Sandia National Laboratories

Project Performance Management (PPM) Process Description For Corporate Line Item Projects Greater Than $20 Million

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Change Log

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1.0 Introduction

This Project Performance Management (PPM) process describes the integration of project management elements required for effective planning, organizing, controlling, and surveillance of Line Item construction projects executed at Sandia National Laboratories (SNL or Sandia). Specifically, this is a comprehensive description of the management process for executing Line Item projects with a Total Project Cost (TPC) greater than $20 million (M). The PPM process encompasses the principles and methods of an Earned Value Management System (EVMS), which provides cost, schedule, and technical performance information for effectively managing projects.

Sandia operations are primarily conducted to support the Mission needs and national security requirements of the U.S. Department of Energy (DOE) and the National Nuclear Security Administration (NNSA), as well as new directives that reflect an increasing role in supporting the Department of Homeland Security (DHS). The Office of Engineering and Construction Management (OECM) within DOE oversees Line Item construction projects at DOE/NNSA sites.

1.1 PPM Corporate Policy Statements & EVMS Principles

As a DOE/NNSA Laboratory, Sandia follows the requirements in DOE Order 413.3, *Program and Project Management for the Acquisition of Capital Assets*, and its accompanying guidance manual, DOE Manual 413.3-1, which mandates Earned Value requirements. All Line Item construction projects at Sandia are executed under the guidance of DOE Order 413.3, which defines Critical Decision (CD) points representing “go-no-go” points in the project.

The PPM process described in this document implements the Lockheed Martin Corporation (LMC) Corporate Policy Statement CPS-026, *Program Performance Management*, and LMC Technology Services Procedure SGP-026, *Program Performance Management*. Sandia has developed its own Corporate Policy Statement, *Project Performance Management*, presented in Appendix A, which defines the PPM implementation for Sandia’s Line Item construction projects that have a TPC over $20M. The PPM process description and organization described herein has been developed based on the 32 guidelines given in the American National Standards Institute/ Electronic Industries Association (ANSI/EIA)-748-A, *Earned Value Management Systems*, and LMC’s seven EVMS principals given in CPS-026.

This PPM document is written to comply with:

1. ANSI/EIA-748-A, *Earned Value Management Systems*, the Industry standard for implementing EVMS;
2. DOE Order 413.3, *Program and Project Management for the Acquisition of Capital Assets*;
3. DOE Manual 413.3-l, *Project Management for the Acquisition of Capital Assets*;
4. Lockheed Martin's Corporate Policy Statement, CPS-026, *Program Performance Management*;
5. Lockheed Martin's Technology Services Procedure, SGP-026, *Program Performance Management*; and
6. Sandia's Corporate Policy Statement, *Project Performance Management*.

The basic tenant of the PPM process includes seven EVMS principles: (1) planning work scope, (2) breaking the work up into manageable elements, (3) developing a Performance Measurement Baseline (PMB), (4) tracking actual project costs, (5) objectively assessing accomplished work, (6) analyzing significant variances, and (7) using EVMS data to guide management decisions. These seven EVMS principles, and the Sandia perspective related to each one, are listed in Table 1-1.

1.2 PPM Purpose & Objectives

The primary *purpose* of a PPM process is to support Project Managers in integrating the scope, schedule, and budget of a project for optimal planning, accurate reporting, and effective control. The primary *objective* of this PPM process, is to ensure Sandia and its subcontractors use a formal internal cost and schedule management control system for construction projects over $20M, and provide DOE/NNSA and Sandia Management with timely EVMS data to determine project status.

Table 1-1 Seven EVMS Principles

These are applied to Line Item Construction Projects at a Minimum.

EVMS Principle	Sandia Project Perspective
1. Plan all work scope for the project to completion.	The Project Manager (PM) works with the Sandia Line customer and DOE/NNSA to establish project requirements—Functional & Operational Requirements (F&ORs)—and develop a complete work scope that will meet the Mission Need within the budget provided. Scope and requirements are documented in the Preliminary Project Execution Plan (PEP) at CD-1. DOE issues a Final PEP at CD-2.
2. Break Down the project work scope into finite pieces that can be assigned to a responsible person or organization for control of technical, schedule, and cost objectives.	Project work detail will be developed within a Work Breakdown Structure (WBS), WBS Dictionary, and a Responsible Individual (RI)/ organization will be assigned. Identified RIs are assigned duties as described in the Responsibility Assignment Matrix (RAM) example shown in Fig 2-2. The Sandia Integrated Project Team (IPT), which includes the Architect/Engineer (A/E) and the General Contractor, is the responsible organization for project execution.
3. Integrate project work scope, schedule, and cost objectives into a Performance Measurement Baseline (PMB) plan against which accomplishments can be measured and control changes to the baseline.	A networked, time-phased Resource Loaded Schedule (RLS) is developed, which is the basis for Budgeted Cost of Work Scheduled (BCWS). A formal Baseline Change Control (BCC) process is implemented after the PMB is established and approved by the DOE at CD-2, "Approve Performance Baseline."
4. Use Actual Costs incurred and recorded in accomplishing the work performed.	Estimated actual costs are first calculated based on the difference between the A/E/General Contractor Budgeted Cost of Work Performed (BCWP) and invoices paid to date through the current month. The Control Account Manager (CAM) further refines the estimated actual cost by invoices submitted but not paid and including any other known factors that affect actual costs.
5. Objectively assess accomplishments at the work-performed level.	The CAM will determine the amount of work that has been accomplished as shown on the PMB. This provides the basis for BCWP in units of dollars, which will be compared with BCWS and Actual Cost of Work Performed (ACWP). The project schedule status file is copied to a new file for the current month and a Turnaround Report is provided to the CAM. The CAM updates the report with their assessment of the tasks performed and accruals on the project. The status schedule is then updated and compared to the PMB to determine variances and Earned Value data. Variances and EVMS data undergo root cause analysis jointly by Project Controls and the CAM.
6. Analyze significant variances from the plan, forecast impacts, and prepare an Estimate at Completion (EAC) based on performance to date and work to be performed.	Analysis of both cost and schedule variances and EVMS data are reviewed by the Project Manager to determine potential corrective actions. A Variance Analysis Report for exceeded thresholds will be provided to Sandia Senior Management and DOE, as required.
7. Use EVM information in Corporation's management processes.	Sandia uses EVMS data on a project-by-project basis to implement management actions to keep the project on track. Project Managers provide monthly reports to Sandia Senior Management and DOE for review of milestones, financial outlays, EVMS data, variance analysis, and appropriate corrective actions. Management actions may include—but are not limited to—stricter controls, applying cost and schedule contingencies, and/or baseline change requests.

1.3 Applicability

This PPM process description applies to construction projects managed by Sandia's primary Laboratory in Albuquerque, New Mexico (SNL/NM) and its sister Laboratory in Livermore, California (SNL/CA). At Sandia, Line Item construction projects (all projects with a TPC over $5M) are managed by three entities within Sandia's Facilities infrastructure as follows:

SNL/NM Facilities Management and Operations Center (FMOC)
Corporate Projects Department (10824) – Manages all Line Item projects, General Plant Projects (GPPs), Facilities & Infrastructure and Re-capitalization Program (FIRP) projects, and large Customer projects at SNL/NM and offsite work locations (such as at the Pantex Plant in Texas).

MESA Program Office (01900)
Exclusively manages the construction of the Microsystems and Engineering Sciences Application (MESA) project, a multi-facility complex at SNL/NM.

SNL/CA Facilities Planning and Engineering
Manages all construction projects at the Livermore, California site.

1.4 EVMS Defined

The EVMS component of PPM defines basic project structural elements and calculates Earned Value metrics that are used to assess the progress of a project. Specifically, EVMS provides *quantitative* vs. *qualitative* project assessment. This information provides Project Managers with definitive data in which they can objectively assess and understand their project's current cost and schedule performance and predict a reasonable estimate for the cost and schedule at completion.

The "health" of a project may not always be immediately apparent by *qualitative* assessment alone, in which case a project can quickly run out of control before obvious warning indicators reveal themselves. Earned Value Management indicators are shown on variance reports, including the Cost Performance Index (CPI) and the Schedule Performance Index (SPI), which provide a method for project trends to be analyzed and assessed. However, the final assessment will be based on a complete assessment made by the Project Manager/Control Account Manager (CAM) who will have additional insight on project factors. Project Controls, which supports Sandia's Construction Project Managers, determines fluctuations in each project, and in accordance with the variance threshold criteria set by OECM, determines which project indicators warrant further analysis and whom will address potential corrective actions.

1.5 Tailoring the PPM Process

The principles of EVMS (Table 1-1) are applied to all Sandia Line Item Construction Projects. At a minimum, these seven EVMS principles will be applied to all significant construction projects at Sandia (including some non-Line

Item projects). Corporate Line Item projects over $20M will implement the full ANSI/EIA-748-A EVMS guidelines described in this document.

While tailoring is appropriate and expected, the PPM process will converge to a more consistent approach for all Line Item projects as they consistently follow the process outlined in this document. EVMS will be applied in a consistent and formally documented process commensurate with the project's cost, scope, and risk. The PPM process will align the Line Item construction processes within Facilities at both SNL/NM and SNL/CA. Implementing, monitoring, controlling, and self-auditing the process will assure the highest level of project performance.

A Compliance Map correlating the Sandia PPM process with the 32 ANSI/EIA-748-A EVMS guidelines (as applicable within the construction environment) is presented in Appendix C. The applicable sections of this document are copied to the map to address each guideline.

1.6 Document Scope

This document is organized into seven chapters and four appendices. Chapter 1 introduces key PPM and EVMS concepts, states the purpose and objectives of this PPM process description, lists the primary drivers for implementing a PPM process, and defines Sandia's Line Item construction and acquisition process, which is graphically illustrated in spreadsheet form. Chapters 2 through 6 are based on the ANSI/EIA-748-A five key areas: (Ch-2) Organization, (Ch-3) Planning, Scheduling, and Budgeting, (Ch-4) Accounting Considerations, (Ch-5) Analysis and Management Reports, and (Ch-6) Revisions and Data Management. The details of the PPM process, as it relates to the 32 ANSI/EIA-748-A guidelines, are discussed in these core chapters. Chapter 7 describes Sandia's PPM Surveillance process. Additional requirements that augment the ANSI/EIA-748-A guidelines include Sandia's PPM/EVMS Training program (Section 2.6) and the Annual Earned Value Management Self-Assessment and Application Inventory (Chapter 7). These additional requirements comply with LMC's Program Performance Management policy and procedure (CPS-026 and SGP-026).

The Appendices include (A) Sandia's PPM Corporate Policy Statement, (B) Glossary of Terms and Acronyms, (C) Sandia's PPM Compliance Map, and (D) an example form for a Work Authorization Document (WAD) (one of the SNL-internal Work Authorization vehicles).

1.7 Acquisition Strategies

Sandia utilizes external suppliers for most of the work associated with Line Item construction projects. Suppliers include Architectural/Engineering (A/E) firms and/or General Contractor (GC) firms, General/Specialty Contractors, and other consultants. Typically, the Conceptual Design and construction for Sandia projects are executed through Firm-Fixed Price (FFP) contracts with external suppliers. On a project-specific basis, the Sandia Project Manager may also hire

external consultants to conduct risk management, Independent Cost Reviews (ICRs), Value Engineering, safety assessments, commissioning, environmental work, and/or other disciplines that may be unique to the project.

Sandia's Construction Procurement Department assigns a Sandia Contracting Representative (SCR) to each project team. The Sandia Project Manager works closely with the SCR for the planning, solicitation, and contract management of external suppliers. All acquisitions are made in accordance with the Construction Procurement Department's requirements, which are aligned with the Federal Acquisition Regulation (FAR). Uniform policies and procedures for Federal project acquisitions provide for a fair and competitive environment.

Sandia uses a number of acquisition strategies. Solicitations can include local or national advertisements or may be made from lists of pre-qualified suppliers. Contract types can include, but are not limited to:

- Firm-Fixed Price (FFP)
- Time and Materials (T&M) reimbursable
- Design/Bid/Build
- Design/Build
- Unit Price
- Construction Manager at Risk (CMAR)

During the Conceptual Design of a project, procurement alternatives are evaluated and a detailed Acquisition Execution Plan (AEP) is developed and tailored to each specific Line Item project. The AEP is generally prepared and formatted in accordance with the DOE *Project Acquisition Plan Guide*. Sandia supports the Federal Project Director (FPD) in the preparation of the AEP and DOE/NNSA Management reviews and approves the AEP prior to its implementation. For Line Item construction projects over $400M (Major System), the DOE Deputy Secretary must approve the AEP. DOE Under Secretaries will approve AEPs for projects between $20M and $400M, and DOE Assistant Secretaries/Program Secretarial Officers (PSOs) will approve Line Items between $5M and $20M. The DOE Office of Management, Budget, and Evaluation (OMBE) will review and concur on all Line Item AEPs.

1.8 DOE Order 413.3 Critical Decision (CD) Process

DOE Order 413.3, *Program and Project Management for the Acquisition of Capital Assets*, was implemented in October 2000 to provide the DOE and the NNSA an increased level of project direction for the acquisition of Capital assets at DOE sites. As shown in Figure 1-1 (from the Order), project execution is divided into phases defined by Critical Decision points starting with project

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Attachment 4
Page 1

PROJECT ACQUISITION PROCESS AND CRITICAL DECISIONS

Project Planning Phase		Project Execution Phase			Mission
Preconceptual Planning	Conceptual Design	Preliminary Design	Final Design	Construction	Operations

CD-0	CD-1	CD-2	CD-3	CD-4
Approve Mission Need	Approve Preliminary Baseline Range	Approve Performance Baseline	Approve Start of Construction	Approve Start of Operations or Project Closeout

See Page 2 for CDs on Environmental Restoration and Facility Disposition Projects

CD-0	CD-1	CD-2	CD-3	CD-4
Actions Authorized by Critical Decision Approval				
• Proceed with conceptual design using program funds • Request PED funding	• Allow expenditure of PED funds for design	• Establish baseline budget for construction • Continue design • Request construction funding	• Approve expenditure of funds for construction	• Allow start of operations or project closeout
Critical Decision Prerequisites				
• Justification of mission need document • Acquisition Strategy • Preconceptual planning • Mission Need Independent Project Review	• Acquisition Plan • Conceptual Design Report • Preliminary Project Execution Plan and baseline range • Project Data Sheet for design • Verification of mission need • Preliminary Hazard Analysis Report	• Preliminary design • Review of contractor project management system • Final Project Execution Plan and performance baseline • Independent cost estimate • National Environmental Policy Act documentation • Project Data Sheet for construction • Draft Preliminary Safety Analysis Report • Performance Baseline External Independent Review	• Update Project Execution Plan and performance baseline • Final design and procurement packages (**) • Verification of mission need • Budget and congressional authorization and appropriation enacted • Approval of Safety documentation • Execution Readiness Independent Review	• Operational Readiness Review and acceptance report • Project transition to operations report • Final Safety Analysis Report **After CD-4** **Closeout** • Project closeout report

(**) To the degree appropriate to initiate construction as scheduled.

Figure 1-1 DOE Project Acquisition Process and Critical Decisions
(Taken from DOE Order 413.3, October 13, 2000.)

justification and ending with the start of operations at a completed facility (CD-0 through CD-4). DOE allows tailoring of the process to combine or eliminate some reviews and Critical Decisions for projects that have low risk and complexity. Sandia works with the assigned FPD on each project to determine the level of appropriate tailoring. Typically, most Line Item construction projects at Sandia undergo all five Critical Decisions (CD-0 through CD-4) and associated reviews. Energy System Acquisition Advisory Boards (ESAABs) are formulated to assist the Critical Decision and Baseline Change Control (BCC) processes.

CD-2 is the one mandatory review, which consists of a thorough review conducted by an external independent team contracted by DOE. The team reviews the entire project and determines if the Performance Baseline is reasonable and has been adequately defined. A brief description of each Critical Decision is described below**.**

CD-0, "APPROVE MISSION NEED"

Approval at CD-0 authorizes the project to proceed with Conceptual Design using Customer expense program funds and to request Project Engineering and Design (PED) funding. Prerequisites for this decision are a Justification of Mission Need document, an outline of the user's needs (in terms of capabilities), and an initial Acquisition Strategy. National Environmental Policy Act (NEPA) documentation should be submitted very early in the project-planning phase.

CD-1, "APPROVE ALTERNATIVE SELECTION AND COST RANGE"

Approval at CD-1 authorizes the expenditure of PED funds for Preliminary Design (start Title I). Prerequisites for this decision include a Conceptual Design Report (CDR), a preliminary Acquisition Execution Plan (AEP), a Preliminary Project Execution Plan (PEP) that presents the preliminary Baseline range, and a Congressional Project Data Sheet (PDS) for design. Additional project documents may be in draft at this point including a Hazards Analysis (HA) and other ES&H documentation.

CD-2, "APPROVE PERFORMANCE BASELINE"

CD-2 is the most Critical Decision point and requires an External Independent Review (EIR) and Independent Cost Review (ICR). Approval at CD-2 allows the project to proceed with Final Design (start Title II). The project's Baseline (scope, cost, and schedule) will be fully established at this point and is the point at which formal EVMS performance metrics and reporting will commence, as required by DOE. Prerequisites for this decision include the Preliminary Design (Title I design package), a final AEP, and a Final PEP, which will contain the Performance Measurement Baseline (PMB). Final plans such as a formal Risk Management Plan (if required), Fire Hazard Analysis (FHA), and the Hazards Analysis (HA) will be complete. The project also must have submitted all required NEPA documentation. (Many activities are already covered by the *Sandia/NM Site-Wide Environmental Impact Statement [SWEIS]* published in December 1999.)

CD-3, "APPROVE START OF CONSTRUCTION"

Approval of CD-3 allows construction activities to proceed. Typically, the project will go out for bid and be awarded to a General Contractor (GC). However, other Acquisition Strategies could include Design/Build or a Construction Manager at Risk (CMAR) strategy. Prerequisites for this decision include the Final Design (Title II design package), an updated PEP and Performance Baseline, and the final budget and Congressional authorization. The project also must have received all final NEPA determinations allowing the project to proceed.

CD-4, "APPROVE START OF OPERATIONS"

At CD-4, the finished facility is ready for customer occupancy and the start of mission operations. Prerequisites to CD-4 include an Operational Readiness Review (ORR) and acceptance, a final Safety Analysis Report (SAR), closeout of all punch list items, and final inspections. A formal Closeout Plan will be prepared and a Transition Team assembled. Projects are not complete until it has been demonstrated that they work as designed.

1.9 Integration of PPM Process into DOE 413.3 Line Item Process

The relationship between the 32 EVMS guidelines listed in ANSI/EIA-748-A and Sandia's Line Item project life-cycle (per DOE Order 413.3) is shown in Figure 1-2. As depicted in the figure, the process begins with the establishment of Mission Need for a new facility, system, or capability. As discussed above, Critical Decisions define the beginning and end points for key project phases (indicated by triangles at the top of the chart). Key activities during the phase between Critical Decisions are listed in the boxes at the top of the diagram. The applicability and implementation of each guideline is reflected in the activities indicated in the horizontal bars across the figure.

The PPM process begins as a gradual implementation process with approval at CD-0, "Approve Mission Need." The graduated shading shown in the horizontal bars indicate the increasing levels of formality in applying the PPM process as project baseline data is defined. The project definition (technical scope), cost, and schedule are established over time from conceptual planning through Final Design. As the project gains definition with each succeeding phase, more rigorous PPM methods are applied. After CD-2, "Approve Performance Baseline," with the PMB established, formal (required) EVMS reporting begins. Formal PPM processes in place include the following areas:

- Work Breakdown Structure (WBS);
- Development of Organizational Breakdown Structure (OBS) and Responsibility Assignment Matrix (RAM);
- Full financial reporting requirements;
- A fully Integrated Resource Loaded Schedule (RLS);

- A Performance Measurement Baseline (PMB);
- Assignment of CAMs to Control Accounts;
- Implementation of Earned Value Management for WBS elements in the Control Accounts (CAs);
- Full implementation of EVMS performance metrics;
- Formal Baseline Change Control (BCC) procedures.

Figure 1-2 indicates where EVMS processes begin (gradual shading across bars) and where formal implementation of EVMS processes commence (solid-colored bars). All bars to the right of CD-2 become solid indicating the complete implementation of EVMS requirements.

NOTE: Final Design typically starts after CD-2. However, in some instances design can begin prior to CD-2, with Federal Project Director (FPD) approval.

