </ul>	2.2.2 – 2.2.4 2.3.2 – 2.3.6 2.3.8, 2.4.3 Section 4	Analysis & Management	Fermilab EVMS Description Rev 0 Project-specific PMP

ANSI/EIA-748-A Guidelines	EVMS Implementation	Major Guideline Category	Fermilab Reference
<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.	2.2.2 – 2.2.4 2.3.2 - 2.3.6 2.3.8, 2.4.3 Section 4	Analysis & Management	Fermilab EVMS Description Rev 0 Project-specific PMP
<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.	3.2.2 – 3.2.4	Analysis & Management	CASB DS Part IV Indirect Costs CASB DS Part 4.4 Treatment of Variances from Actual Cost Fermilab EVMS Description Rev 0 Project-specific PMP
<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.	2.3.2, 2.3.5 – 2.3.8 2.4.2	Analysis & Management	Fermilab EVMS Description Rev 0 Project-specific PMP
<b>Guideline 26:</b> Implement managerial actions taken as the result of earned value information.	2.3.5, 2.3.6, 2.4.2	Analysis & Management	Fermilab EVMS Description Rev 0 Project-specific PMP
<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.	2.3.5 – 2.3.8	Analysis & Management	Fermilab EVMS Description Rev 0 Project-specific PMP
<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.	5.1.2 – 5.1.5 5.1.5.1 – 5.1.5.3 5.1.5.6 – 5.1.5.8 5.2	Revisions & Data Management	Fermilab EVMS Description Rev 0 Project-specific Configuration Management Plan (CMP)
<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.	Section 5	Revisions & Data Management	Fermilab EVMS Description Rev 0 Project-specific CMP

ANSI/EIA-748-A Guidelines	EVMS Implementation	Major Guideline Category	Fermilab Reference
<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>	1.3.4, 3.1.10 5.1.5.1, 5.1.5.4	Revisions & Data Management	Fermilab EVMS Description Rev 0 Project-specific PMP Project-specific CMP
<p><b>Guideline 31:</b> Prevent revisions to the program budget except for authorized changes.</p>	5.1.2 – 5.1.5 5.1.5.1, 5.2 5.1.5.6 – 5.1.5.8	Revisions & Data Management	Project-specific CMP
<p><b>Guideline 32:</b> Document changes to the performance measurement baseline.</p>	5.1.2 – 5.1.4	Revisions & Data Management	Project-specific CMP
<p><b>Other. Surveillance.</b> Surveillance is not included in the ANSI/EIA guidelines but is part of industry best practices.</p>	6.1 – 6.2	N/A	Fermilab EVMS Description Rev 0

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## APPENDIX B

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### Abbreviations, Acronyms, and Glossary of Terms

**AC** — Actual Cost  
**ACWP** — Actual Cost of Work Performed  
**AE** — Acquisition Executive  
**ANSI** — American National Standards Institute  
**BAC** — Budget at Completion  
**BCWP** — Budgeted Cost of Work Performed  
**BCWS** — Budgeted Cost of Work Scheduled  
**CAM** — Control Account Manager  
**CBB** — Contract Budget Baseline  
**CD** — Critical Decision  
**CDR** — Conceptual Design Report  
**CFO** — Chief Financial Officer  
**CFR** — Code of Federal Regulations  
**CO** — Contracting Officer  
**CPM** — Critical Path Method  
**DEAR** — Department of Energy Acquisition Regulation  
**DOE** — U.S. Department of Energy  
**EAC** — Estimate at Completion  
**EIR** — External Independent Review  
**ETC** — Estimate to Complete  
**EV** — Earned Value  
**EVMS** — Earned Value Management System  
**FAR** — Federal Acquisition Regulations  
**FSO** — Fermi Site Office  
**FY** — Fiscal Year  
**ICE** — Independent Cost Estimate  
**ICR** — Independent Cost Review  
**IPR** — Independent Project Review  
**IPT** — Integrated Project Team  
**IR** — Independent Review  
**ISM** — Integration Safety Management  
**ISMS** — Integrated Safety Management System  
**IT** — Information Technology