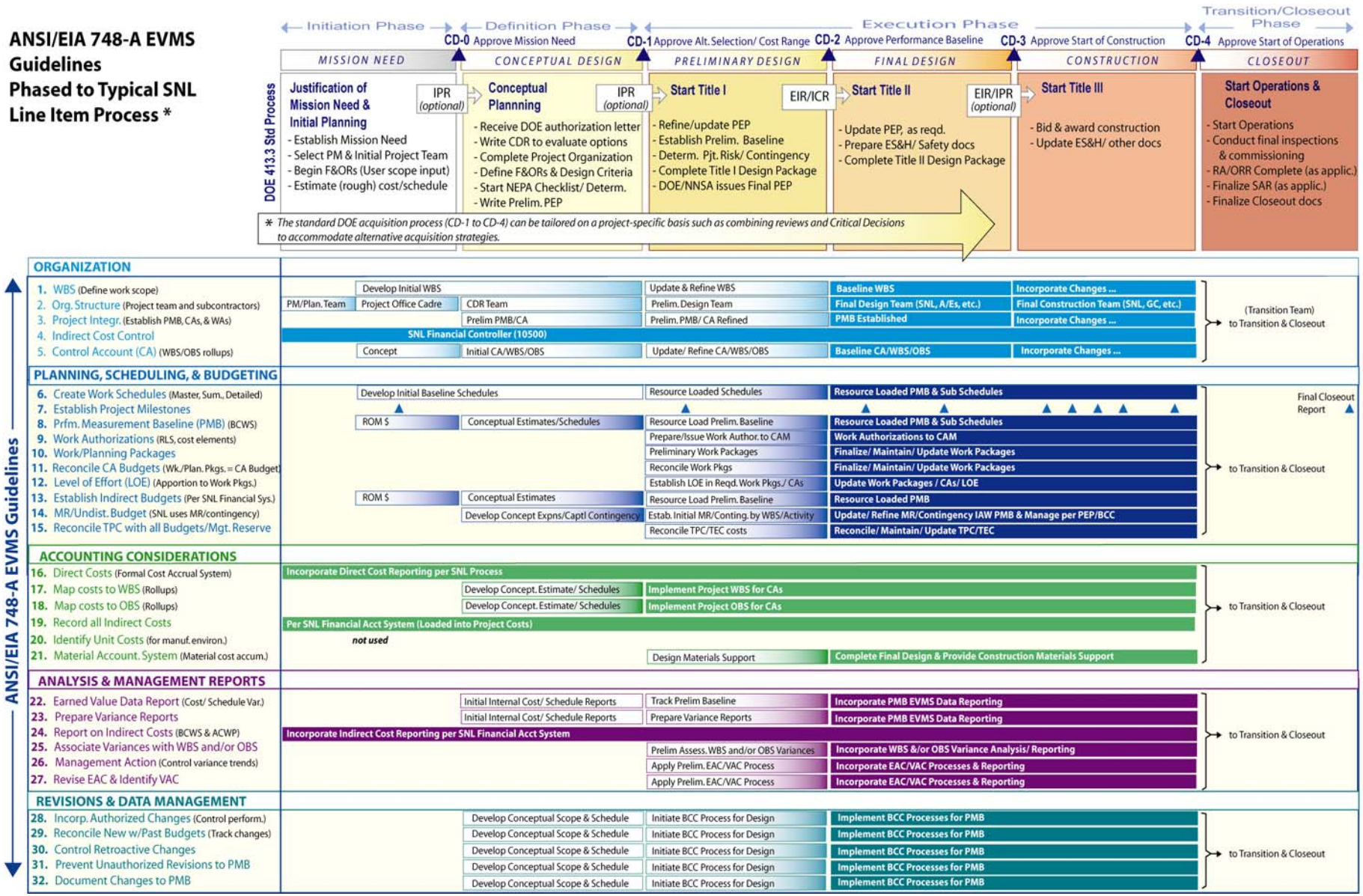


Figure 1-2 Project Performance Management (PPM) Process

2.0 Organization

An initial level of project organization must be established early in a project's life-cycle. At a minimum, the Project Manager and Federal Project Director (FPD) will be selected along with a core team to begin project planning and definition of customer requirements. As shown in Figure 1-2, the Project Manager and the first members of the Integrated Project Team (IPT) are selected during the justification of Mission Need and Initial Planning phase. Prior to CD-0, the team begins the development of an initial Work Breakdown Structure (WBS) and a very rough first approximation of the project's cost and schedule. Control Accounts are developed at the conceptual level. The Sandia User (Customer) works with the Sandia and DOE IPTs to communicate their Functional and Operational Requirements (F&ORs) upon which further definition and refinement of the project scope will be based.

Project Managers need to continue to assess the organization of their project throughout the project's life cycle. This includes refining the structure of the WBS and ensuring that Responsible Individuals (RIs) are properly trained to fulfill their roles and responsibilities, as assigned. Planning the work scope for the project from initiation to completion is essential to control "scope creep." All stakeholders must unilaterally accept the project scope fairly early in the planning process (and certainly prior to Final Design). Once the Performance Measurement Baseline (PMB) is determined, DOE issues a Final Project Execution Plan (PEP) outlining the scope, budget, and schedule for the project, which will then be reviewed at Critical Decision 2 (CD-2). The IPT changes as the project evolves through the execution phase.

2.1 Project Planning

Significant facilities and capabilities to meet Mission needs are first addressed within Sandia's Planning Department, which works with Sandia Line Customers to determine what facilities, programs, and capabilities are required to meet DOE's and NNSA's Mission needs—and the priorities of those projects. These plans are listed in Sandia's Annual *Ten-Year Comprehensive Site Plan* (TYCSP), which discusses short-, medium-, and long-range planning for pertinent facilities and infrastructures for all Sandia facility locations (Sandia/NM, Sandia/CA, Sandia Nevada – Tonopah Test Range [Sandia/NV-TTR], Sandia Hawaii [Sandia/HI], Sandia Carlsbad, New Mexico, and Sandia offsite areas such as at Pantex in Amarillo, Texas).

2.2 Work Breakdown Structure (WBS)

A WBS is a hierarchical grouping of project elements that organizes and defines the total work scope of the project. The WBS is a project tool that forms the basis for planning and scheduling work, budgeting, and reporting—on EVMS and other project status areas. Each Line Item construction project will utilize a WBS to effectively and efficiently manage the project scope.

2.2.1 WBS Levels

WBS levels are used to represent an increasingly detailed definition of the project work. Typically, Line Item projects will have five WBS levels (Levels 0-4) under "Facilities Design and Construction" and "Project Services" as depicted in Figure 2-1. Control Account Managers (CAMs) are normally assigned at WBS Level 3, however CAMs may be assigned at lower WBS levels at the discretion of the Sandia Project Manager.

- **Level 0** represents the entire Line Item project.
- **Level 1** represents the two major divisions in project execution. The "Facilities Design and Construction" WBS elements are Congressionally approved and funded. The "Project Services" WBS elements are funded by Sandia.
- **Level 2** represents the WBS elements for "Design" and "Construction" under the execution phase ("Facilities Design and Construction") and the various project services necessary to complete the Congressionally approved project under "Project Services."
- **Level 3** represents the primary WBS components under "Design" and "Construction" that typically reflect a WBS element managed by a CAM. Level 3 under ~~the~~ "Project Services" ~~sides~~ represents such tasks as ES&H documentation and early conceptual design work.
- **Level 4** breaks down Level 3 components into more specific tasks. Control Accounts may be assigned at this level at the discretion of the Sandia Project Manager.

2.2.2 WBS Requirements

A WBS similar to the generic WBS illustrated in Figure 2-1 is required for each Line Item construction project. WBS elements under "Facilities Design and Construction" (through Level 3) and "Project Services" (through Level 2) are negotiated with the local DOE/NNSA Sandia Site Office (SSO). Level 4 project execution details are typically defined for most Line Item projects, but can be adjusted to accommodate a scope of work that requires a less (or greater) degree of detail. Similarly, Levels 5 or 6 may be used to further break down Level 4 elements depending on the degree of detail required to effectively manage the project.

2.2.3 WBS Dictionary

Each Line Item construction project is required to develop a WBS Dictionary, which will further define the WBS elements. The WBS Dictionary describes how work will be carried out to develop, design, construct, equip, and manage the project. The project-specific WBS Dictionary defines and describes elements of work in the project.

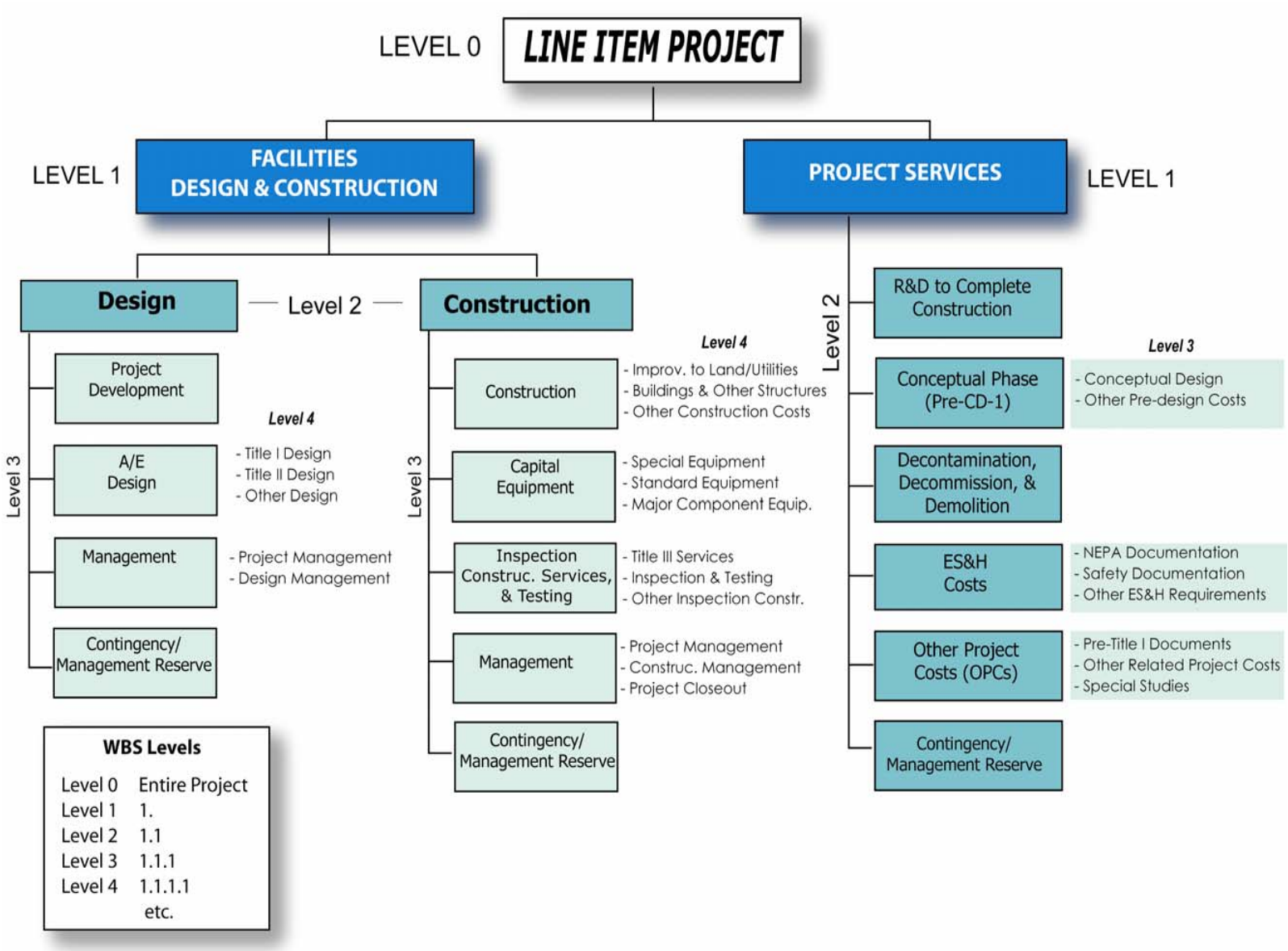


Figure 2-1 WBS Chart for a Generic SNL Line Item Construction Project

2.3 Project Execution Plan (PEP)

The Project Execution Plan (PEP) is the primary agreement on project planning and objectives between the DOE/NNSA/HQ Program Office and the DOE/NNSA field office and is required for all Line Item projects (>$5M).

The PEP is a high-level planning document for project execution. In general, the PEP describes the organization of the Sandia Integrated Project Team (IPT) and the Federal IPT, defines roles and responsibilities, restates the Mission need and provides a general overview of the project, outlines cost and schedule data from the Performance Baseline, and lists Functional and Operational Requirements (F&ORs). The major elements required in the PEP are given in DOE Order 413.3 and DOE Manual 413.3-1.

The PEP is approved by the DOE/NNSA/HQ organization funding the project, with additional signatures showing approval/concurrence by the DOE/NNSA Federal Project Director (FPD) and the local DOE/NNSA office, the Sandia Project Manager, Facilities Management, and the Sandia Line Customer.

As described in Section 1.8, a Preliminary PEP is developed prior to CD-1 to begin Title I Preliminary Design, while the Final PEP is approved by all responsible parties and submitted by DOE prior to CD-2 to begin Title II Final Design. Revisions to the PEP may also be incorporated prior to CD-3 (Start Construction) as well as at other intervals, if required, to reflect any significant change in the status of the project.

2.4 Organization Breakdown Structure (OBS)

The Organizational Breakdown Structure (OBS) shows how project personnel are organized and defines roles and responsibilities and reporting hierarchies. The specific project organization structure for each Line Item is clearly defined in the PEP. The roles and responsibilities and reporting levels are defined from the highest levels at DOE/NNSA/HQ down to the local project participants within the DOE/NNSA site office; the Sandia Line Management, Program Directors/Champions, and Facilities Management; the Sandia Project Manager; and the core project team members including Sandia's Procurement staff, Project Controls staff, financial accounting personnel, construction assistants, technical writers, System Engineers, and other Subject Matter Experts (SMEs). Project team members external to Sandia but part of the Sandia IPT will include the Architectural/Engineering (A/E) design firm and the General Contractor (GC) as well as other consultants, as applicable. The primary leads in the project organization include:

- The **DOE Acquisition Executive (AE),** or their delegate, provides the guidance for the project to support the Mission Need; approves the annual budget requests; and approves requests for Critical Decisions (CD-0 through CD-4).
- The **DOE or DOE/NNSA Program Manager** budgets the funds required to execute the project and defines programmatic Mission requirements and objectives.

- The **DOE or DOE/NNSA FPD** is the field Point-of-Contact (POC), submits budgets, and ensures that the contractor designs and constructs a facility that will meet Mission requirements.
- The **Sandia Project Manager** is charged with managing the day-to-day execution of the facility design and construction, and executing the project within approved cost, schedule, and scope baselines. The Project Manager also manages all resources necessary to accomplish the project whether they are in-house personnel, consultants, or contractors. The Sandia Project Manager may also appoint Deputy Project Managers.
- The **Control Account Manager (CAM)** has responsibility for the cost, schedule, and technical responsibility for the effort in each assigned Control Account. For most Sandia construction projects, the CAM and the Project Manager are one and the same. The CAM is responsible for the planning and control of each Control Account and the identification, analysis, and reporting of significant variances. Typical documents used by the CAM include but are not limited to:
  - ✓ Project Execution Plan (PEP)
  - ✓ Responsibility Assignment Matrix (RAM)
  - ✓ Cost Estimates
  - ✓ Project Management Plan (e.g., Control Account development and detailed account of project execution)
  - ✓ PPM Process Description (this document)
  - ✓ Schedules (e.g., Preliminary Schedules, Summary Schedule, Integrated Project Schedule, and Contractor's Construction Schedule)
  - ✓ Work Authorizations (e.g., Contracts, WADs, and Service Orders)
  - ✓ Monthly Performance reports
  - ✓ Variance Reports
  - ✓ Configuration Change Requests (CCRs)
  - ✓ BCPs (approved and/or submitted) and BCP logs
  - ✓ Management Reports (internal to Sandia)
- **Project Champions** are upper level Sandia and/or DOE/NNSA Management who strongly advocate the project by raising awareness about the project, demonstrating why the work is important, and obtaining needed support.

2.5 Responsibility Assignment Matrix (RAM)

The Responsibility Assignment Matrix (RAM) is an essential element of the project that integrates the organization structure with the scope of work outlined in the PEP. Major project milestones, documents, and actions are identified, then cross-walked to the part of the organization that is responsible for that deliverable.

An example of these responsibilities is identified by their function in the example RAM shown in Figure 2-2. Responsibility functions are categorized as follows:

- ▶ Approves
- Prepares
- ☑ Input/ Knowledge
- Reviews (concurrence and comments)
- ⊙ Notification (receives copy)

The RAM matrix clarifies the roles and responsibilities of all the parties/ organizations involved in the project, with "Approves" being the highest level of responsibility. Various members of the Sandia and DOE IPTs perform some or all of the following functions: Project Management; cost and schedule management; WBS management; task assignment management; and/or consultant/technical review.

Examples of some of the deliverables assigned to Responsible Individuals (RIs)/ organizations are listed in Figure 1-1, which shows prerequisite documents needed through the Critical Decision (CD) process per DOE Order 413.3.

2.6 Training Requirements

All Sandia personnel, including existing staff and onsite contractor personnel, new hires, and transfers, who are involved in planning or implementing the PPM process (i.e., PPM personnel) are trained at the level applicable to their roles and responsibilities. At a minimum PPM training will require that:

- All applicable project personnel read the current revision of this PPM Process Description document on an annual basis. These individuals may also be required to read additional PPM reference materials or addendums as identified by the Facilities Project Office.
- All project personnel complete the EVMS compliance training using Lockheed Martin's EVMS fundamentals online course and complete the compliance test every two years.

Additionally, formal EVMS training is required for Project Managers, CAMs, and Accountable Managers (i.e., Managers with oversight of Line Items) at a minimum of every two years. Training is delivered through online courses administered through Sandia's Training Education Development System (TEDS) and in-class training sessions. Formal training is given at various levels of rigor, thus allowing training modules to be tailored specifically for each role. For example, Accountable Program Managers will need only to receive an overview of PPM processes, while Project Managers and CAMs will receive a more systematic and thorough presentation of roles, responsibilities, and techniques as outlined in the PPM Process Description. The training is modeled after Lockheed Martin's EVMS online learning modules and will continue to be updated and refined to address Sandia- and construction-specific issues.

Project personnel who are not specifically involved with the PPM process, such as customers and stakeholders, will be provided a copy of the Sandia's *Line Item Customer Training Manual*.

Responsibility Matrix Legend: ▶ Approves ✎ Prepares ☑ Input/Knowledge 📖 Reviews ⊙ Notification	DOE		Sandia											
	NNSA/HQ	NNSA/SSO	Sponsor Representative	Communications	Purchasing	Security	Project Manager	Admin. Support	NEPA/Risk Assessment	ES&H	O&M	Design Team	Construction Mgr. Engin.	Inspection
Project Justification **CD-0, "**Approve Mission Need"	▶	☑	✎				☑							
Project Development		▶	☑	☑			✎		☑			☑		
Preliminary Project Execution Plan (PEP)	▶	✎	☑	☑	☑	☑	✎	☑	☑	☑	☑	☑	☑	☑
Project Authorization		▶	☑				✎	☑						
Develop Preliminary Baseline **CD-1,** "Approve Alt. Selection & Cost Range"	▶	📖					✎							
Environmental Compliance/ NEPA		▶	☑				☑		☑	✎		☑		
Design Criteria		▶	☑	☑		☑	▶		☑	☑	☑	☑	☑	☑
A/E Acquisition		⊙			▶		✎					☑		
Preliminary Design	☑	▶	☑				▶				☑	☑	☑	
Preliminary Design QA		☑	☑	☑		☑	▶		☑	☑	☑	✎	☑	☑
CD-2, "Approve Performance Baseline"	▶	📖					✎							
Final Design	☑	▶					▶				☑	☑	☑	
Final Design QA		☑	☑	☑		☑	▶		☑	☑	☑	✎	☑	☑
Title III		⊙	☑	☑			☑				☑	✎	▶	☑
Construction Acquisition		⊙			▶		📖					☑	✎	☑
Final PEP	▶	✎	☑	☑	☑	☑	✎	☑	☑	☑	☑	☑	☑	☑
CD-3, "Approve Start of Construction"	▶	📖					✎							
Construction		⊙			☑		📖					☑	▶	☑
Construction Management/Inspection		☑					▶			☑			✎	☑
Special Equipment Procurement		📖	☑		▶		📖			☑		✎	☑	
Special Equipment Installation		⊙	☑				📖						▶	☑
Operational Readiness		▶	☑				⊙		☑	☑	☑	☑	☑	
Start Up		📖					▶		☑	☑	☑	☑	✎	☑
Acceptance by Sandia		⊙	▶	☑	☑	☑	📖		☑	☑	☑	☑	✎	☑
CD-4, "Approve Start of Operations"	▶	📖	⊙				✎							
Final Cost Report		▶			☑		✎						☑	

Figure 2-2 Example of a High Level Responsibility Assignment Matrix (RAM)

WBS numbers are associated with each milestone and/or high-level task area listed in the left column. Responsible Individuals are assigned to complete Work Packages within each area.

3.0 Planning, Scheduling, and Budgeting

This chapter discusses how the project planning outputs discussed in Chapter 2 (WBS, OBS, PEP, and RAM) are used in the development of the project schedule, from preliminary schedules to the fully Integrated Project Schedule. Preliminary baseline schedules are developed from the preliminary WBS. As the WBS becomes more refined through design criteria developed in the Conceptual Design Report (CDR), so does the project schedule. Project Managers must balance customer requirements with the DOE budget for their projects and ensure this is reflected in their schedules. As shown in Figure 1-2, under "Planning, Scheduling, and Budgeting," budgeting begins with a rough order of magnitude cost range. Estimates are refined and Contingency/Management Reserve is created. Work Authorizations are prepared for both external and internal suppliers throughout the life-cycle of the project. Preliminary Work Packages are created and the fully resourced-loaded Performance Management Baseline (PMB) is completed by CD-2. Through Final Design, Construction, and Closeout, the PMB, Work Packages, Control Accounts, and Contingencies/Management Reserves are maintained, updated, and logged to accurately track the project's performance and status.

3.1 Project Summary Schedule

The Project Summary Schedule is a rollup schedule created from the Integrated Project Schedule showing major project milestones and high-level activities (generally at WBS Level 3), which summarizes work to be performed on the project. The intent of the Project Summary Schedule is to provide a clear, pictorial overview of the project. It should depict all key milestones and critical tasks in an abbreviated format that captures the scope of the project. The activities and milestones should align with the guidance in DOE Order 413.3 as discussed in Section 1.8 and depicted in Figure 1-1.

3.2 Integrated Project Schedule

The Integrated Project Schedule shows the network of program-planned activities that reflect cost, schedule, and technical performance as described in the Project Execution Plan (PEP). It is hierarchically structured and provides integrated planning down to at least the Control Account level of detail. The Integrated Project Schedule is constructed to provide horizontal and vertical traceability and interdependencies. It is also used to perform critical path analysis. Figure 3-1 illustrates the basic process for schedule planning and baseline development.

Some key elements generally identified on the Integrated Project Schedule include:

- WBS reference numbers
- Task description
- Duration of task
- Project/Task number (i.e., Charge Account) of the Control Account
- Revision numbers
- "As of" or “time now” dates
- Hours or material dollars planned for the task (resource loading)
- Service Center Overhead (SCOH) and Corporate Assessments
- Contingency/Management Reserve
- Functionally-oriented organization
- Person or organization responsible for the task
- Project phase
- Baseline Start/Finish Dates—These are the dates integrated with the PMB and against which Earned Value can be measured.

Once approved at CD-2, the Integrated Project Schedule becomes the overall and singular baseline project schedule network and is maintained by the assigned Project Controls staff. All project Control Accounts are listed on the Integrated Project Schedule and must sum to (reconcile with) the Total Project Cost (TPC). Thus, the sum of all Control Accounts equals resource-loaded Work Packages and unloaded Planning Packages (if applicable) plus Contingency/Management Reserve, which together establish a time phased performance measurement (schedule/cost) baseline.

3.2.1 Vertical Traceability

Project schedules must exhibit vertical traceability, which relates activities and milestones between different levels in the schedule within the same Control Account (i.e., WBS levels). Vertical traceability provides the common constraint relationship between different levels of the project schedule hierarchy such that higher-level schedule activity durations constrain lower level activity durations; that is, lower-level activities must reside within the higher-level activity start and end dates. The following components link to the schedule level:

- WBS product hierarchy
- Schedule resource information, logic, and networks

3.2.2 Horizontal Traceability

Project schedules must also exhibit horizontal traceability. Horizontal traceability allows task interdependencies to be identified. Thus, it is the interdependent relationship between the activities within different Control Accounts as well as the interdependency between tasks within the same activity.

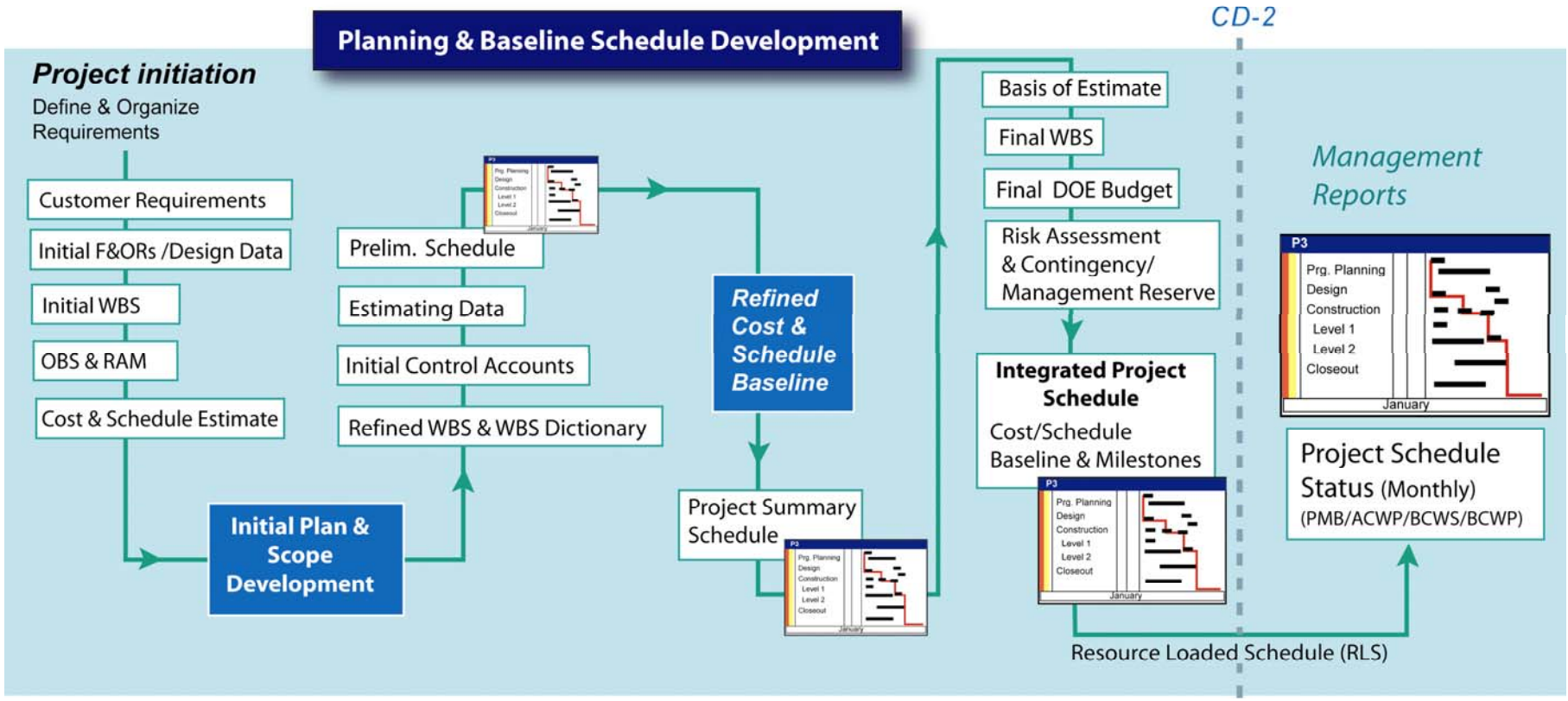


Figure 3-1 Planning and Baseline Development Flowchart
The schedule is developed and refined as more project planning information becomes available.

3.2.3 Work Packages and Planning Packages

Project work is subdivided into manageable groups of activities within a Control Account that are assigned to *Work Packages* for near-term activities and *Planning Packages* for yet to be defined logical aggregations of far-term activities (e.g., several months or more out). As soon as sufficient information is available for completing the detailed planning, the Planning Package must be defined into a discrete Work Package. This "Rolling Wave" technique results in a more meaningful and useful baseline. Each Control Account budget and schedule will be planned in detail into Work Packages and Planning Packages, and time-phased by the responsible Project Manager/CAM (usually the same individual).

A typical Work Package has the following characteristics:

- Represents units of work at levels where work is performed (activity level).
- Is clearly distinguishable from all other Work Packages.
- Is assigned to a single responsible organizational element through the RAM and/or a Work Authorization vehicle.
- Defines scheduled start and completion dates.
- Contains interim milestones representative of physical accomplishments, as applicable.
- Has a budget (traceable to a WBS element) or assigned value expressed in terms of dollars, man-hours, or other measurable units.
- May be (1) a duration limited to a relatively short span of time, (2) subdivided by discrete value milestones to facilitate the objective measurement of work performed, or (3) established as a Level of Effort (LOE) if it does not produce definitive end products.

3.2.4 Critical Path

The Critical Path is a series of activities that must be completed on schedule for an event to complete on schedule. Each activity on the Critical Path becomes a critical activity. If any activity on the Critical Path slips, the event cannot complete on schedule. The Critical Path represents the scheduled activities with the highest risk and the least margin for error. On the schedule, the Critical Path is delineated as an unbroken line between predecessor and successor project tasks from project beginning to project end. This is the longest path through a project network or the network path with the least amount of float. *(Float is the amount of time an activity can slip before it affects another activity finish date.)*

3.2.5 Contractor Planning

Contracts for A/Es and General Contractors (GCs) contain requirements to provide a Schedule in sufficient detail to provide the Project Manager the

information to effectively manage the project. The Project Office will support the Project Manager in ensuring the submitted schedule is consistent with the Performance Management Baseline (PMB).

3.3 Risk Management

Effective risk management is an essential element of every project. The Sandia risk management concept is based on the principles that risk management must be analytical, forward-looking, structured, informative, continuous, and dynamic.

The Sandia risk management process is comprised of four key areas. They are Planning, Assessment (including risk identification and analysis), Handling, and Monitoring/Improving. The overriding objective of the process is to identify potential project risks and implement actions that will mitigate their impact.

Risk assessments are performed as early as possible in a project's life-cycle and should identify critical technical, performance, schedule, and cost risks. Once risks are identified, sound risk mitigation strategies and actions are developed and documented. As the project progresses, new information and insights will allow the Project Manager to continuously refine the identified risks and mitigation strategies or remove the risk from consideration once it is no longer applicable. A risk mitigation strategy for most Line Item projects will include the establishment of an adequate level of Contingency/Management Reserve funding, and schedule contingency to reasonably ensure successful project completion.

A formal Risk Management Plan (RMP), per DOE Order 413.3, is required for all Major System projects (>$400M). A RMP may also be specifically directed by DOE/NNSA for projects having some high focus characteristics or as otherwise determined by the Acquisition Executive (AE) or their designated entity. For projects where a formal RMP is not required, the plan for identifying, managing, and mitigating risks will be addressed as a section in the Project Execution Plan (PEP).

3.4 Contingency/ Management Reserve

Risk mitigation strategies may not necessarily identify all aspects of project risk. A specific allocation (called Contingency/Management Reserve) will normally be established for both cost and schedule that reflects:

- The probable contribution of *known* risk consequences that have not been specifically mitigated or eliminated, and
- An allowance for *unknown* issues within scope that are based on the Project Team's understanding of the overall project complexity and difficulty as well as unknown site conditions that may be encountered during excavation work.

Cost Contingency/Management Reserve will include the Factored Exposure of identified risks **(PROBABILITY X CONSEQUENCE = FACTORED EXPOSURE)** and a Project Team-derived assessment of the overall risk based on the assessment of the risk in each major Control Account. Not all identified risks will be realized, especially as attention is directed toward understanding and eliminating the risks. Conversely, not all risks will be identified during the Planning and Assessment phases.

Schedule Contingency will include margins (extra days) by major activity based on the Project Team's assessment of the overall project complexity and difficulty and based on Sandia's process experience from previous projects.

Aggressive risk assessment, mitigation and monitoring will assist in minimizing the impact of any realized risks. Moreover, the application of agreed to project Contingency/Management Reserve is for Management control purposes and is not used for scope, cost, and schedule changes outside the approved baseline. Contingency/ Management Reserve is filtered out of EVMS calculations until it is applied to a discrete task.

3.5 Work Authorizations

For Line Item projects, work is not performed, costs are not incurred, and procurement is not initiated until work authorization is obtained from the assigned Project Manager through a specific Work Authorization vehicle. To accomplish efficient and effective work via the Work Authorization, all affiliated parties must agree on the scope, schedule, and resources for the activity before the Work Authorization is granted. Each Work Authorization will be assigned to a Responsible Individual (RI) who will be tasked with accomplishing the written Statement of Work (SOW) for that element of the Control Account. In addition, the RI's Manager is required to attest to the negotiated commitment required from their employee. Work Authorization vehicles at Sandia:

- Are negotiated agreements for accomplishing tasks as defined in the project's WBS and will be issued at various phases of the project, as work is required.
- Can take the form of a Contract, Purchase Order (PO), Service Order, Contract Work Authorization (CWA), Memorandum of Understanding (MOU), or Work Authorization Document (WAD). (A WAD template is presented in Appendix D.)
- Can be assigned to *internal* Sandia organizations or *external* entities as illustrated in Figure 3-2.

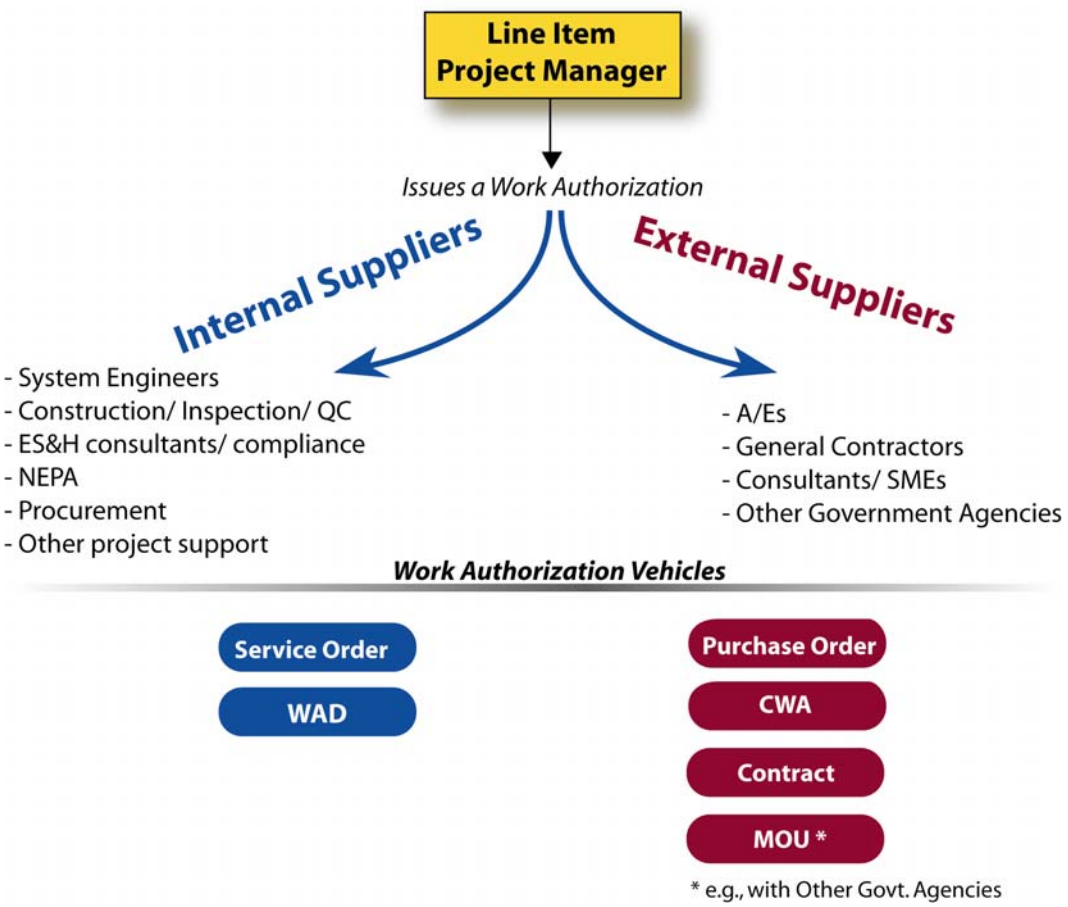


Figure 3-2 Types of Work Authorization Vehicles

The Sandia Project Manager is ultimately responsible for all Work Authorizations relevant to the project; however, CAMs may be delegated to issue Work Authorizations. Roles and responsibilities (and authority levels) for Deputy Project Managers and CAMs are detailed in Section 5.5.

3.6 Overhead Budgets

There are two types of overhead that apply to projects: Facilities Service Center Overhead (SCOH) and Corporate Assessments. These are applied at the activity level. SCOH costs are established and tracked by Facilities Business Systems Department and Corporate Assessments are the responsibility of the Sandia Controller Center (10500) (Corporate Finance). Corporate Assessments are applied to SCOH. Therefore, there are no Sandia Overhead budgets per se to consider as a Control Account.

3.7 Requirements for Employing Earned Value Methodology

Work Packages are established and opened when the Budgeted Cost of Work Scheduled (BCWS) is planned. Each Work Package will have one Earned Value methodology selected to track work progress. Discrete Work Packages (i.e., tangible/measurable work) will use techniques such as **Discrete Effort** and **Apportioned Effort.** Non-discrete Work Packages, such as for Project Management and general support—work that cannot be readily measured—will be tracked using the **Level of Effort (LOE)** technique. The Earned Value technique used in the monthly reporting of work accomplished will include the following characteristics:

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

3.7.1 Earned Value Techniques

Discrete work will be measured using scheduled start and completion dates that represent physical accomplishment. The technique chosen must be compatible with the Control Account schedule. The technique may also employ objective milestones identified to facilitate evaluation of work-in-process (work accomplished).

- **Discrete Effort:** This is a method that requires the Project Manager/CAM to assess the project's progress and estimate how much work has been accomplished. This determination may be based on scheduled start and completion dates that represent physical accomplishment and/or interim milestones established during the planning of the Work Package budget. This is typically expressed in percent of effort complete. Typically, Work Packages are comprised of discrete Tasks that are usually no longer than three weeks in duration. If a Task is longer than two months in duration, the CAM should determine beforehand what constitutes the effort expended or completed for estimating Task percent complete (e.g., defining intermediate milestones).
- **Apportioned Effort:** This method involves budgeting work and "earning value" for a discrete Work Package in a defined relationship with another related Work Package from which progress can be measured objectively. For example, a "Quality Control Review" Work Package may be budgeted at 10 percent of the "Production Processing" budget. Therefore, the value earned monthly by the "Quality Control Review" Work Package would be 10 percent of the valued earned monthly by the "Production Processing"

Work Package, regardless of the actual work performed by Quality Control reviewers.

Additionally, all projects include general work effort that cannot be discretely measured. The LOE methodology will be selected only after all other techniques have been evaluated and reviewed for appropriateness and found not applicable.

- **Level of Effort (LOE):** This is effort of a general or supportive nature, which does not produce a definite end product. A LOE Work Package uses only one Earned Value technique—such that the BCWP equals the BCWS in each reporting period. LOE tasks are budgeted on a time-phased basis for control and reporting purposes.

3.8 Performance Baseline Reviews

Performance Baseline reviews are conducted to ensure that the project's baseline is complete, traceable, and reasonable, in terms of schedules, milestones, and cost estimates. The reviews ensure that there is an adequate level of scope and design detail at each stage in order that priorities and issues can be identified and key performance criteria can be met. Baseline reviews also assess the acquisition strategy/plan, life-cycle costs, project risks/hazards, and the Earned Value Management System (EVMS).

As discussed in Section 1.8, DOE Order 413.3 requires Critical Decision points for all Line Items. However, with DOE concurrence, some Critical Decisions and reviews may be combined or eliminated depending on the complexity of the project. Typically, most Line Item construction projects at Sandia undergo all Critical Decision reviews (optional and mandatory). Critical Decision reviews and other Performance Baseline reviews are conducted, when required, as discussed below.

- **CD-0, "Approve Mission Need"**

  An optional DOE Mission Need Review may occur at CD-0. This is an Independent Project Review (IPR) that will look at the initial project planning accomplished to date including the development of the Mission Need Statement. This review evaluates the Project Team's early efforts in formulating a very preliminary project Performance Baseline. Typical elements of the review include:

  - ✓ Mission Need Statement
  - ✓ Program/Mission Requirements
  - ✓ Total Project Cost and Schedule range estimates

- **CD-1, "Approve Alternative Selection and Cost Range"**

  An optional DOE review may occur at CD-1. This is an IPR that will focus on the analysis supporting the selection of the preferred alternative, will ensure the system functions and requirements are defined, and analyze the preliminary cost and schedule ranges. A Preliminary Project Execution Plan (PEP), Conceptual Design Report (CDR), schedule, and cost range estimates, as well as draft environmental planning documents, as applicable, are submitted for this review. The project's Acquisition Strategy (e.g., Design/Build and Design/Bid/Build) is also an integral part of this review.

- **Sandia Internal Review**

  Prior to the release of the preliminary project baseline (prior to CD-2) for DOE's formal review (i.e., after receipt of Title I design package), the Baseline will be reviewed and approved by the Project Manager with upper Sandia Management concurrence. Any required changes to the Baseline will be incorporated by the Project Controls staff and then resubmitted to the Project Manager for final review.

- **CD-2, "Approve Performance Baseline"**

  At CD-2, all Line Item projects (>$5M) undergo a required DOE External Independent Review (EIR) conducted through the DOE Office of Engineering and Construction Management (OECM). The primary purpose of the EIR is to support OECM's validation of the Performance Management Baseline (PMB) and provide reasonable assurance that the project can be successfully executed in terms of meeting both the authorized budget and Mission requirements.

  OECM is responsible for developing and finalizing the scope for all Performance Baseline reviews. One week after receipt of core project documentation from Sandia, the OECM prepares an initial Scope of Work (SOW) for the review. This allows OECM and their review team time to familiarize themselves with the details of the project and identify specific activities to be covered and persons to be contacted during the review. The draft is then forwarded to the NNSA Deputy Administrator's support office. The NNSA Project Management Support Office and/or the Program Secretarial Officer (PSO) support staff, as appropriate, will then have one week to review, comment, and provide recommendations on the scope of the review itself for OECM's consideration.

  The final Performance Baseline review scope will be issued by OECM to Sandia one week prior to the review start date. The scope can include the following review elements:

- ✓ Project Execution Plan (PEP)
- ✓ Detailed Resource Loaded Schedule (RLS)
- ✓ Detailed Cost Estimate for Total Project Cost (TPC)
- ✓ Alternative analysis and facility life-cycle cost assessment
- ✓ Value Management/Engineering
- ✓ Work Breakdown Structure (WBS) and WBS Dictionary
- ✓ System Functions and Requirements Document (also referred to as the "Design-to" requirements, Design Criteria, or F&ORs)
- ✓ Acquisition Execution Plan (AEP) for the selected alternative
- ✓ Preliminary Design (Title I design package)
- ✓ Results of and responses to Preliminary Design Review
- ✓ Hazards assessment and documentation (e.g., Primary Hazard Screening [PHS], Hazards Analysis [HA], Fire Hazard Analysis [FHA], etc.)
- ✓ Risk Management strategy (formal plan or as a section in the PEP)
- ✓ Project Performance Management (PPM) Process Description
- ✓ Organization Breakdown Structure (OBS) showing Sandia and DOE Integrated Project Teams (IPTs) (roles/responsibilities and qualifications)

- **DOE Independent Cost Review (ICR)**

  An Independent Cost Review (ICR) is used primarily to verify project cost and schedule estimates and support the CD-2 process in validating project Performance Baselines since ICRs are part of the External Independent Review (EIR). However, an ICR or even an Independent Cost Estimate may be requested at other times for other reasons. The OMBE functions as DOE's agent to establish contracts for ICRs. The results of ICRs are documented in formal reports and submitted to the Program Office and Acquisition Executive by the OMBE. (Sandia typically performs an internal ICR prior to the DOE review at CD-0.)

- **SNL Baseline Change Proposal (BCP) Reviews**

  Once the Performance Baseline has been established, validated, and approved (at CD-2), the project is subject to formal Baseline Change Proposals (BCPs) until project closeout. All proposed changes are reviewed and approved as discussed in Chapter 6.0, “Revisions and Data Management,” dependent upon the defined change threshold (e.g., review by Project Manager, Baseline Change Control Board [BCCB], Sandia Site Office [SSO], and DOE/NNSA/HQ). The BCP will be either endorsed/approved, resubmitted with changes, or rejected (refer to Figure 6-1). The disposition of all BCPs will be formally documented and tracked by the Project Manager. The Project Controls staff will

incorporate approved changes to the updated Performance Baseline (i.e., scope, schedule, and cost estimates).