**LOE** — Level of Effort  
**NEPA** — National Environmental Policy Act  
**OBS** — Organizational Breakdown Structure  
**OECM** — Office of Engineering and Construction Management  
**OMB** — Office of Management and Budget  
**OPC** — Other Project Costs  
**PARS** — Project Assessment and Reporting System  
**PB** — Performance Baseline  
**PED** — Project Engineering and Design  
**PEP** — Project Execution Plan  
**PMB** — Performance Measurement Baseline  
**PMB** — Performance Measurement Technique  
**PV** — Planned Value (also known as BCWS)  
**RAM** — Responsibility Assignment Matrix  
**RD** — Requirements Document  
**RFP** — Request for Proposal  
**RFQ** — Request for Quote  
**SAE** — Secretarial Acquisition Executive  
**SOW** — Scope of Work  
**SV** — Schedule Variance  
**TEC** — Total Estimated Cost  
**TPC** — Total Project Cost  
**UB** — Undistributed Budget  
**WAD** — Work Authorization Document  
**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.

**Actual Cost (AC)** - Total costs incurred (direct and indirect) in accomplishing an identified element or scope of work during a given time period.

**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.

**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.

**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 (OECM names this “Management Reserve”)** - An amount of the total allocated budget withheld by the project for management control purposes. Contingency is not part of the Performance Measurement Baseline. The usage of the term *contingency* throughout this document is **not** the contingency held by DOE.

**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 management control point at which budgets (resource plans) and actual costs are accumulated and compared to earned value for management control purposes.

**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 (Cost Variance = Earned Value – Actual Cost.) 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)** - A formal determination made by the AE and/or designated official (Mission Need Statement) at a specific point in a project life cycle that allows the project to proceed. Critical Decisions occur in the course of a project, for example, prior to the commencement of conceptual design (CD-1), the commencement of execution (CD-3), and 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. The Critical Path might change from time to time, as activities are completed ahead of or behind schedule. Although normally calculated for the entire project, the Critical Path can also be determined for a milestone or a subproject. The Critical Path is usually defined as those activities with float less than or equal to a specified value, often zero.

**Critical Path Method (CPM)** - A network analysis technique used to predict project duration by analyzing which sequence of activities (which path) has the least amount of scheduling flexibility (the least amount of float). Early dates are calculated by means of a forward pass using a specified start date. Late dates are calculated by means of a backward pass starting from a specified completion date to result in zero total float for each activity.

**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.

**Earned Value (EV)** – The value of completed work expressed in terms of the budget assigned to that work.

**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.

**Independent Cost Estimate (ICE)** - A “bottoms up” documented, independent cost estimate that serves as an analytical tool to validate, crosscheck, or analyze cost estimates developed by project proponents.

**Independent Cost Review (ICR)** - An essential project management tool used to analyze and validate an estimate of project costs. An independent cost review is typically conducted on all projects at the point of baseline approval. Such reviews may be required by the U.S. Congress, DOE management, DOE headquarters program offices, or field project management staff. The requiring office or agency will provide specific requirements for such reviews. An ICR may be performed by an independent internal or external organization.

**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/Contingency** - An amount of the total allocated budget held for management control purposes by the contractor. Management reserve/contingency is not part of the Performance Measurement Baseline. The usage of the term *management reserve/contingency* throughout this document is **not** the same as contingency held by DOE.

**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.

**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.

**Planned Value (PV)** - The sum of the budgets for all work (work packages) scheduled to be accomplished (including in-process work packages), plus the amount of level of effort and apportioned effort scheduled to be accomplished within a given time period; also called Budgeted Cost of Work Scheduled (BCWS).

**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 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.

**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 or summary-level planning package.

**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.