- **CD-3, "Approve Start of Construction"**

  At CD-3, a Construction or Execution Readiness Review is conducted by OECM. This is required for all Major System projects (>$400M). For all other projects, the Program Secretarial Officer (PSO), conducted through the Project Management Support Office, will conduct an Independent Project Review (IPR). The purpose of this review is to assess the readiness for construction and to confirm the completeness and accuracy of the Performance Baseline. The core scope of the review has several elements relative to construction readiness, but retains many of the elements contained in the Performance Baseline review (CD-2). Core documents for CD-3 review include:

  - ✓ Project Execution Plan (PEP)
  - ✓ Integrated Project Schedule
  - ✓ Detailed Cost Estimate
  - ✓ Acquisition Execution Plan (AEP)
  - ✓ Final Design drawings and specifications
  - ✓ Results of and responses to the Final Design Review
  - ✓ System Functions and Requirements document (e.g., F&ORs)
  - ✓ Risk Management Assessment
  - ✓ Safety documentation (PHS, HA, FHA, etc.)

4.0 Accounting Considerations

Project costs are recorded and accrued by Sandia's Financial Accounting System using Control Accounts. As shown in Figure 1-2, ANSI/EIA-748-A guidelines for Accounting Considerations include the requirement to record Direct (raw) and Indirect (burden) costs and to show how they are mapped to a project. The last section of this chapter addresses Sandia's Material Accounting method for tracking accruals.

4.1 Sandia Financial Accounting System

Costs are recorded in a manner consistent with Sandia's Financial Accounting System. Chapter 4 of Sandia's *Financial Manual*, "Cost Accounting Standards Administration and Other Financial Requirements," describes Sandia's standards as follows:

> As a contractual requirement, Sandia complies with Cost Accounting Standards (CAS) in its accounting and charging practices. CAS consists of nineteen detailed standards, promulgated by the Cost Accounting Standards Board and is applicable to contractors of both the defense and civilian agencies of the U. S. Government, including the Department of Energy (DOE). CAS provides accounting requirements for contractors who charge costs to Government contracts.
>
> A Cost Accounting Standards disclosure statement is regularly submitted to the DOE Contracting Officer consistent with CAS and contractual requirements. This disclosure statement provides a general description of Sandia's current or proposed accounting practices, including criteria for classifying Direct and Indirect costs and the basis for allocating Indirect costs. It also documents planned accounting changes for subsequent fiscal years.
>
> With disclosure to DOE, Sandia is contractually obligated to follow its disclosed accounting practices.

4.2 Control Accounts

Within Sandia's Financial Accounting System, cost collection is performed against summary accounts known as "Projects," with sub-account detail referred to as "Tasks." This forms the "Project/Task number" designation associated with each WBS element. Since costs are collected at the Control Account Level, each Control Account will have a unique Project/Task number. This allows all WBS elements within that Control Account to be "rolled up" under the same Project/Task number. Similarly, under each Project/Task number there may be multiple Work Packages and/or Planning Packages, which in combination constitute a unique Control Account.

The Project number is a sequentially assigned a five-digit number, while the Task number is defined at the WBS level (allowing multi-level roll-ups). Under each Project/Task number there may be multiple Work Packages, which in

combination constitute a unique Control Account. Each Control Account established within a Line Item project will correlate to a Level 3 or lower project WBS element (refer to Figure 2-1).

4.3 Direct Costs

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

4.4 Indirect Costs

Indirect costs are those costs incurred for the operation of Sandia that cannot be directly or specifically associated with technical projects in a technical or other direct program. Indirect and Service Center Overhead (SCOH) costs are established and tracked by Facilities Business Systems Department. Sandia Corporate Assessments are established by the Sandia Controller Center (10500) (Corporate Finance) and are applied to SCOH. Indirect costs are distributed to construction projects through an allocation process by applying recovery rates to an appropriate allocation base. Sandia's financial overhead policy (specifically, Chapters 4, 5, and 6 of Sandia's *Financial Manual*) describes how Indirect costs are allocated.

Direct costs and any associated indirect burdens are collected at the project and task level. The combination of direct and indirect costs is referred to as burdened costs. In accordance with DOE requirements, costs must be segregated into two categories—Capital and Expense.

- ***Capital*** costs include the more tangible and obvious elements of a project such as buildings, structures, infrastructure, and capabilities. It also includes project design (preliminary and final), cost of land and improvements, software/hardware and development costs, special and standard equipment, major computer systems, site services (e.g., inspection and escorting costs), and Project Management.
- ***Expense*** costs include all costs incurred during conceptual planning of a project such as Mission Needs Requests, Demolition and Decontamination (D&D), writing the Conceptual Design Report (CDR), preparing ES&H and NEPA documentation, and other project support functions through the life-cycle of the project.

Figure 4-1 illustrates some of the major categories that fall within each portion of the budget.

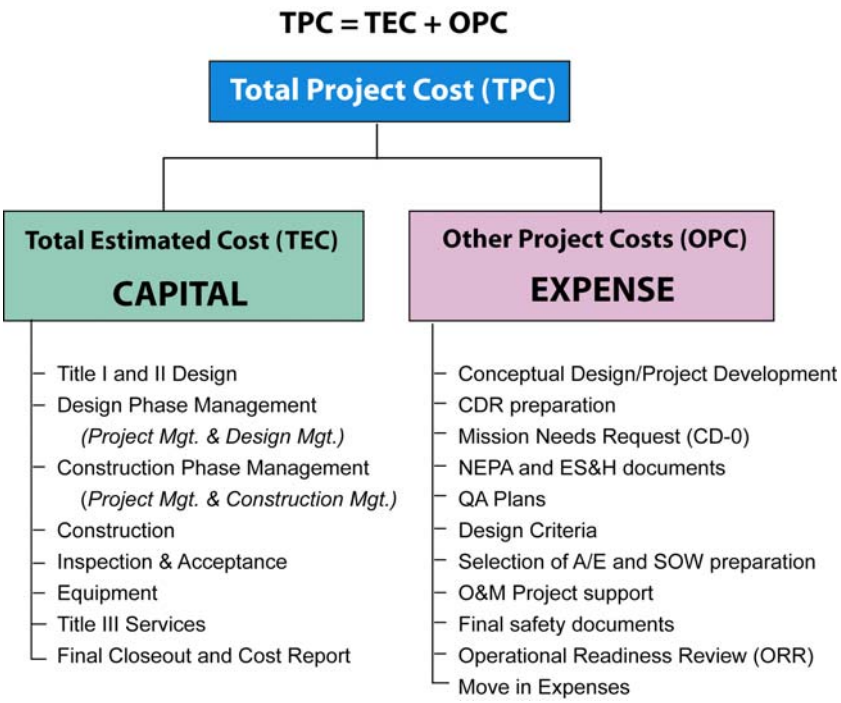


Figure 4-1 Typical Line Item Accounting Structure

4.5 Material Accounting

Material costs are generally recognized as General Contractor Firm-Fixed Price (FFP) contract costs. Due to the nature of an FFP contract, residual inventory accountability (materials purchased but not yet used) is managed and held at the General Contractor level. Cost performance measurement of the FFP contract is measured monthly in order to provide the most meaningful (i.e., timely) cost performance and cost variance data.

Construction projects currently use estimated actual costs for the General Contractor by taking the General Contractor construction schedule that is provided on a monthly basis and comparing the percent complete cost amount to the invoices actually paid. Accruals then are the cumulative estimated total cost minus any invoices already paid. The net amount—percent complete minus invoices paid—becomes the monthly accrual. The following month, the accrual is reversed (subtracted back out) and the process is repeated.

NOTE: Construction project scope does not include production unit costs, equivalent unit costs, or lot costs. Construction costs are estimated using units of construction material; however, for EVMS purposes, the Project Manager does not track them individually as such. On the project level contractor performance is measured based on accomplishment of scope.

5.0 Analysis and Management Reports

From the Performance Measurement Baseline (PMB) discussed in Chapter 3, cost and schedule status will be measured and analyzed. Project variance thresholds, provided by DOE's Office of Engineering and Construction Management (OECM), as well as potentially stricter thresholds imposed by Sandia, provide the parameters for monthly project reports. The Monthly Report identifies project performance parameters (as both time-phased and "snapshot" in time) based on variance analysis. The report may also recommend corrective actions, as appropriate. Management actions (e.g., requesting a Baseline Change Proposal [BCP] and applying Contingency/Management Reserve) will be implemented as prescribed in DOE Order 413.3.

5.1 Project Status

An accurate and current status of the project is needed to ensure that performance commitments (such as the decision to accelerate a project) will be met within the limitation of the authorized budget. The project status will affect decisions to be made relating to resource allocation and the methods used for accomplishing tasks to meet regulatory milestones and performance commitments.

5.1.1 Schedule Status

The project schedule is updated at least monthly as part of the Schedule Turnaround Process. The Project Manager/CAM analyzes the schedule and is responsible for determining:

- Work accomplished or completed,
- Actual start and finish dates (for discrete Work Packages), and
- Remaining duration of activities outstanding.

The Project Manager/CAM collects performance status at the activity level, as appropriate, for work performed during the current period. The Project Controls staff records the percentage of the work completed for both performance-based and Level of Effort (LOE) activities in the project management software. As noted in Section 3.7.1, for LOE activities, BCWP is always calculated to equal BCWS. LOE activities (generally supportive functions) comprise a minor portion of the schedule.

As illustrated in Figure 5-1, once performance status is determined, BCWS and BCWP values for the project are exported from the Project Controls scheduling software and entered to the Monthly Report.

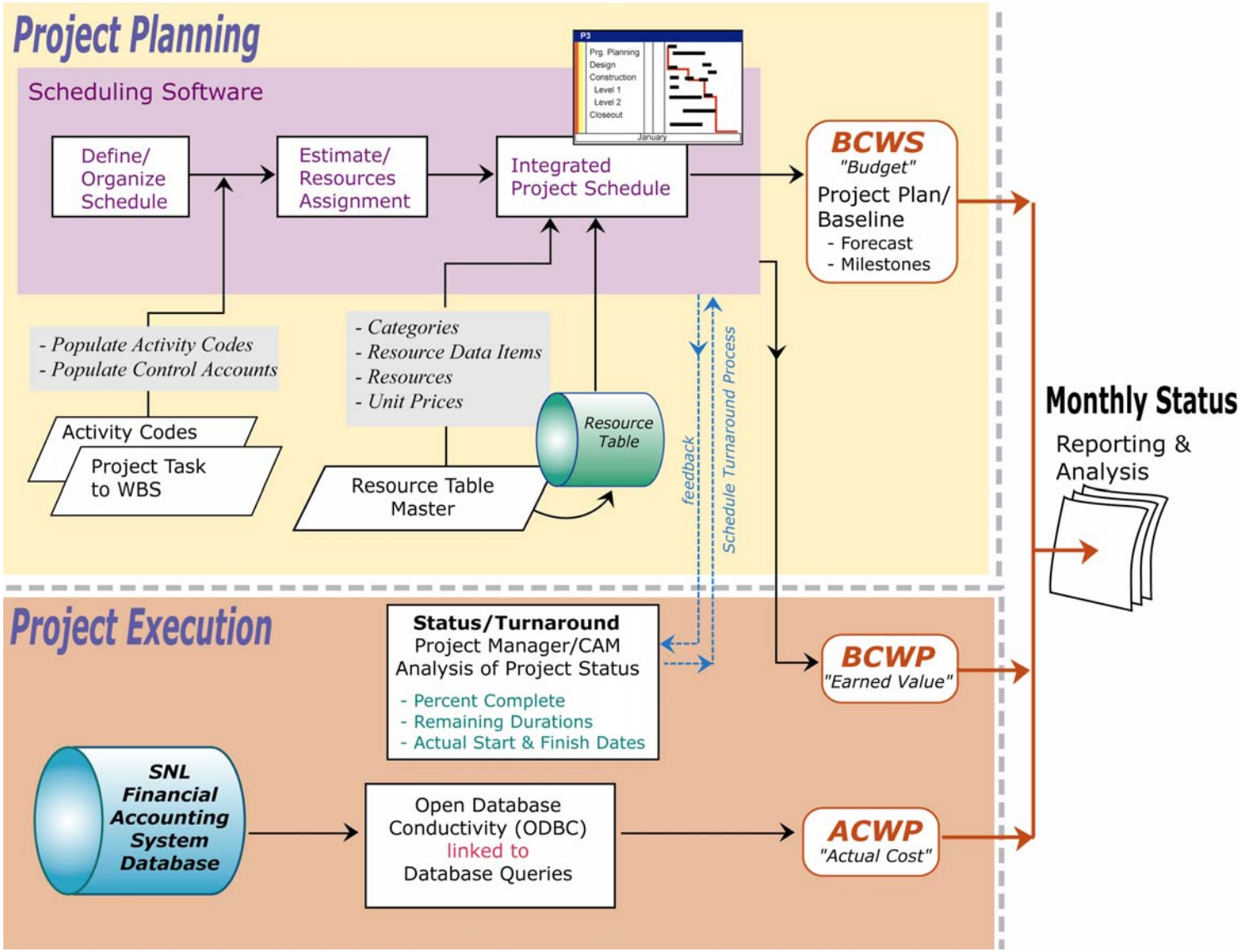


Figure 5-1 Planning, Execution, and Analysis Process

To maintain data integrity, uniquely coded baseline and status files are archived each month. This method of file management allows the retrieval of the two data files (i.e., status and baseline files) that are unique to a particular period by which data can be verified or reproduced, as necessary.

As discussed in Section 3.7, schedule progress for physical accomplishment of discrete Work Packages will be translated into BCWP (Earned Value) for a specific reporting period by one of several methods (e.g., Percent Complete or Apportioned Effort, both which may utilize predetermined milestones.)

5.1.2 Cost Status

As shown in Figure 5-1, costs (ACWP) are obtained from Sandia's Financial Accounting System through monthly database warehouse queries and are merged into the Monthly Report. To ensure continuity in reporting costs, the cost collection structure is aligned with the WBS in the Integrated Project Schedule. Accruals plus paid invoices represent the actual project cost to date.

5.2 Variance Analysis & Reporting

Periodic reports are produced at detailed and summary levels as appropriate for DOE, the Sandia Project Manager, the CAM, Facilities Managers, and Line Managers. Project Summaries provided to DOE/NNSA consist of performance measurement indices, milestone accomplishments, and variance analysis when required. Figure 5-2 illustrates the overall reporting hierarchy.

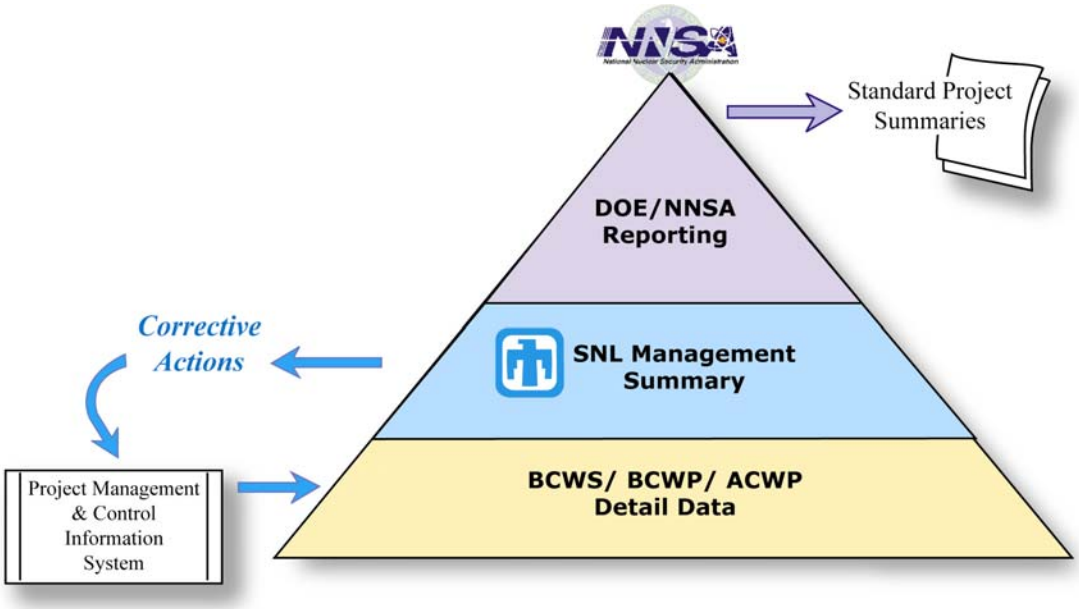


Figure 5-2 Earned Value Data Reporting

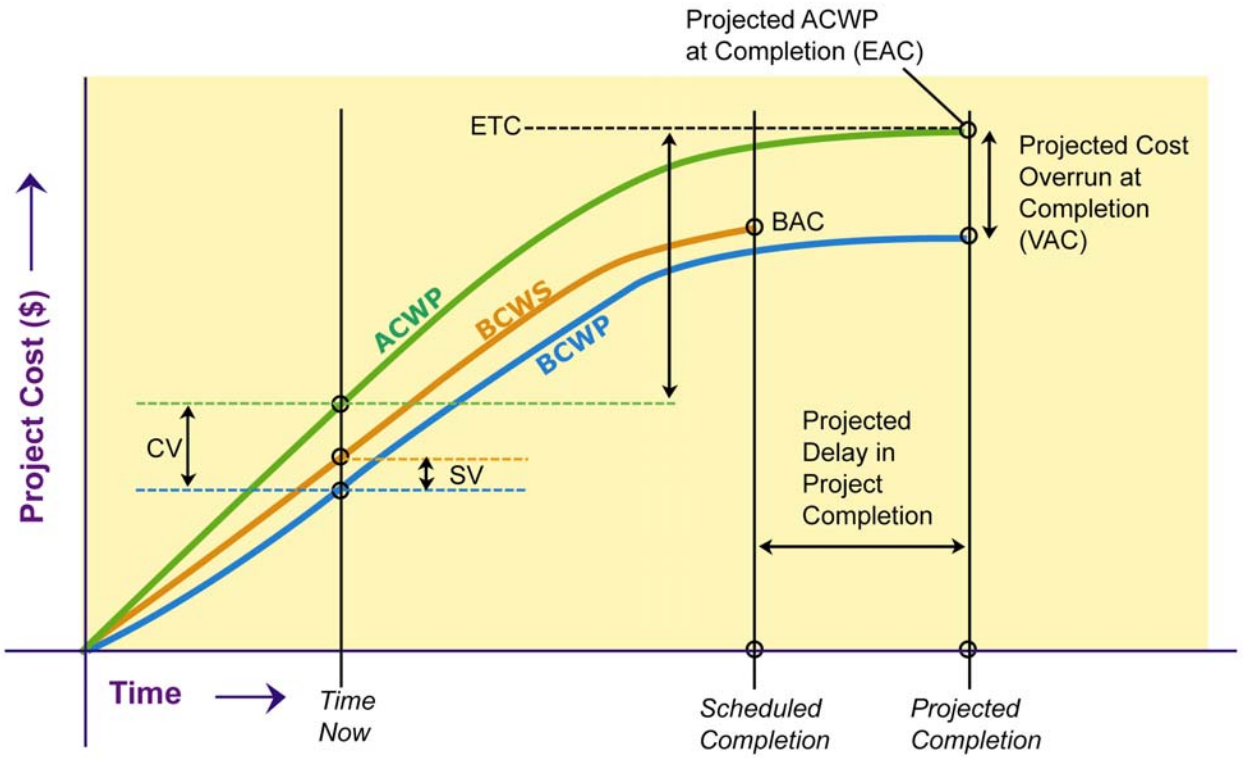
5.3 EVMS Metrics

The CAM(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 ensuring a full understanding of the cost and schedule variance analysis. All metrics will be updated monthly, at a minimum. The metrics employed should be both time-phased and "snapshot" in nature. Time-phased metrics include Cost Performance Index (CPI) and Schedule Performance Index (SPI). The CAM will assess the time-phased metrics to look for trends that are indicative of Control Account performance. "Snapshot" metrics include cost and schedule variances.

Figure 5-3 shows an example project graphically illustrating EVMS metrics. The orange, blue, and green trend lines are all expressed in project dollars. The *orange* line is the Budgeted Cost of Work Scheduled (BCWS), the planned work as defined in the current Performance Management Baseline (PMB). The *green* line, the Actual Cost of Work Performed (ACWP) for the given time period, shows a higher than estimated project cost (the project is overrunning). The *blue* line, the Budgeted Cost of Work Performed (BCWP), or the actual work accomplished for the given time period, is below the baseline (*orange*). As given under "Formulas" beneath the graph, the Schedule Variance is the difference between BCWP and BCWS; the Cost Variance is the difference between BCWP and ACWP. The figure also illustrates other performance indicators including Estimate to Complete (ETC), Variance at Completion (VAC), and Budget at Completion (BAC).

5.3.1 Variance Thresholds

Project performance will meet the thresholds defined by DOE/NNSA Directives (or applicable Program Office). However, the Project Manager may be directed by Sandia Management to use more rigorous thresholds based on the project risk and other factors. These thresholds could be imposed as low as the Control Account level. The rationale for employing stricter thresholds internally is generally to encourage the project to maintain tighter controls so there is much less likelihood of breaching externally imposed thresholds.



Performance Formulas

CV = BCWP - ACWP
SV = BCWP - BCWS

CPI = BCWP/ ACWP
SPI = BCWP/ BCWS

VAC = BAC - EAC

Overall Status

$$\text{Percent Compete} = \frac{\text{BCWP}_{\text{cum}}}{\text{BAC}}$$

$$\text{Percent Spent} = \frac{\text{ACWP}_{\text{cum}}}{\text{BAC (or EAC)}}$$

Definitions

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

Figure 5-3 EVMS Metrics Example

5.3.2 Variance Analysis

Variance analyses provides the means for the CAM to communicate cost, schedule, and Estimate at Completion (EAC) divergences from the PMB. Root cause analysis is performed at the Control Account level. For example some variance may be due to factors outside the control of the Project Manager such a supply and transportation delays. The Control Account structure is integral with the WBS (i.e., it mirrors the WBS). As a result, project variances can be "rolled-up" to the appropriate WBS level for Sandia or DOE/NNSA reports. The formulas for determining variances are as follows:

- **Cost Variance (CV):** The cost variance is determined by BCWP minus ACWP. A positive cost variance generally means that project work is being accomplished for less than planned. Conversely, a negative cost variance generally indicates that a possible overrun may result.
- **Schedule Variance (SV):** The schedule variance is determined by BCWP minus BCWS. A positive schedule variance generally means that the work is being accomplished ahead of schedule. Conversely, a negative schedule variance generally indicates that the work is behind schedule.
- **Coupled Cost and Schedule Variance:** Although the examples above are generally true when each variance is examined in isolation, examination of both variances simultaneously may yield different conclusions and potential action plans. For example, a positive CV (BCWP – ACWP = +) coupled with a negative SV may indicate that the project is behind schedule because insufficient staff is available (underspent), hence the Cost Performance Index (CPI) (i.e., BCWP/ACWP) may be greater than one.
- **Variance at Completion (VAC):** The VAC is calculated by the Budget at Completion (BAC) minus the Estimate at Completion (VAC = BAC – EAC). A positive VAC is favorable and indicates a possible underrun. A negative VAC indicates a possible overrun.

In the monthly variance report, the CAM will provide an accurate description of the problem. The description should focus as much as possible on the root cause, rather than symptoms. A discussion of variance impact will be provided as well. For example, a SV might impact successor tasks.

Finally, the variance report will contain corrective action alternatives, as appropriate. Corrective actions include, but are not limited to, staffing changes, recovery schedules, "crashing" the schedule, and other work-around plans. Variance analyses should correspond closely to past and future risk analyses and assessments. As a result of EVMS information and variance reports, management can make informed decisions.

5.4 Project Cost Estimates

This section describes the process for establishing and maintaining an Estimate at Completion (EAC) based on cumulative costs and the Estimate to Complete (ETC), both of which are calculated estimates, as well as a more subjective Current Working Estimate (CWE) based on the Project Manager's and/or CAM's overall monthly assessments. First, project ETCs and EACs are calculated using industry and government accepted EVMS techniques and methods as detailed in the formulas and algorithms below. However, the final estimate will take into account the Project Manager's and/or the CAM's personal assessment(s) of the remaining work to be completed and whether the calculated amounts have considered all known factors. Therefore, they may change the calculated amount based on these up-to-date factors to determine the best overall estimate.

5.4.1 Monthly Project Status Calculations

Sandia prepares Monthly Project Summary reports that provide cost and schedule variances, cost and schedule performance indices (CPI and SPI), and the Estimate At Completion (EAC), Estimate to Complete (ETC), Variance at Completion (VAC), and the Current Working Estimate (CWE) taking into account the CAM's assessment of known future changes.

The following bullets define various methods/algorithms for calculating an estimate for the cost to complete a project from a point in time—an estimate that includes known future changes and the estimated total final project cost. However, these are only *tools* and not definitive methods. The CAM or Project Manager can overrule calculated results based on their knowledge of the project and the known changes.

a. The ETC and EAC will be computed monthly using industry and government-accepted EVMS metrics. The monthly ETC will be computed by applying past performance, in terms of the Cost Performance Index (CPI) and the Schedule Performance Index (SPI), to the remaining work. The **Work Remaining** will be computed by subtracting the cumulative Earned Value ($BCWP_{cum}$) from the authorized Budget at Completion (BAC) or:

$$\textbf{Work Remaining} = BAC - BCWP_{cum}$$

To calculate the **ETC,** the Work Remaining is divided by the Performance Factor (PF), yielding the algorithm:

$$ETC = (BAC - BCWP_{cum}) / PF$$

Note: PF is equal to CPI or SPI or a combination of both.

This calculation assumes future project performance is a function of the performance to date. From the foregoing, the **EAC** is then obtained by adding the cumulative ACWP to the ETC or:

$$EAC = ACWP_{cum} + (BAC - BCWP_{cum}) / PF$$

At the start of the Task Plan, the EAC will be set equal to the BAC. Based on work performed, the EAC will usually be first calculated after three accounting periods so that a historical trend can be established.

b. **EACs** are calculated on both the Control Account and total project level and are reviewed monthly by the CAM and updated, as appropriate based on the CAM's assessment of the remaining work, to ensure that they reflect the best estimate of total costs for all authorized work

c. **Current Working Estimates (CWEs)** will be based on the Project Manager's and/or the CAM's assessment of the EAC *plus known future changes* including pending Baseline Change Proposals (BCPs). CWEs can be higher or lower than the computed EAC and will be reported in the Monthly Summary Report.

d. The use of **"multiple-look" EAC** values that use several CPI and SPI performance factors is encouraged both at the total project level and Control Account levels. These can include Weighted Averages such as:

- Three or six month CPI moving averages,
- Cumulative CPI and/or SPI, and
- CPI-weighted values.

Table 5-1 lists some suggested **EAC** algorithms that can be used for computing various types of EAC estimates.

Table 5-1 EAC Algorithms Suggested for Computing EACs

Estimates at Completion (EAC)
$EAC_{CPI} = ACWP_{cum} + (BAC - BCWP_{cum}) / (CPI_{cum})$
$EAC_{CPI3} = ACWP_{cum} + (BAC - BCWP_{cum}) / CPI3\ mo\ avg$
$EAC_{SPI} = ACWP_{cum} + (BAC - BCWP_{cum}) / SPI_{cum}$
$EAC_{SCI} = ACWP_{cum} + (BAC - BCWP_{cum}) / (SPI_{cum} \times CPI_{cum})$
$EAC_{PC} = ACWP_{cum} + (BAC - BCWP_{cum}) / [(.8 \times CPI_{cum}) + (.2 \times SPI_{cum})]$

5.5 EVMS Responsibilities

The responsibilities for PPM personnel directly involved with EVMS metrics and assessments are summarized as follows:

- **Control Account Manager (CAM)**
  - ✓ Prepare monthly ETC and EAC.
  - ✓ Prepare monthly CWEs for Sandia and DOE Management review based on known future changes.
  - ✓ Writes the BCPs supported by the Project Controls staff.
  - ✓ Attends Sandia Baseline Change Control Board (BCCB) to present BCPs for Project Manager approval.

- **Project Controls**
  - ✓ Update project schedules monthly and help create monthly status reports.
  - ✓ Support Project Managers, DPMs and CAMs in preparation of monthly CWE.
  - ✓ Send Project Managers/CAMs updated schedule data for review.
  - ✓ Assist in monthly EAC and VAC reporting.
  - ✓ Schedule Sandia/DOE BCCB, as required.

- **Project Manager**
  - ✓ Review monthly EAC/VAC data.
  - ✓ Provide input and review CWE based on known future changes (includes pending BCPs).
  - ✓ Direct corrective action(s), where necessary.

5.6 Management Reports

5.6.1 Monthly Reports

Sandia's Project Managers generate Monthly Reports for all Line Item construction projects. The purpose of the Monthly Report is to provide the Sandia Project Manager, Sandia Senior Management, and DOE/NNSA a periodic assessment of each project by which to monitor and manage the project. These project status reports contain the following information:

- Financial summary
- Budget and outlay profiles
- Status of key milestones
- Estimate at Completion (EAC) and Current Working Estimate (CWE)
- Baseline Change Control (BCC) Log
- Project Manager comments
- EVMS data
- Variance report (if needed)

5.6.2 Variance Analysis Reports

A variance analysis report will be generated when cost and/or schedule variances exceed pre-established thresholds. The report will include alternatives for corrective actions that will address the variant conditions for management actions.

5.7 Management Responsibilities

5.7.1 Management and Accountability for Sandia Facilities Projects

Each project will define and document its organization and accountability structure. Figure 5-4 illustrates the typical Line Item project accountability structure. As shown in the figure, the Sandia Program Director has the overall accountability for the project scope, cost, and schedule and establishes the programmatic and risk parameters for the project. The Program Director relies on the accountable Line Director and/or other accountable Line Managers to establish the technical/operational requirements from a Corporate perspective. The accountable Line Customer provides the Functional and Operational Requirements (F&ORs) for their project and delegates representatives to work directly with the Sandia Project Manager as part of the Sandia Integrated Project Team (IPT). The Sandia Project Manager is the primary Point-of-Contact (POC) for the project and is accountable to develop and execute the project consistent with the technical and Program Director requirements. The figure also illustrates that the Project Manager has formal reporting responsibilities to DOE/NNSA, Facilities Management, and the Line organization.

5.7.2 PPM Policy Ownership and Implementation

As shown in Figure 5-4, Sandia's Chief Financial Officer (CFO), Vice President of Finance and Budget, owns the PPM *policy*. The Facilities Director (10800) then has responsibility to implement the policy. Facilities Management—those organizations executing Line Item construction projects (i.e., Corporate Projects, MESA Program, and SNL/CA Facilities Planning and Engineering)—owns the PPM *process*. Under each Department, Project Managers are responsible for executing the PPM process and conducting timely EVMS reporting. Finally, as shown at the bottom of the figure, the Project Office (10825) provides the necessary support for PPM implementation and Surveillance of the PPM process and is the owner of this PPM Process Description *document*.

5.8 Management Oversight

The Project Manager will provide regular reports to Management on project status. The reporting cycle will be determined on a risk-based approach that will include such factors as project size, complexity, the number and volume of tasks, as well as the point in the project's life-cycle. For example, a project that is in the Conceptual Design stage will likely require less frequent reporting then when it is in full design or construction. The level of reporting will be defined as part of the Communication Plan or in the PEP. Once the project has obtained Critical Decision 2 approval, the reporting cycle will be at least on a monthly basis. Reports will be sent to the appropriate management levels as defined in the project's Organizational Breakdown Structure (OBS). Typically, reports will be forwarded to Facilities Management and the Program and Line Management project customers.

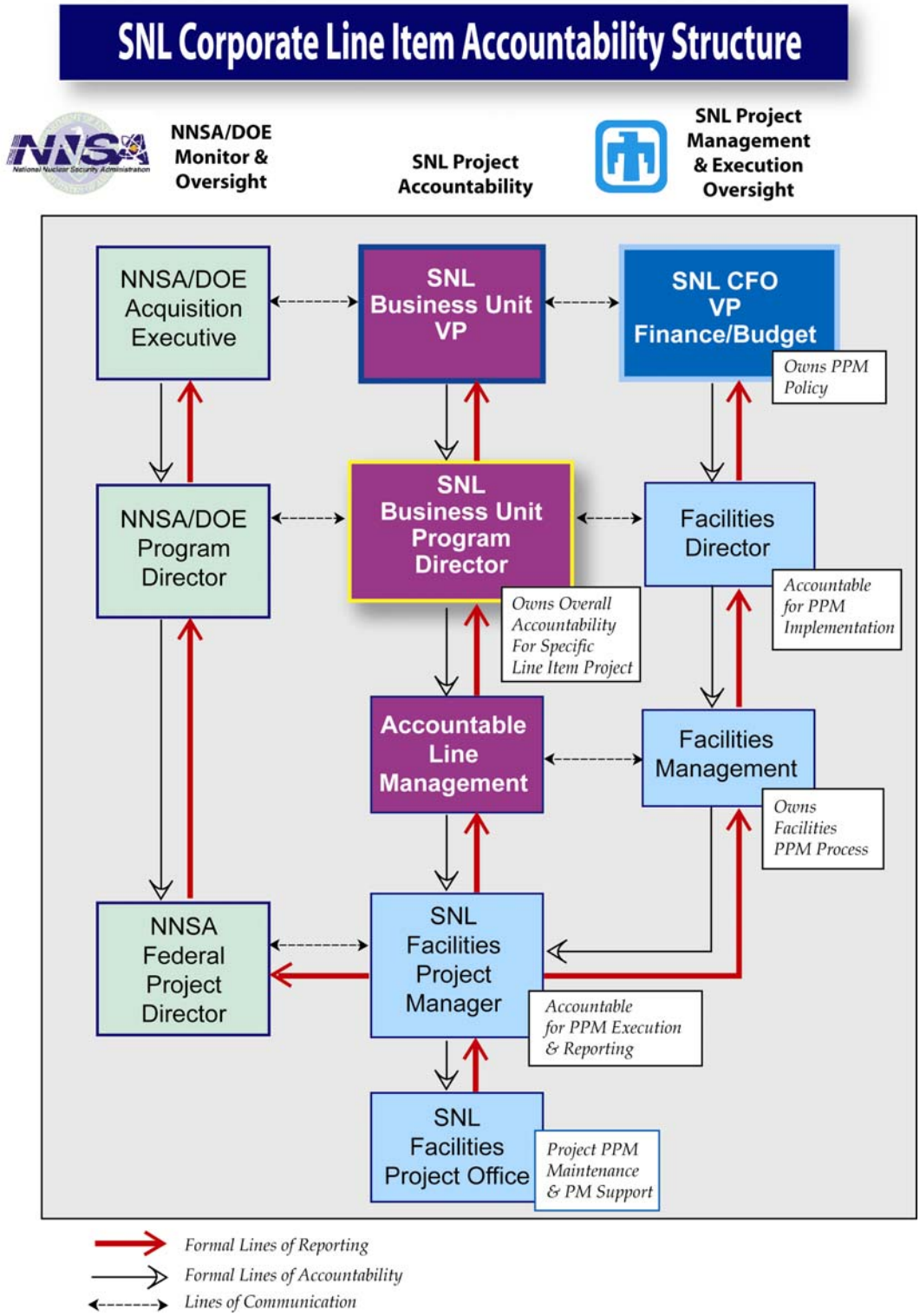


Figure 5-4 Line Item Accountability Process

Program, Line, and Facilities Management will regularly review project status and take appropriate actions to develop corrective actions, if and as required. Management review may include review of any or all of the following:

- Project cost/schedule performance rolled-up to a level appropriate to the overall risks of the project.
- Variance reports and suggested corrective actions.
- Critical Path activity performance.
- Project personnel and staffing.
- Project Baseline change performance.
- Contingency/Management Reserve use and remaining Contingency/Management Reserve.
- Risk strategies.

Management will address variances that are outside the threshold ranges (Section 5.3.1 and 5.3.2). The Project Manager will implement corrective actions based on variance reports identifying activities that fall outside established threshold ranges. Program and Facilities Management may develop corrective actions jointly, as appropriate.

Once the project has received an approved PMB (at CD-2), monthly customer (DOE/NNSA) reports will be generated by the Project Manager as specified in DOE Order 413.3. In addition, the Project Manager will support the Federal Project Director (FPD) in preparing their Quarterly Reports and presentations to the DOE/NNSA Acquisition Executive (AE).

6.0 Revisions and Data Management

This chapter describes formal change control and "Below Level 3" (Sandia internal) changes on a project. "Below Level 3"changes do not affect the Performance Management Baseline (PMB) cost and schedule objectives (i.e., project milestones or TPC or are not otherwise DOE Directed Changes. All changes Level 2 and higher are handled as formal changes because they either affect the project Baseline or are DOE Directed Changes. Sandia's change management process ensures that all changes to the project Performance Measurement Baseline (PMB) are properly defined, proposed through the correct channels, adequately reviewed and considered, and finally dispositioned (i.e., accepted, rejected, or resubmitted with revisions). All changes will be documented and approved prior to their implementation. As shown in Figure 1-2 by the partially shaded bars, Baseline Change Control (BCC) processes are initiated after CD-1 (start Preliminary Design), then are fully implemented once the Baseline is established at CD-2 as shown by the solid bars.

6.1 BCC Procedure, Thresholds, & Approvals

A proper BCC process is critical to preserving the integrity of the PMB and must be well organized and functioning. Project Baselines are defined in the PEP within the scope, cost, and schedule sections. These include descriptions of the authorized work and the scope/cost/schedule thresholds and approval authorities. To remain a useful PPM tool, the PMB needs to be maintained in order that it represents the actual plan (BCWS) and work accomplished (BCWP) (e.g., timely). Consequently, it is necessary to manage and update the PMB through a formal, traceable BCC process. For Line Item projects greater than $20M the following change control processes will apply:

A. A formal project change control procedure will be established so that scope, cost, and schedule Baseline changes are identified, controlled, and managed through a traceable, documented process prior to initiation of revisions. All accepted changes to the PMB (scope, cost, and schedule changes) will be formally logged, documented, and filed for the life of the project after which all project documentation is archived and sent to Sandia's long-term storage.

B. The established BCC process shall be prepared in accordance with the BCC guidelines. Change control processes will begin:

- After CD-1 for Design (scope/cost/schedule); and
- After CD-2 for the PMB.

C. Change control thresholds (defined for scope/cost/schedule) and approval levels shall be in accordance with the project change control guidelines specified in the PEP. For projects greater than $20M, the BCC approval authorities are as follows:

- Level 0 – DOE/NNSA Secretarial Acquisition Executive (SAE)
- Level 1 – DOE/NNSA Program Secretarial Officer (PSO)
- Level 2 – DOE/NNSA Site Office Manager/Deputy Manager
- Level 3 – Contractor (Sandia)

Figure 6-1 illustrates the BCC process flow and approval authorities for *formal* BCPs implemented at threshold Levels 0, 1, 2, and 3. Figure 6-2 illustrates the Below Level 3 Configuration Change Request (CCR) process for project changes that do not affect the Baseline (below Level 3). However, all requested changes are initiated through the CCR process and then elevated to the BCP process, as applicable. During the construction phase, it is expected that the contractor will submit many Requests for Information (RFIs) directed to the A/E for clarification of design and construction issues. Some RFIs that require a configuration change may generate a CCR.

Sandia will further define and implement thresholds and approval authorities for changes managed at the site (contractor) level. Normally, the Project Manager will approve site level changes and/or endorse higher-level changes to DOE/NNSA for subsequent review and approval.

D. DOE/NNSA change control forms and instructions for their completion will be used as specified in the PEP. The forms may be adjusted or expanded as required by Sandia so that the BCP being presented is clear, descriptive, accurate, and complete and serves as a stand-alone document.

E. Timely incorporation of authorized changes is essential to ensure accurate reporting of the PMB. At a minimum, performance reporting on approved changes will be implemented during the period in which they are incorporated, or consistent with other project functional capabilities (e.g., financial, procurement, contracts, etc.), within the next month's reporting cycle.

F. Changes to prior period baseline performance data (retroactive changes) should be limited to accounting adjustments, to correct data errors, or to incorporate customer (DOE/NNSA) Directed Changes.

G. Reallocation and/or use of project Contingency/Management Reserve as a result of Baseline changes will be recorded in the project BCC Log.

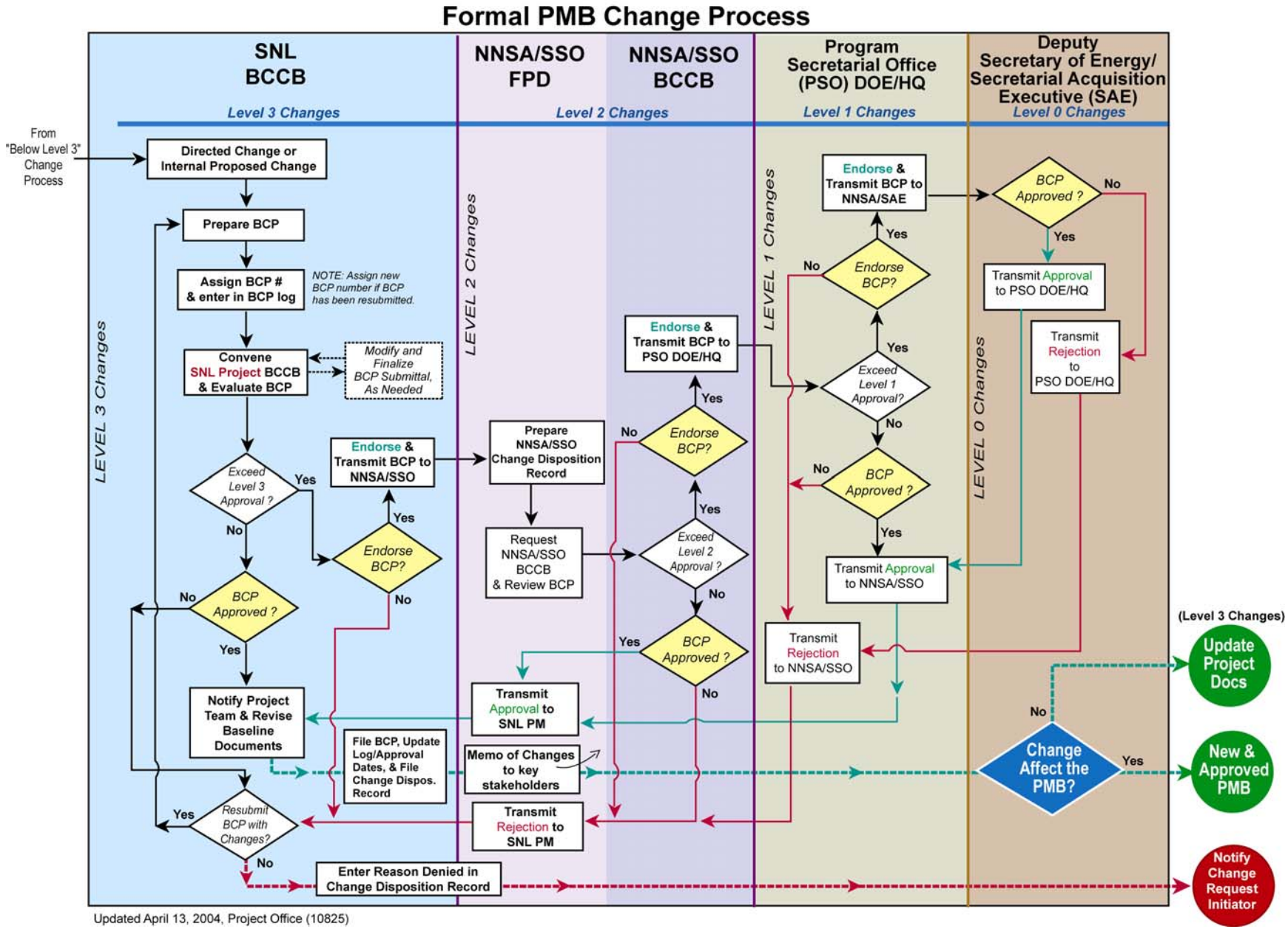


Figure 6-1 BCP Process Flow and Levels of Endorsement and Approval Authority

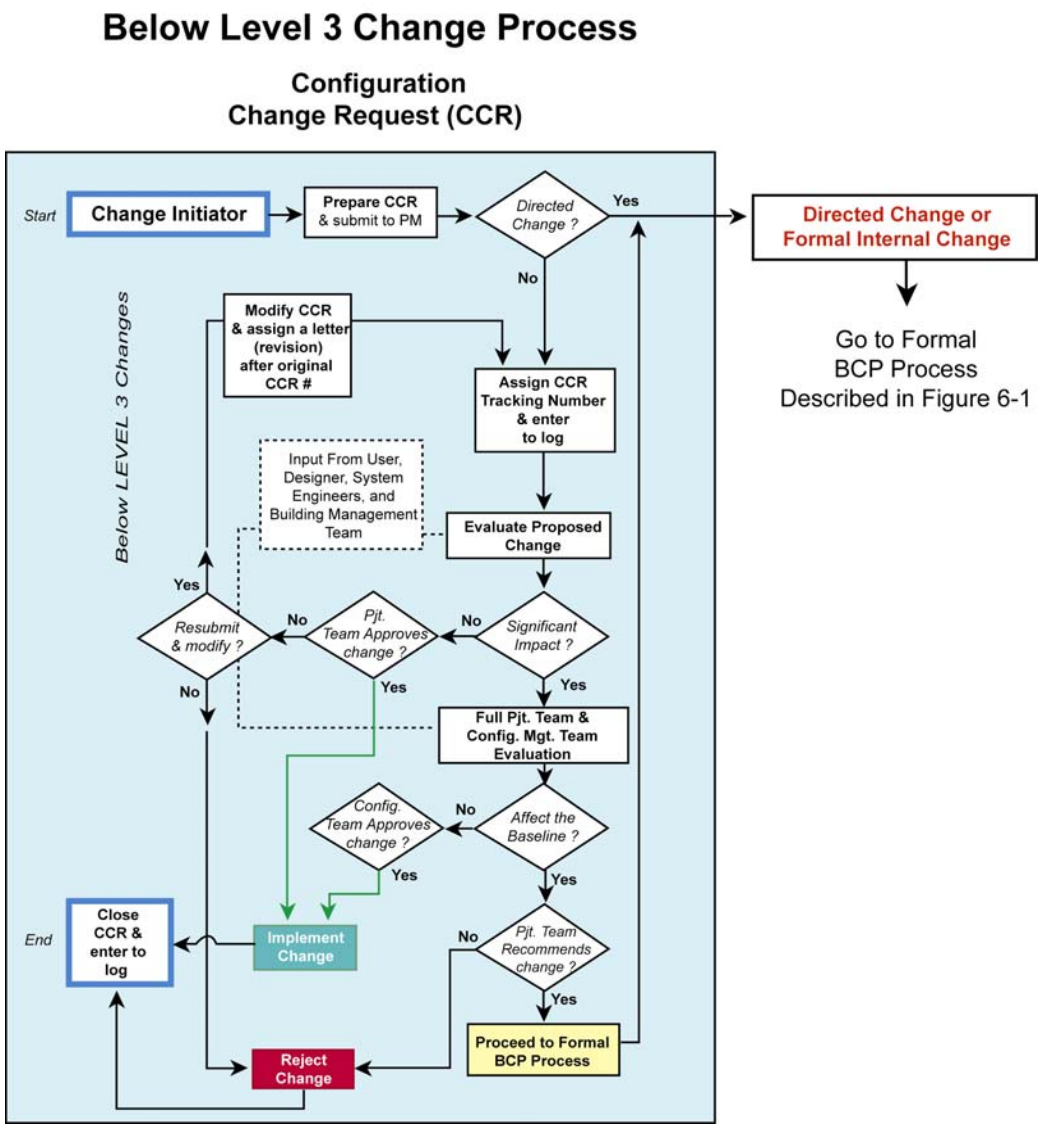


Figure 6-2 Below Level 3 Change Process

6.2 External/Internal Changes

External and internal drivers may cause the PMB to change.

6.2.1 Externally Directed Changes

An externally Directed Change is one that is imposed on the project, generally by DOE/NNSA/HQ, 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:

- Congressional Appropriations (budget changes)
- Government-wide Rescissions
- DOE/NNSA/HQ approved funding changes
- Program Secretarial Officer (PSO) direction
- New or revised DOE/NNSA policy directives
- Regulatory or statutory requirements (e.g. environmental laws, policies, etc.)

Normally, the DOE/NNSA Federal Project Director (FPD) will provide a copy of the Directed Changes to the Program Director/Project Manager in writing.

Externally Directed Changes may affect the project Total Project Cost (TPC) and/or Total Estimated Cost (TEC), both of which require DOE/NNSA approval. If changes to the PMB are within the purview of Sandia, then they are accomplished as described in Section 6.2.2. Conversely, if Directed Changes impact the Baseline in a manner that exceeds the Sandia approval thresholds, and unless specifically authorized for implementation in the DOE/NNSA written instructions, the BCP will be formally processed for DOE/NNSA approval. A copy of the written directed change should accompany the BCP.

6.2.2 Internal Changes

Sandia may prepare and implement internal BCPs for review by Sandia's Baseline Change Control Board (BCCB) within the limits of the PEP-approved Level 3 thresholds, as necessary to accommodate cost, schedule, or technical scope changes (Figure 6-1). These BCPs may be prepared to reorganize work or personnel and/or to accommodate different engineering or technical approaches. Since BCPs will result in the redistribution of budget, traceability to previous Baselines and attention to funding requirements must be maintained. Another example would be a Sandia Program level change that may require a project to undergo major re-planning to redefine the project scope and thus the Functional and Operational Requirements (F&ORs). Level 2 and higher BCPs are sent to NNSA/SSO for BCCB for review. Significant changes may be sent as high as the Acquisition Executive (AE) at DOE/HQ.

6.3 Change Control Responsibilities

The responsibilities for personnel directly responsible for BCC activities are summarized as follows:

Sandia Project Manager

- *Endorse* Level 2 or higher BCPs to DOE/NNSA for review and approval (see Figure 6-1).
- Approve, reject, or resubmit with changes all Baseline changes within Site Level authority (i.e., Threshold Level 3) in a timely manner.
- Authorize budget allocations from project Contingency/Management Reserve as required by the approved BCP (Level 3).
- Inform key stakeholders of Level 3 and higher changes (see Figure 6-1).
- *Approve*, reject, or resubmit with changes all Level 4 changes using the Configuration Change Request (CCR) form. (These are referred to as "Below Level 3" changes. The process is shown in Figure 6-2).

Project Controls Staff

- Assist Control Account Managers (CAMs) in developing and preparing BCPs, as required.
- Schedule Sandia Baseline Change Control Board (BCCB) to review site Level 3 or higher BCPs.
- Establish new Project/Tasks and/or close existing ones, as required.
- Update the Project Baseline schedules, resources, and budgets in accordance with the approved BCP.
- Allocate the project Contingency/Management Reserve as required per the BCP.
- Update and maintain the BCC Log for both "Below Level 3" and formal BCP changes. Track all approved Contingency/Management Reserve changes.

Control Account (Project/Task) Managers

- Identify/forecast need for BCPs to Project Controls staff.
- Develop and prepare BCP with the required cost/schedule/technical documentation.
- Provide input to Project Controls concerning affected WBS elements and activities.
- Attend BCCB to present BCPs for Project Manager review and approval.

6.4 Document & Files Management

Project Data

All project data/files including EVMS reports for each project will be maintained, distributed, and archived by the Project Manager or a delegated Responsible Individual (RI).

PPM Revisions

It will be the responsibility of the Facilities Project Office to maintain this PPM description (i.e., the process outlined in this document). The PPM process will be available on a Sandia share drive and will be maintained, updated, and formally revised electronically. The cover page of the PPM will show the date of the last change(s) made to the electronically controlled version and those changes will be logged on a Change Log form located at the front of the document. All hard copies of the document will be updated by inserting the appropriate change pages, however, at no time will a hard copy be considered the Controlled Document, but will only be a copy. The Controlled version will reside on the network and will be available in read-only format. The Facilities Project Office Department Manager must approve all content changes to this document (not including general editing corrections).

6.5 Retroactive Changes

Retroactive changes to prior performance data are avoided. Required adjustments to prior data are rare and carefully controlled. The only justifications are adjustments to project or Corporate accounting methods to improve accuracy of data and for accounting errors. Care is taken to ensure that variances are not masked and the PMB is not changed. All key stakeholders will be informed of any retroactive changes.

7.0 Surveillance

Management will maintain an effective and efficient Project Performance Management (PPM) process though Surveillance, which will include ensuring that Line Item projects over $20M conduct Self-Assessments. Sandia will continuously improve this PPM process through Surveillance, using the most current management techniques and processes to manage projects most efficiently. This Chapter describes the Surveillance responsibilities and the processes that will be implemented.

7.1 PPM Responsibilities

The Facilities Project Office (10825) will be responsible for Surveillance of the PPM process. Each Surveillance team selected to assess Facilities projects will include members of the Project Office and include other Sandia Department members who are not directly involved in the project's execution. The Surveillance team leader must also not be directly involved in the project's execution. The Project Office will:

- Coordinate the Sandia Facilities annual PPM Self-Assessment (i.e., each Line Item) with other Facility organizations responsible for projects with a cost greater than $20M.
- Summarize the PPM Self-Assessment results to provide a single overview for submittal through the Accountable Sandia Directors to Lockheed Martin Corporation (LMC) (at least annually).
- Review any Self-Assessment findings and facilitate the processes for corrective action(s).

Sandia Facilities organizations that execute Line Item projects (SNL/NM Corporate Projects, MESA Program, and SNL/CA Facilities Planning and Engineering) will:

- Assist the Project Office by obtaining the data necessary to accurately fill out the PPM Self-Assessment Checklist for their projects.
- When appropriate, develop Corrective Action Plans (CAPs) resulting from the Self-Assessment and ensure they are implemented in accordance with this PPM document and Sandia Corporation requirements.
- Provide documentation identifying corrective action completion by the Line Item organization to the Project Office within 60 days (exceptions will be handled on a case-by-case basis).

7.2 Self-Assessment

Project Managers executing Line Items will submit Self-Assessment data to the Project Office by the end of the each calendar year. The Project Office will submit a single Sandia Self-Assessment overview to Lockheed Martin Corporation (LMC) in the first quarter of the following calendar year.

Sandia will use the latest version of LMC's EVMS Self-Assessment and Application Inventory format for project Self-Assessment.

7.3 Management Surveillance

Management Surveillance is a continuous Quality Control (QC) monitoring process. Sandia Facilities Management will insure that the PPM process is providing current, reliable, and confident information on project performance and that the Project Manager is correctly using the information to manage their project.

The Management Surveillance process will include the following:

- Each project's Baseline will be reviewed during CD-2 reviews as directed in DOE Order 413.3.
- Independent Surveillance reviews of projects requiring PPM processes will be conducted in accordance with the Project Execution Plan (PEP) and DOE Manual 413.3-1, Chapter 9, "Project Reviews."
- The PPM system will be periodically, but not less than annually, reviewed against the ANSI/EIA-748-A Guidelines, Sandia Corporate Requirements, and the LMC Earned Value Council's self-assessment guidelines.
- Sandia Facilities Management will provide Surveillance on an "as needed" basis based on Monthly Project Reports and/or consultation with the Project Office after the annual self-assessment period.

The Project Office will maintain records of Surveillance actions and monitor CAPs.

References

American National Standards Institute/ Electronic Industries Association, ANSI/EIA-748-A, *Earned Value Management Systems.*

U.S. Department of Energy, DOE Order 413.3, *Program and Project Management for the Acquisition of Capital Assets.*

U.S. Department of Energy, DOE Manual 413.3-1, *Project Management for the Acquisition of Capital Assets.*

U.S. Department of Energy, *DOE Project Acquisition Plan Guide.*

Lockheed Martin Corporation, Corporate Policy Statement CPS-026, *Program Performance Management.*

Lockheed Martin Corporation, SPS-070, *Program Management*.

Lockheed Martin Corporation, Technology Services Procedure SGP-026, *Program Performance Management*.

Sandia National Laboratories, Corporate Policy Statement, *Project Performance Management*, Corporate Process Requirement No: CPR400.4.3.

Sandia National Laboratories, *Financial Manual*, Chapter 4, "Cost Accounting Standards Administration and Other Financial Requirements," CPR500.1.1, SNL Division 10000, Revised February 6, 2004.

Sandia National Laboratories, *Sandia National Laboratories Ten-Year Comprehensive Site Plan (TYCSP)* (Annually revised).

Sandia National Laboratories, *Site-Wide Environmental Impact Statement (SWEIS)* (December 1999).

Sandia National Laboratories, *Line Item Customer Training Manual, Department.*

Websites

These sites are not accessible as such:

http://contracts.corp.lmco/ccontracts/evm/evm.html

http://lmco.com

EVMS Homepage: http://www.acq.osd.mil/pm

Appendix A –

Sandia FMOC Corporate Policy Statement "Project Performance Management"

Corporate Process Requirement No: CPR400.4.3
Frank Figueroa, 10000

Issue Date:
March 15, 2004
Revision Date:
Original

IMPORTANT NOTICE: A printed copy of this document may not be the document currently in effect. The official version is located on the Sandia Restricted Network (SRN) and watermark-controlled.

Project Performance Management

This document contains the following sections:

1.0 Statement of Applicability
2.0 Process Requirement
PPM Process
3.0 Roles and Responsibilities
Vice President, Business Management and Facilities Services Division
Director, Facilities Management and Operations Center
Manager, Technical Facilities Projects Services Program
4.0 Definitions

1.0 Statement of Applicability

This Corporate Process Requirement applies to all Sandia Corporation Organizations that procure/execute/manage Line Item Construction Projects that exceed $20 million in total project costs (TPC). Requests for exceptions must be submitted in writing to the Sponsor of this Process Requirement. Consequences for violating Corporate Business Rules will be determined in the same manner as other Disciplinary Actions.

2.0 Process Requirement

It is Sandia Corporation policy to provide its customers with construction projects that meet or exceed required performance levels within established cost and schedule targets. Accordingly, the Facilities Management and Operations Center (FMOC) is required to document, implement, and maintain a Project Performance Management (PPM) process consistent with the type, size, and complexity of its construction projects, the relevant contractual requirements, the level of risk, and sound business judgment.

PPM Process

The PPM process provides the Corporation, program, project, and Department of Energy (DOE) management with objective, timely, and comprehensive insight into project progress. The PPM process:

- integrates project requirements, scope, schedule, and cost objectives;
- establishes a plan for accomplishing the program or project objectives; and
- applies appropriate earned value techniques for performance measurement during the execution of a project.

The combination of advance planning, baseline maintenance, and earned value analysis provides a measure of accomplishment, cost and schedule performance metrics, and predictive metrics. The PPM process includes the following elements:

- Planning all work from project inception to completion.
- Breaking down the project work into finite pieces that can be assigned to a responsible person or organization for control of technical, schedule, and cost objectives.
- Integrating the project scope, schedule, and cost objectives into a performance measurement baseline plan against which accomplishments may be measured.
- Controlling changes to the baseline.
- Using actual costs incurred and recorded in accomplishing the work performed.
- Assessing the accomplishments at the work-performed level in an objective manner.
- Analyzing significant variances from the plan.
- Forecasting impacts and preparing an estimate at completion based on performance to date and work to be performed.
- Using Earned Value Management (EVM) information in the Corporation's management processes.

The PPM process will include the application of EVM principles to the projects in order to provide management with an effective and objective measure of technical, cost, and schedule performance. The PPM process documentation includes a description of the EVM application and its method of assessing business/program or project risk.
Industry guidelines are provided in ANSI/EIA-748, Earned Value Management Systems (EVMS). Contractual requirements are provided in DOE Order 413.3 and DOE Manual 413.3-1, Project Management for the Acquisition of Capital Assets. This process requirement is also in compliance with Lockheed Martin's Corporate Policy Statement CPS-026, Program Performance Management and Lockheed Martin's Technology Services Procedure SPG-026, Program Performance Management.

3.0 Roles and Responsibilities

Vice President, Business Management and Facilities Services Division Ensures that the objectives of this policy are met and delegates accountability for implementation to the Director, Facilities Management and Operations Center (FMOC).
Director, Facilities Management and Operations Center (through the Technical Facilities Projects Services Program Manager)

- Institutes the PPM process, monitors its success, and ensures that Corporation personnel comply. Applies EVM principles to Line Item construction projects with a total project cost exceeding $20 million.
- Integrates the PPM process across all disciplines' work activities.
- Develops and maintains a graphical or narrative EVM process flow and a map that documents the compliance with this policy.
- Trains all personnel involved in planning or implementing the PPM process.
- Implements EVM best practices to the extent that they benefit the project.
- Provides timely performance information (e.g., trend data) to the Corporation, program, project, and Department of Energy management.
- Uses performance information to enhance confidence and satisfaction of project stakeholders.

- Develops and implement a PPM Surveillance Plan that considers a project's risk and EVMS performance at a minimum. A joint surveillance plan with primary project stakeholders is recommended.
- Applies lessons learned from the PPM Surveillance.
- Annually, in the first quarter, prepares and submits an EVMS Self Assessment and Application Inventory to Lockheed Martin, using the PPM Surveillance results as the rationale for the responses provided. This confirms that the FMOC's EVM process is designed to generate performance data in which management can have confidence.
- Reports the Cost Performance Index (CPI) and Schedule Performance Index (SPI) trend data points during the monthly and/or Quarterly Performance Reviews/Reports.

Manager, Technical Facilities Projects Services Program (FMOCFPSP) (or designated FPSP Manager)

- Provides summary information to Lockheed Martin (required to maintain EVMS corporate certification) and other appropriate management and customer personnel.
- Provides corporate management with appropriate reports.
- Communicates with Department of Energy oversight activities to ensure that Sandia's PPM initiatives are understood and customer issues are addressed.
- Considers the Program Performance Management activities for risk and compliance with this policy and local procedures, in the process of conducting routine surveillance.

4.0 Definitions

To get the latest definitions of terms used in this document follow this link.

Subject Matter Expert: Steven Fattor
Corporate Business Rules Web Coordinator: Juanita Evans

Appendix B –

Glossary of Terms and Acronyms

Glossary

Accomplishment – The interim, critical, or discrete activities that must be completed prior to a defined milestone or package of work.

Actual Cost of Work Performed (ACWP) – The cost incurred and recorded in accomplishing the work performed within a given time period.

ANSI/EIA Standard-748-A – The set of 32 statements, originally established by DoD 5000.2R, which define the parameters for the contractor's integrated cost/schedule management system. The 32 criteria are subdivided into five key performance areas.

Apportioned Effort (AE) – Effort that, by itself, is not readily measurable or divisible into discrete Work Packages, but which is related in direct proportion to the planning and performance on other measured effort.

Baseline – (See Performance Measurement Baseline).

Budget at Completion (BAC) – The sum of all budgets established for a project. It is the total authorized budget for accomplishing the project scope of work.

Budgeted Cost of Work Performed (BCWP) (aka. "Earned Value") – It is the sum of the budgets for completed Work Packages and completed portions of open Work Packages, *plus* the applicable portion of the budgets for Level of Effort (LOE) and Apportioned Effort. BCWP is expressed in project dollars.

Budgeted Cost for Work Scheduled (BCWS) (aka. "Budget") – The planned cost for a defined scope of work or portion thereof that was scheduled to be accomplished through a given time period. Specifically, BCWS is the sum of the budgets for all Work Packages and Planning Packages scheduled to be accomplished (including in-process Work Packages), plus the amount of Level of Effort (LOE), Apportioned Effort, and summary Planning Packages scheduled within a given time period.

Change Control Board (aka. Configuration Control Board) – A group of people responsible for evaluating and approving or disapproving proposed changes to the configuration of a project (scope, cost, and schedule) that are under formal change control and for ensuring implementation of approved changes.

Charge Number – An accounting number established for the accumulation and collection of costs. There can be one or more charge numbers that sum to a Control Account. A charge number may be assigned to one task, multiple tasks, or all tasks in a Control Account.

Control Accounts – (previously called Cost Accounts) a management control point at which resource plans and actual costs are accumulated and compared to Earned Value for management control purposes. Control accounts are defined by integration of the project organization and the WBS, and thus represent a defined work scope with associated charge number(s) given to a single organizational unit (and CAM) for work performance. The Control Account is where project cost, schedule, and technical work scope requirements are integrated, planned, and managed.

Contingency/Management Reserve – An amount of the total project budget withheld for management control purposes rather than designated for the accomplishment of tasks within the project. It is not a part of the Performance Measurement Baseline (PMB). This funding source is set aside for use only under specific conditions. It should never be used to add additional scope or to correct schedule slippage.

Control Account Plan (CAP) –The CAP represents work within a single Work Package (a single WBS element), and therefore is the focus for planning, monitoring, and controlling work.

Control Account Manager (CAM) – The individual identified in the Organizational Breakdown Structure (OBS) as having cost, schedule, and technical responsibility for the effort in each Control Account assigned to the CAM (at Sandia the Project Manager and the CAM are usually one in the same except on very large projects such as MESA). The CAM is responsible for the planning and control of each account and the identification, analysis, and reporting of significant variances over which he/she is assigned responsibility. Upon assuming Control Account responsibility, the CAM is empowered to exercise prerogative in managing resources and schedule to meet technical objectives.

Cost Accumulation Structure – The cost accumulation structure provides a method for segregation of costs. Logic is developed and applied when establishing Control Accounts and charge numbers. This logic typically identified the WBS element and the responsible organization. Costs include materials, labor, and other direct costs. These are collected at a minimum at the Control Account level. Charge numbers are mapped to Control Accounts to ensure actual costs are properly applied.

Cost Performance Index (CPI) – The decimal value determined by dividing the numerical value for Earned Value (BCWP) by the numerical value for Actuals (ACWP) in a given time period. A value greater than 1.0 indicates cost performance better than planned. A value less than 1.0 indicates cost performance poorer than planned. (It is a measure of the dollar amount “earned” for every dollar actually spent.)

Cost Variance – A metric for the cost performance on a project. It is the algebraic difference between Earned Value and actual cost (Cost Variance = BCWP – ACWP). A positive value indicates a favorable position and a negative value indicates an unfavorable condition.

Critical Path – On a project schedule this is the "the longest event path through a project network or the network path with the least float." It is a series of activities that must be completed on schedule for an event to complete on schedule. Each activity on the Critical Path is a critical activity. If an activity on the Critical Path slips, the event cannot compete on schedule. The Critical Path represents the scheduled activities with the highest risk and the least margin for error, therefore, this path is closely monitored because any delay in this network could extend costs and/or schedule.

Current Working Estimate (CWE) – The CWE is based on CAM and/or Project Management assessments (best judgment) of known or future events that would affect the Estimate at Completion (EAC). Examples of events considered in the CWE are BCPs submitted but not approved or known shortfalls in future resources.

Defense Contract Management Agency (DCMA) – The agency responsible for contract administration and providing liaison between the government customer and the prime contractor.

Direct Costs – Those costs identified specifically with a contract, based upon the contractor's cost identification and accumulation system as accepted by the cognizant Defense Contract Audit Agency (DCAA) representatives.

Discrete Effort – Effort that is planned, budgeted, and performed as separate detailed Work Packages, each of which has a specific end product or end result. Discrete effort can be scheduled in relation to clearly definable start and completion dates and contains milestones against which performance can be measured.

Estimate at Completion (EAC) – The current estimate total cost of accomplishing all project authorized work. It equals the direct costs plus indirect costs allocable to the contract plus the estimate of costs to completion (Estimate to Complete [ETC]). (EAC = Actual costs to date + ETC)

Estimate to Complete (ETC) – That portion of the EAC that addresses total expected costs for all work remaining on the contract.

EVMS – An integrated system that includes the comparison of BCWP, BCWS, and ACWP to determine project performance expressed as variances and indices.

Earned Value – As a narrow definition, this is simply BCWP. It represents the value of work accomplished in terms of dollars, and is based on work

accomplishments. Accomplishments are statused and entered into the EVMS prior to the end of the accounting month, at a minimum.

Float – The amount of time an activity can slip before it affects another activity finish date. It is the difference between when an activity can happen and when an activity must happen. Positive float (reserve) should be conserved and managed. Negative float indicates activities that must be reworked to meet event schedules. Events may be milestones or deliverables.

Horizontal traceability – The ability to identify interfaces and consistent dates between interconnecting schedules within each level of the schedule. An assessment of inter-organizational and intra-organizational impacts on future activities and milestones based on actual performance to date and current program conditions can be made.

Indirect Costs – That portion of labor, material, or other cost not directly related or specifically identifiable to a contractually authorized end product or service. Such costs will usually include, but are not limited to, supervisory and administrative labor, utilities, fringe benefits, and expendable type materials such as operating supplies. Indirect costs could include Project Management, Overhead (OH), burden, G&A, Lab Directed Research and Development (LDRD), etc. expenses.

Integrated Project Schedule – The Integrated Project Schedule is a network of program-planned activities keyed to the Project Plan. It is hierarchically structured and provides integrated planning down to at least the Control Account level of detail. The Integrated Project Schedule is constructed to provide horizontal and vertical traceability, interdependencies, and the ability to roll information up the network. It is also used to perform critical path analysis.

Level of Effort (LOE) – General or supportive effort that does not produce a defined end product or result. Work that does not, in itself, provide tangible products. Examples are supervision, Project Management and project administration tasks. LOE is characterized by a sustained rate of activity over a specific period of time and therefore, schedule variances are not possible with LOE tasks.

Milestone – An event or achievement that signifies completion of a planned effort. Major milestones include contract milestones defined by the customer in the design or construction contract and DOE/NNSA designated Critical Decision points. Significant events or deliverables are typically defined by the project to provide planning constraints for lower-level tasks.

Office of Engineering and Construction Management (OECM) – A division within the DOE tasked with integrating sound fiscal acquisition and business practices into the project management process for DOE

construction projects and Facilities & Infrastructure (F&I). OECM administers

Organizational Breakdown Structure (OBS) – The hierarchical arrangement of the management organization for a project that graphically depicts reporting relationships. The organizational structure will be by work team, function, or whatever organization units are used by the project.

Percent complete – The percentage of work completed for a budgeted element. Dividing the numerical value for the cumulative Earned Value by the numerical value for the Budget at Completion (BAC), multiplying the result by 100 gives the percent complete.

Planning Packages – A logical aggregation of work within a Control Account, normally the far-term effort, that can be identified and budgeted in early baseline planning, but can not yet be defined into work packages.

Planned Value (PV) – This is the BCWS. It equals physical work scheduled plus approved budget to accomplish that work. Cumulative PV is everything scheduled to present. Current PV is a describes a set period of time.

Project Performance Management (PPM) – The set of Project Management tools for determining project status from a quantitative vs. qualitative assessment. PPM incorporates a Earned Value Management System.

Performance Measurement Baseline (PMB) – The total time-phased budget plan against which project performance is measured. It is the schedule for expenditure of the resources allocated to accomplish project scope and schedule objectives. It is equal to the Contract Budget Base less Contingency/Management Reserve.

Project Manager (PM) – The individual assigned responsibility for all project activity. The Project Manager is the work team leader for the construction project. All personnel assigned to the project report to the Project Manager or the assigned Deputy Project Manager. However, the Project Manager still retains ultimate responsibility.

Project Performance Management (PPM) – Project Performance Management is a process built on a platform of fundamental Project Management concepts. Its objective is to provide a means to measure work accomplished against a detailed performance plan in order to forecast the ongoing final total project cost and schedule position. The structure and disciplines of the process provide for integration of cost and schedule elements with technical performance in order to provide visibility into project performance.

Responsibility Assignment Matrix (RAM) – A document that provides an overview of the control accounts relationship to the WBS and responsible organization. The RAM is created by properly locating the intersection of

the responsible functional organization with the WBS. It identifies all Control Account Managers, their line management organization, and shows the relationship of each control account to its associated WBS element.

Request for Information (RFI) – During construction, the General Contractor often requires clarification on design for construction issues that arise on the job. It is expected that many RFIs will be issued during the construction phase. If an RFI requires a configuration change to resolve the problem or results in an additional cost, a Configuration Change Request (CCR) form will be prepared.

Rolling Wave – This is a concept related to time-phasing Planning Packages in a sequential and/or parallel "rolling wave" of work. It is a technique for forward planning and budgeting that allows detailed budgeting and scheduling of work tasks that start within the near-term as Work Packages. The remaining project work is held within Control Accounts as Planning Packages.

Schedules – Line Item Projects have various schedules developed as the project progresses. During project development, prior to CD-2, a *Preliminary* resource loaded *Schedule* is developed. Once the baseline is established at CD-2, the fully resource loaded schedule becomes the *Integrated Project Schedule*. A "rollup" *Summary Schedule* can be derived from the Integrated Project Schedule. The General Contractor (GC) also provides their own resource loaded schedule, called the *Construction Schedule.*

Schedule Performance Index (SPI) – The decimal value determined by dividing the numerical value for earned value by the numerical value for budget for a given time period. A valuegreater than 1.0 indicates schedule performance better than planned. A value less than 1.0 indicates schedule performance poorer than planned.

Schedule Variance – A metric for the schedule performance on a project. It is the algebraic difference between Earned Value and the budget (Schedule Variance = Earned Value – Budget). A positive value is a favorable condition while a negative value is unfavorable.

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

To Complete Performance Index (TCPI) – The decimal value determined by dividing the numerical value for work remaining (BAC – BCWP) by the numerical value for resources required to complete unaccomplished work or Estimate-to-Complete (ETC) for a given time period. The ETC is the numerical forecast of resource requirements for uncompleted work. A value >1.0 indicates future performance must exceed past performance to

meet the reported Estimate-at-Complete (EAC). A value <1.0 indicates future performance can be poorer than past performance to meet the reported EAC.

Variance at Complete (VAC) – The difference between the total budget and Estimate at Complete (BAC – EAC).

Variance Analysis – The analysis of Cost Variances, Schedule Variances, or At-Complete Variances to determine the cause for the variance, any impact the variance may have, and any corrective action necessary to meet project objectives as planned. Variance data originates at the Control Account level; however, analysis is performed at the level that will provide the most meaningful information to management.

Vertical traceability – This refers to the ability to relate activities and milestones between different levels of the Integrated Project Schedule. Milestones that appear on more than one level of the schedules must have the same date (or an earlier date) as the date on the upper level schedules in order to satisfy vertical traceability.

Work Authorization – Project work is described in terms of the scope, schedule, and cost, which is authorized through a work authorization system.

Work Package – A Work Package is a natural subdivision of the Control Account. The Work Package will describe the detailed work to be performed, schedule the expenditures of resources, and serve as a vehicle for monitoring and reporting progress and accomplishment of work.

Work Breakdown Structure – The WBS is the framework used to facilitate the requirement of integrating scope, schedule, and cost. It is a logical breakdown of work into detailed tasks. The WBS can be organized in various ways, but it is best to organize it in a format that describes how the work will actually be carried out. The WBS should be a product-oriented division of project tasks depicting the breakdown of work scope for work authorization, tracking, and reporting purposes. The WBS is a direct representation of the work scope defined in the project.

WBS Dictionary – Is a detailed listing of WBS elements with a description of the work scope content in each element. The work descriptions are normally summary level and provide for clear segregation of work for work authorization and accounting purposes.

Acronyms

ACWP	Actual Cost of Work Performed ("actuals" monthly accrued costs)
A/E	Architect/Engineer or Architectural/Engineering
AE	Acquisition Executive
AEP	Acquisition Execution Plan
ANSI	American National Standards Institute
ANSI/EIA	American National Standards Institute/ Electronic Industries Association
BAC	Budget at Completion
BA	Budget Authority
BCC	Baseline Change Control
BCCB	Baseline Change Control Board
BCP	Baseline Change Proposal
BCWP	Budgeted Cost of Work Performed (or "earned value")
BCWS	Budgeted Cost of Work Scheduled (or "budget")
BL	Baseline
CA	Control Account
CAM	Control Account Manager
CAP	Corrective Action Plan
CAS	Cost Accounting Standards
CCR	Configuration Change Request
CD	Critical Decision (CD-1 to CD-4)
CFO	Chief Financial Officer
CDR	Conceptual Design Report
CM	Construction Management
CMAR	Construction Manager at Risk
CMT	Configuration Management Team
CP	Critical Path
CPI	Cost Performance Index
CPS	Corporate Policy Statement
CV	Cost Variance
CWE	Current Working Estimate
DCAA	Defense Contract Audit Agency
DCMA	Defense Contract Management Agency
D&D	Demolition and Decontamination
DHS	U.S. Department of Homeland Security
DoD	U.S. Department of Defense
DOE	U.S. Department of Energy
DPM	Deputy Project Manager
EA	Environmental Assessment
EIS	Environmental Impact Statement
EIR	External Independent Review
EAC	Estimate at Completion
ETC	Estimate to Complete
ESAAB	Energy Systems Acquisition Advisory Board
ES&H	Environment, Safety, and Health
EV	Earned Value
EVT	Earned Value Technique
EVMS	Earned Value Management System
FAR	Federal Acquisition Regulation
F&OR	Functional and Operational Requirement
FFP	Firm-Fixed Price
FHA	Fire Hazard Analysis
FPD	Federal Project Director
FIRP	Facilities & Infrastructure and Recapitalization Program

FMOC	Facilities Management and Operations Center
FY	Fiscal Year
GC	General Contractor
G&A	General and Administrative (Overhead)
GAAP	Generally Accepted Accounting Principals
GFE	Government Furnished Equipment
GPP	General Plant Project
HA	Hazards Analysis
HR	Human Resources
HQ	Headquarters
IAW	in accordance with
ICE	Independent Cost Estimate
IPT	Integrated Project Team
ICR	Independent Cost Review
IPR	Independent Project Review
ID	identification
IPR	Independent Project Review
IWTA	Intra-Sandia Work Transfer Agreement
LDRD	Lab Directed Research and Development
LMC	Lockheed Martin Corporation
LMSSC	Lockheed Martin Space Systems Company
LOE	Level of Effort
M	Million dollars
MR	Management Reserve
MESA	Microsystems and Engineering Sciences Application
M&O	Management and Operations
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act
NNSA	National Nuclear Security Administration
OBS	Organization Breakdown Structure
ODBC	Open Database Conductivity
OECM	Office of Engineering and Construction Management (DOE)
OMBE	Office of Management, Budget, and Evaluation (DOE)
OPC	Other Project Costs
O&M	Operations and Maintenance
OH	Overhead
ORR	Operational Readiness Review
P3	Primavera Project Planner
PDS	Project Data Sheet
PED	Project Engineering and Design
PEP	Project Execution Plan
PF	Performance Factor
PHS	Primary Hazard Screening
PM	Project Manager
PMB	Performance Measurement Baseline
PO	Purchase Order
POC	Point-of-Contact
PPM	Project Performance Management
PSO	Program Secretarial Officer (DOE)
QA	Quality Assurance
QC	Quality Control
R&D	Research and Development
RAM	Responsibility Assignment Matrix
RFI	Request for Information
RFP	Request for Proposal
RFQ	Request for Quotation
RI	Responsible Individual
RLS	Resource Loaded Schedule

ROM	Rough Order of Magnitude
RW	Rolling Wave
SAR	Safety Analysis Report
SAE	Secretarial Acquisition Executive
SCOH	Service Center Overhead (Sandia)
SCR	Sandia Contracting Representative
SME	Subject Matter Expert
SNL	Sandia National Laboratories
SNL/NM	Sandia National Laboratories/New Mexico
SNL/CA	Sandia National Laboratories/California
SOW	Statement of Work
SPI	Schedule Performance Index
SRN	Sandia Restricted Network
SSO	Sandia Site Office (DOE/NNSA)
SV	Schedule Variance
SWEIS	Site-Wide Environmental Impact Statement
T&M	Time and Materials
TEC	Total Estimated Cost
TEDS	Training Education Development System
TYCSP	Ten-Year Comprehensive Site Plan
TPC	Total Project Cost
VAC	Variance at Completion
VP	Vice President
VPAT	Visual Project Analysis and Tracking
WA	Work Authorization
WAD	Work Authorization Document
WBS	Work Breakdown Structure

Appendix C –

ANSI/EIA-748-A Guideline Map

EARNED VALUE MANAGEMENT SYSTEM GUIDELINES

The following map list the 32 guidelines for Earned Value Management as standardized in American National Standards Institute/ Electronic Industries Association (ANSI/EIA)-748-A. The second column of the table, "Sandia Implementing Policies and Procedures," defines how Sandia meets each guideline. Sandia uses the term "project" instead of "program" since this Compliance Map relates to the management of discrete Line Item construction projects (over $20M). The last column points the reader to the applicable section(s) of the document that demonstrate compliance with a particular guideline.

ANSI/EIA-748-A Guidelines	Sandia Project Performance Management (PPM) Implementation
ORGANIZATION	
Guideline 1: Define the authorized work elements for the program. A Work Breakdown Structure (WBS), tailored for effective internal management control, is commonly used in this process.	Authorized work is organized per the project WBS and implemented in accordance with DOE Order 413.3 and the Project Execution Plan (PEP). **2.2 Work Breakdown Structure (WBS)** A WBS is a hierarchical grouping of project elements that organizes and defines the total work scope of the project. The WBS is a project tool that forms the basis for planning and scheduling work, budgeting, and reporting—on EVMS and other project status areas. Each Line Item construction project will utilize a WBS to effectively and efficiently manage the project scope.
Guideline 2: Identify the program organizational structure including the major subcontractors responsible for accomplishing the authorized work, and define the organizational elements in which work will be planned and controlled.	The Federal Project Director (FPD) is selected and the Integrated Federal Project Team is organized. The Sandia Project Manager is selected and an initial Sandia Integrated Project Team is organized, which evolves from Programming, Design, Construction, and Project Closeout. The Organizational Breakdown Structure (OBS) (both Federal and Sandia IPTs) is presented in the PEP. Both the Architectural/Engineering (A/E) firm(s) and the General Contractor (GC) firm(s) will be a part of the Sandia IPT's OBS. **2.4 Organization Breakdown Structure (OBS)** The OBS shows how project personnel are organized and defines roles and responsibilities and reporting hierarchies. The specific project organization structure for each Line Item is clearly defined in the PEP. … Project team members external to Sandia but part of the Sandia IPT will include the Architectural/Engineering (A/E) design firm and the General Contractor (GC) as well as other consultants, as applicable. The primary leads in the project organization include: *(Sandia)* ✓ The **Sandia Project Manager** is charged with managing the day-to-day execution of the facility design and construction, and executing the project within approved cost, schedule, and scope baselines. The Project Manager also manages all resources necessary to accomplish the project whether they are in-house personnel, consultants, or contractors. The Sandia Project Manager may also appoint Deputy Project Managers. ✓ The **Control Account Manager (CAM)** has responsibility for the cost, schedule, and technical responsibility for the effort in each assigned Control Account. For most Sandia construction projects the CAM and the Project Manager are one and the same. The CAM is responsible for the planning and control of each Control Account and the identification, analysis, and reporting of significant variances.

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Guideline 3: Provide for the integration of the company's planning, scheduling, budgeting, work authorization and cost accumulation processes with each other, and as appropriate, the program work breakdown structure and the program organizational structure.	WBS elements and OBS roles/responsibilities for the Federal and Sandia organizational charts are integrated into a matrix called the Responsibility Assignment Matrix (RAM). The resulting RAM maps each work element to a responsible individual (RI) and forms the outline for the Control Account Managers (CAM). The Integrated Project Schedule forms the basis for measuring project performance. **3.0 Planning, Scheduling and Budgeting** This chapter discusses how the project planning outputs discussed in Chapter 2 (WBS, OBS, PEP, and RAM) are used in the development of the project schedule, from preliminary schedules to the fully Integrated Project Schedule. **3.2 Integrated Project Schedule** The Integrated Project Schedule shows the network of program-planned activities that reflect cost, schedule, and technical performance as described in the Project Execution Plan (PEP). It is hierarchically structured and provides integrated planning down to at least the Control Account level of detail. The Integrated Project Schedule is constructed to provide horizontal and vertical traceability and interdependencies. It is also used to perform critical path analysis. **3.2.3 Work Packages and Planning Packages** Project work is subdivided into manageable groups of activities within a Control Account that are assigned to Work Packages for near-term activities and Planning Packages for yet to be defined logical aggregations of far-term activities (e.g., several months or more out). A typical Work Package has … *(bullet)* A budget (traceable to a WBS element) or assigned value expressed in terms of dollars, man-hours, or other measurable units. **3.5 Work Authorizations** For Line Item projects, work is not performed, costs are not incurred, and procurement is not initiated until work authorization is obtained from the assigned Project Manager through a specific Work Authorization vehicle. **4.2 Control Accounts** Within Sandia's Financial Accounting System, cost collection is performed against summary accounts

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	known as "Projects," with sub-account detail referred to as "Tasks." This forms the "Project/Task number" designation associated with each WBS element. Since costs are collected at the Control Account Level, each Control Account will have a unique Project/Task number. This allows all WBS elements within that Control Account to be "rolled up" under the same Project/Task number. Similarly, under each Project/Task number there may be multiple Work Packages and/or Planning Packages, which in combination constitute a unique Control Account.
Guideline 4: Identify the company organization or function responsible for controlling overhead (indirect costs).	Overhead budgets are the responsibility of the Sandia Controller Center (10500), which is the Sandia Finance Department. They bear the responsibility of developing overhead pools, and tracking actual indirect expenditures. Indirect and Service Center Overhead (SCOH) costs are established and tracked by Facilities Business Systems Department. Corporate Assessments are applied to SCOH. **3.6 Overhead Budgets** There are two types of overhead that apply to projects: Facilities Service Center Overhead (SCOH) and Corporate Assessments. These are applied at the activity level. SCOH costs are established and tracked by Facilities Business Systems Department and Corporate Assessments are the responsibility of the Sandia Controller Center (10500) (Corporate Finance). Corporate Assessments are applied to SCOH. Therefore, there are no Sandia Overhead budgets per se to consider as a Control Account.
Guideline 5: Provide for integration of the program work breakdown structure and the program organizational structure in a manner that permits cost and schedule performance measurement by elements of either or both structures, as needed.	The integration of the Work Breakdown Structure (WBS) with the Organizational Breakdown Structure (OBS) forms the RAM by linking each activity with a Responsible Individual (RI). In this way the RAM also defines the Control Accounts and the Work Packages and Planning Packages within each Control Account. A summary RAM is included in each Project Execution Plan (PEP). **2.2 Work Breakdown Structure (WBS)** A WBS is a hierarchical grouping of project elements that organizes and defines the total work scope of the project. The WBS is a project tool that forms the basis for planning and scheduling work, budgeting, and reporting—on EVMS and other project status areas. Each Line Item construction project will utilize a WBS to effectively and efficiently manage the project scope. **2.4 Organization Breakdown Structure (OBS)** The OBS shows how project personnel are organized and defines roles and responsibilities and reporting hierarchies. The specific project organization structure for each Line Item is clearly defined

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	in the PEP. … Project team members external to Sandia but part of the Sandia IPT will include the Architectural/Engineering (A/E) design firm and the General Contractor (GC) as well as other consultants, as applicable. The primary leads in the project organization include: *(Sandia)* ✓ The **Sandia Project Manager** is charged with managing the day-to-day execution of the facility design and construction, and executing the project within approved cost, schedule, and scope baselines. The Project Manager also manages all resources necessary to accomplish the project whether they are in-house personnel, consultants, or contractors. The Sandia Project Manager may also appoint Deputy Project Managers. ✓ The **Control Account Manager (CAM)** has responsibility for the cost, schedule, and technical responsibility for the effort in each assigned Control Account. For most Sandia construction projects the CAM and the Project Manager are one and the same. The CAM is responsible for the planning and control of each Control Account and the identification, analysis, and reporting of significant variances. **2.5 Responsibility Assignment Matrix (RAM)** The Responsibility Assignment Matrix (RAM) is an essential element of the project that integrates the organization structure with the scope of work outlined in the PEP. Major project milestones, documents, and actions are identified, then cross-walked to the part of the organization that is responsible for that deliverable. **3.2 Integrated Project Schedule** The Integrated Project Schedule shows the network of program-planned activities that reflect cost, schedule, and technical performance as described in the Project Execution Plan (PEP). It is hierarchically structured and provides integrated planning down to at least the Control Account level of detail. The Integrated Project Schedule is constructed to provide horizontal and vertical traceability and interdependencies. It is also used to perform critical path analysis. Some key elements generally identified on the Integrated Project Schedule include: …*(bullet)* Functionally-oriented organization and …*(bullet) P*erson or organization responsible for the task. **4.2 Control Accounts** Within Sandia's Financial Accounting System, cost collection is performed against summary accounts known as "Projects," with sub-account detail referred to as "Tasks." This forms the "Project/Task number" designation associated with each WBS element. Since costs are collected at the Control Account Level, each Control Account will have a unique Project/Task number. This allows all WBS

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	elements within that Control Account to be "rolled up" under the same Project/Task number. Similarly, under each Project/Task number there may be multiple Work Packages and/or Planning Packages, which in combination constitute a unique Control Account.
PLANNING & BUDGETING	
Guideline 6: Schedule the authorized work in a manner, which describes the sequence of work and identifies significant task interdependencies required to meet the requirements of the program.	The activities entered in the scheduling system are linked in logically related sequences depicting how the work will be performed over the duration of the project. Tasks are entered depicting requirements in the project schedule. The Project Office (10825) under the supervision of the responsible CAM creates schedules. Schedule activities have interdependencies, constraints, and relationships to other tasks in any existing Control Account, also known as horizontal traceability. Vertical Traceability is the hierarchy of the continuous logical sequence from summary to detail level of a WBS element. Linkage among schedule tasks also establishes the Critical Path. **3.1 Project Summary Schedule** The Project Summary Schedule is a rollup schedule created from the Integrated Project Schedule showing major project milestones and high-level activities (generally at WBS Level 3), which summarizes work to be performed on the project. The intent of the Project Summary Schedule is to provide a clear, pictorial overview of the project. It should depict all key milestones and critical tasks in an abbreviated format that captures the scope of the project. **3.2 Integrated Project Schedule** The Integrated Project Schedule shows the network of program-planned activities that reflect cost, schedule, and technical performance as described in the Project Execution Plan (PEP). It is hierarchically structured and provides integrated planning down to at least the Control Account level of detail. The Integrated Project Schedule is constructed to provide horizontal and vertical traceability and interdependencies. It is also used to perform critical path analysis.
Guideline 7: Identify physical products, milestones, technical performance goals, or other indicators that will be used to measure progress.	Most aspects of the construction project involve physical products. Thus a large portion of the requirements based schedule tasks are discrete, involve acceptance, and are milestone based.

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	3.2 Integrated Project Schedule The Integrated Project Schedule shows the network of program-planned activities that reflect cost, schedule, and technical performance as described in the Project Execution Plan (PEP). It is hierarchically structured and provides integrated planning down to at least the Control Account level of detail. The Integrated Project Schedule is constructed to provide horizontal and vertical traceability and interdependencies. It is also used to perform critical path analysis. **3.2.3 Work Packages and Planning Packages** Project work is subdivided into manageable groups of activities within a Control Account that are assigned to Work Packages for near-term activities and Planning Packages for yet to be defined logical aggregations of far-term activities (e.g., several months or more out). A typical work package … *(bullet)* contains interim milestones representative of physical accomplishments, as applicable. **3.7.1 Earned Value Techniques** Discrete work will be measured using scheduled start and completion dates that represent physical accomplishment.
Guideline 8: Establish and maintain a time-phased budget baseline, at the control account level, against which program performance can be measured. Budget for far-term efforts may be held in higher-level accounts until an appropriate time for allocation at the control account level. Initial budgets established for performance measurement will be based on either internal management goals or the external customer negotiated target cost including estimates for authorized but undefinitized work. On government contracts, if an over target baseline is used for performance measurement reporting purposes, prior notification must be provided to the customer.	As the schedule is developed, Control Accounts are assigned to all resource-loaded tasks. This allows summaries and analysis at the Control Account level, as well as the ability to "drill down" to the individual task level drivers of the Control Account. Initial budgets are based on external customer approved target costs. Target costs are allocated to the project scope and Contingency/Management Reserve. As the project progresses, Planning Packages are refined and detailed into Work Packages. An example of this process is the Construction Planning Package becoming refined into Work Packages when the construction contract is actually awarded. **3.2 Integrated Project Schedule** The Integrated Project Schedule shows the network of program-planned activities that reflect cost, schedule, and technical performance as described in the Project Execution Plan (PEP). It is hierarchically structured and provides integrated planning down to at least the Control Account level of detail. The Integrated Project Schedule is constructed to provide horizontal and vertical traceability and interdependencies. It is also used to perform critical path analysis. Once approved at CD-2, the Integrated Project Schedule becomes the overall and singular baseline

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	project schedule network and is maintained by the assigned Project Controls staff. All project Control Accounts are listed on the Integrated Project Schedule and must sum to (reconcile with) the Total Project Cost (TPC). Thus, the sum of all Control Accounts equals resource-loaded Work Packages and unloaded Planning Packages (if applicable) plus Contingency/Management Reserve, which together establish a time phased performance measurement (schedule/cost) baseline.
Guideline 9: Establish budgets for authorized work with identification of significant cost elements (labor, material, etc.) as needed for internal management and for control of subcontractors.	Significant cost elements of the project scope are the Design and Construction contracts. Design and Construction contracts are subdivided into Control Accounts. The initial budgets provided to the General Contractor originate in the contract award (Work Authorization). General Contractors are usually given EVMS schedule and performance criteria, expressed in the terms of the contract itself. Resource-loaded, linked schedules are developed and provided monthly with status to the Project Manager. Other project personnel (internal and external), whom operate mostly in a support, or Time and Materials (T&M) mode have controls placed on them as well. While not required to provide detailed schedules, they are required to supply cost and schedule information on invoices. **3.2.3 Work Packages and Planning Packages** Project work is subdivided into manageable groups of activities within a Control Account that are assigned to *Work Packages* for near-term activities and *Planning Packages* for yet to be defined logical aggregations of far-term activities (e.g., several months or more out). As soon as sufficient information is available for completing the detailed planning, the Planning Package must be defined into a discrete Work Package. This "Rolling Wave" technique results in a more meaningful and useful baseline. Each Control Account budget and schedule will be planned in detail into Work Packages and Planning Packages, and time-phased by the responsible Project Manager/CAM (usually the same individual). A typical Work Package has the following characteristics: ✓ Represents units of work at levels where work is performed (activity level). ✓ Is clearly distinguishable from all other Work Packages. ✓ Is assigned to a single responsible organizational element through the RAM and/or a Work Authorization vehicle. ✓ Defines scheduled start and completion dates.

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	✓ Contains interim milestones representative of physical accomplishments, as applicable. ✓ Has a budget (traceable to a WBS element) or assigned value expressed in terms of dollars, man-hours, or other measurable units. ✓ May be (1) a duration limited to a relatively short span of time, (2) subdivided by discrete value milestones to facilitate the objective measurement of work performed, or (3) established as a Level of Effort (LOE) if it does not produce definitive end products.
Guideline 10: To the extent it is practical to identify the authorized work in discrete work packages, establish budgets for this work in terms of dollars, hours, or other measurable units. Where the entire control account is not subdivided into work packages, identify the far term effort in larger planning packages for budget and scheduling purposes.	As the project progresses, Planning Packages are refined and detailed into Work Packages. An example of this process is Construction Planning Packages becoming refined into detailed Work Packages when the construction contract is actually awarded. **3.2.3 Work Packages and Planning Packages** Project work is subdivided into manageable groups of activities within a Control Account that are assigned to *Work Packages* for near-term activities and *Planning Packages* for yet to be defined logical aggregations of far-term activities (e.g., several months or more out). As soon as sufficient information is available for completing the detailed planning, the Planning Package must be defined into a discrete Work Package. This "Rolling Wave" technique results in a more meaningful and useful baseline. Each Control Account budget and schedule will be planned in detail into Work Packages and Planning Packages, and time-phased by the responsible Project Manager/CAM (usually the same individual). A typical Work Package has the following characteristics: ✓ Represents units of work at levels where work is performed (activity level). ✓ Is clearly distinguishable from all other Work Packages. ✓ Is assigned to a single responsible organizational element through the RAM and/or a Work Authorization vehicle. ✓ Defines scheduled start and completion dates. ✓ Contains interim milestones representative of physical accomplishments, as applicable. ✓ Has a budget (traceable to a WBS element) or assigned value expressed in terms of dollars, man-hours, or other measurable units. May be (1) a duration limited to a relatively short span of time, (2) subdivided by discrete value milestones to facilitate the objective measurement of work performed, or (3) established as a Level of Effort (LOE) if it does not produce definitive end products.

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Guideline 11: Provide that the sum of all work package budgets plus planning package budgets within a control account equals the control account budget.	Resources are assigned in the Integrated Project Schedule. They are assigned a dollar amount, and a Control Account that mirrors Control Accounts set up in the Sandia Financial system. No resource is assigned without a Control Account identifier. This allows all resource-loaded Work Packages and Planning Packages to be summed to a Control Account budget. **3.2.3 Work Packages and Planning Packages** Project work is subdivided into manageable groups of activities within a Control Account that are assigned to *Work Packages* for near-term activities and *Planning Packages* for yet to be defined logical aggregations of far-term activities (e.g., several months or more out). As soon as sufficient information is available for completing the detailed planning, the Planning Package must be defined into a discrete Work Package. This "Rolling Wave" technique results in a more meaningful and useful baseline. Each Control Account budget and schedule will be planned in detail into Work Packages and Planning Packages, and time-phased by the responsible Project Manager/CAM (usually the same individual).
Guideline 12: Identify and control level of effort activity by time-phased budgets established for this purpose. Only that effort which is unmeasurable or for which measurement is impractical may be classified as level of effort.	A performance methodology for all tasks within the schedule is assigned. LOE effort is controlled and limited to only those tasks, which have been evaluated and found unsuitable for percent complete or apportioned methodologies. Examples of LOE tasks are Project Management and Construction Management. **3.2.3 Work Packages and Planning Packages** Project work is subdivided into manageable groups of activities within a Control Account that are assigned to *Work Packages* for near-term activities and *Planning Packages* for yet to be defined logical aggregations of far-term activities (e.g., several months or more out). As soon as sufficient information is available for completing the detailed planning, the Planning Package must be defined into a discrete Work Package. This "Rolling Wave" technique results in a more meaningful and useful baseline. Each Control Account budget and schedule will be planned in detail into Work Packages and Planning Packages, and time-phased by the responsible Project Manager/CAM (usually the same individual). A typical Work Package has the following characteristics: ✓ Represents units of work at levels where work is performed (activity level). ✓ Is clearly distinguishable from all other Work Packages. ✓ Is assigned to a single responsible organizational element through the RAM and/or a Work

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	Authorization vehicle. ✓ Defines scheduled start and completion dates. ✓ Contains interim milestones representative of physical accomplishments, as applicable. ✓ Has a budget (traceable to a WBS element) or assigned value expressed in terms of dollars, man-hours, or other measurable units. ✓ May be (1) a duration limited to a relatively short span of time, (2) subdivided by discrete value milestones to facilitate the objective measurement of work performed, or (3) established as a Level of Effort (LOE) if it does not produce definitive end products. **3.7.1 Earned Value Techniques** … Additionally, all projects include general work effort that cannot be discretely measured. The LOE methodology will be selected only after all other techniques have been evaluated and reviewed for appropriateness and found not applicable. **Level of Effort (LOE):** This is effort of a general or supportive nature, which does not produce a definite end product. A LOE Work Package uses only one Earned Value technique—such that the BCWP equals the BCWS in each reporting period. LOE tasks are budgeted on a time-phased basis for control and reporting purposes.
Guideline 13: Establish overhead budgets for each significant organizational component of the company for expenses, which will become indirect costs. Reflect in the program budgets, at the appropriate level, the amounts in overhead pools that are planned to be allocated to the program as indirect costs.	Overhead budgets are the responsibility of the Sandia Finance department. They bear the responsibility of developing overhead pools, and tracking actual indirect expenditures. Indirect and Service Center Overhead (SCOH) costs are established and tracked by Facilities Business Systems Department. Corporate Assessments are applied to SCOH. **3.6 Overhead Budgets** There are two types of overhead that apply to projects: Facilities Service Center Overhead (SCOH) and Corporate Assessments. These are applied at the activity level. SCOH costs are established and tracked by Facilities Business Systems Department and Corporate Assessments are the responsibility of the Sandia Controller Center (10500) (Corporate Finance). Corporate Assessments are applied to SCOH. Therefore, there are no Sandia Overhead budgets per se to consider as a Control Account.

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Guideline 14: Identify management reserves and undistributed budget.	Contingency/Management Reserve is used for construction projects. It is developed after an analysis and assessment of risk. **3.4 Contingency/Management Reserves** … *Cost Contingency/Management Reserve* will include the Factored Exposure of identified risks **(PROBABILITY X CONSEQUENCE = FACTORED EXPOSURE)** and a Project Team-derived assessment of the overall risk based on the assessment of the risk in each major Control Account.
Guideline 15: Provide that the program target cost goal is reconciled with the sum of all internal program budgets and management reserves.	The project target cost goal (called TPC) is reconciled as part of the monthly EVMS update process. Tasks are summarized into Control Accounts are thus summarized into the project costs. The addition of Contingency/Management Reserves completes the reconciliation to the target cost goal. Total Project Cost (TPC) = Total Estimated Cost (TEC) + Other Project Costs (OPC) **3.2 Integrated Project Schedule** … Once approved, the Integrated Project Schedule becomes the overall and singular baseline project schedule network and is maintained by the assigned Project Controls staff. All project Control Accounts are listed on the Integrated Project Schedule and must sum to (reconcile with) the Total Project Cost (TPC). Thus, the sum of all Control Accounts equals resource-loaded Work Packages and unloaded Planning Packages (if applicable) plus Contingency/Management Reserve, which together establish a time phased performance measurement (schedule/cost) baseline. **3.2.5 Contractor Planning** Contracts for A/Es and General Contractors (GCs) contain requirements to provide a Schedule in sufficient detail to provide the Project Manager the information to effectively manage the project. The Project Office will support the Project Manager in ensuring the submitted schedule is consistent with the Performance Management Baseline (PMB).

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ACCOUNTING CONSIDERATIONS	
Guideline 16: Record direct costs in a manner consistent with the budgets in a formal system controlled by the general books of account.	Costs are recorded in a manner consistent with budgets in the Sandia Financial Accounting System. **4.3 Direct Costs** A direct cost is any cost that is specifically identifiable with or attributable to a particular project. Therefore, direct costs include any costs identifiable with the assigned tasks of a specific project. These costs include labor, travel, chargebacks, and procurement costs or any other costs directly associated with a specific project.
Guideline 17: *(When a work breakdown structure is used)* Summarize direct costs from control accounts into the work breakdown structure without allocation of a single control account to two or more work breakdown structure elements.	The Control Accounts established for each project correlate to a project WBS element, so that a Control Account represents one, and only one, WBS element. Control Accounts are assigned during the creation of the Integrated Project Schedule. **3.2 Integrated Project Schedule** … Once approved, the Integrated Project Schedule becomes the overall and singular baseline project schedule network and is maintained by the assigned Project Controls staff. All project Control Accounts are listed on the Integrated Project Schedule and must sum to (reconcile with) the Total Project Cost (TPC). Thus, the sum of all Control Accounts equals resource-loaded Work Packages and unloaded Planning Packages (if applicable) plus Contingency/Management Reserve, which together establish a time phased performance measurement (schedule/cost) baseline. **4.2 Control Accounts** Within Sandia's Financial Accounting System, cost collection is performed against summary accounts known as "Projects," with sub-account detail referred to as "Tasks." This forms the "Project/Task number" designation associated with each WBS element. Since costs are collected at the Control Account Level, each Control Account will have a unique Project/Task number. This allows all WBS elements within that Control Account to be "rolled up" under the same Project/Task number. Similarly, under each Project/Task number there may be multiple Work Packages and/or Planning Packages, which in combination constitute a unique Control Account.

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Guideline 18: Summarize direct costs from the control accounts into the contractor's organizational elements without allocation of a single control account to two or more organizational elements.	The Control Accounts established for each project correlate to a project organization element, so that a Control Account represents one, and only one, organizational element. Control Accounts are created as a mirror image of their associated WBS. In this way a one to one allocation is assured. **3.2 Integrated Project Schedule** Once approved at CD-2, the Integrated Project Schedule becomes the overall and singular baseline project schedule network and is maintained by the assigned Project Controls staff. All project Control Accounts are listed on the Integrated Project Schedule and must sum to (reconcile with) the Total Project Cost (TPC). Thus, the sum of all Control Accounts equals resource-loaded Work Packages and unloaded Planning Packages (if applicable) plus Contingency/Management Reserve, which together establish a time phased performance measurement (schedule/cost) baseline. **4.2 Control Accounts** Within Sandia's Financial Accounting System, cost collection is performed against summary accounts known as "Projects," with sub-account detail referred to as "Tasks." This forms the "Project/Task number" designation associated with each WBS element. Since costs are collected at the Control Account Level, each Control Account will have a unique Project/Task number. This allows all WBS elements within that Control Account to be "rolled up" under the same Project/Task number. Similarly, under each Project/Task number there may be multiple Work Packages and/or Planning Packages, which in combination constitute a unique Control Account.
Guideline 19: Record all indirect costs, which will be allocated to the contract.	Direct costs are charged to the project through the Sandia Financial Accounting System. Indirect costs are allocated according to Sandia's financial Overhead policy. **4.4 Indirect Costs** Indirect costs are those costs incurred for the operation of Sandia that cannot be directly or specifically associated with technical projects in a technical or other direct program. Indirect and Service Center Overhead (SCOH) costs are established and tracked by Facilities Business Systems Department. Sandia Corporate Assessments are established by the Sandia Controller Center (10500) (Corporate Finance) and are applied to SCOH. Indirect costs are distributed to construction projects through an allocation process by applying recovery rates to an appropriate allocation base. Sandia's financial overhead policy (specifically, Chapters 4, 5, and 6 of Sandia's *Financial Manual*) describes how Indirect costs are allocated.

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Guideline 20: Identify unit costs, equivalent units costs, or lot costs when needed.	Construction project scope does not include production unit costs, equivalent unit costs, or lot costs. Construction costs are estimated using units of construction material; however, for EVMS purposes, the Project Manager does not track them individually as such. On the project level contractor performance is measured based on accomplishment of scope. **Not Applicable…**
Guideline 21: For EVMS, the material accounting system will provide for: (1) Accurate cost accumulation and assignment of costs to control accounts in a manner consistent with the budgets using recognized, acceptable, costing techniques. (2) Cost performance measurement at the point in time most suitable for the category of material involved, but no earlier than the time of progress payments or actual receipt of material. (3) Full accountability of all material purchased for the program including the residual inventory.	Material accounting at Sandia is managed in the following areas: 1) Control Account budgets and financial system Project/Task numbers (charge numbers), are the same. This ensures that costs are accumulated in an acceptable manner with a one-to-one relationship with plan (BCWS) and Actuals. 2) Material is accounted for by the General Contractor. Monthly information provided to the Project Manager allows him/her to compare material claims of the General Contractor against invoices paid. 3) Residual inventory is not an issue for the construction project per se. In a Firm-Fixed Price (FFP) contract, the residual inventory becomes the concern of the General Contractor. **4.5 Material Accounting** Material costs are generally recognized as General Contractor Firm-Fixed Price (FFP) contract costs. Due to the nature of an FFP contract, residual inventory accountability (materials purchased but not yet used) is managed and held at the General Contractor level. Cost performance measurement of the FFP contract is measured monthly in order to provide the most meaningful (i.e., timely) cost performance and cost variance data.

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ANALYSIS & MANAGEMENT	
Guideline 22: At least on a monthly basis, generate the following information at the control account and other levels as necessary for management control using actual cost data from, or reconcilable with, the accounting system: (1) Comparison of the amount of planned budget and the amount of budget earned for work accomplished. This comparison provides the schedule variance. **(2)** Comparison of the amount of the budget earned the actual (applied where appropriate) direct costs for the same work. This comparison provides the cost variance.	Monthly reporting by Sandia: 1) On a no less than monthly basis, the schedule, performance, and cost (EVMS) data is presented at the Control Account level to management after reconciling the data to the accounting system. 2) On a no less than monthly basis, management is provided EVMS reports that include BCWS, BCWP, and ACWP. Thus, management is provided no less than monthly cost and schedule variance. **5.1.1 Schedule Status** The project schedule is updated at least monthly as part of the Schedule Turnaround Process. The Project Manager/CAM analyzes the schedule and is responsible for determining: ✓ Work accomplished or completed ✓ Actual start and finish dates (for discrete Work Packages), and ✓ Remaining duration of activities outstanding. The Project Manager/CAM collects performance status at the activity level, as appropriate, for work performed during the current period. The Project Controls staff records the percentage of the work completed for both performance-based and Level of Effort (LOE) activities in the project management software. As noted in Section 3.7.1, for LOE activities, BCWP is always calculated to equal BCWS. LOE activities (generally supportive functions) comprise a minor portion of the schedule. **5.3.2 Variance Analysis** Variance analyses provides the means for the CAM to communicate cost, schedule, and Estimate at Completion (EAC) divergences from the PMB. Root cause analysis is performed at the Control Account level. For example some variance may be due to factors outside the control of the Project Manager such a supply and transportation delays. The Control Account structure is integral with the WBS (i.e., it mirrors the WBS). As a result, project variances can be “rolled-up” to the appropriate WBS level for Sandia or DOE/NNSA reports.

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Guideline 23: Identify, at least monthly, the significant differences between both planned and actual schedule performance and planned and actual cost performance, and provide the reasons for the variances in the detail needed by program management.	On a no less than monthly basis, Project Management is provided EVMS reporting that includes BCWS, BCWP, and ACWP. Schedule variance that flow from BCWP-BCWS are analyzed against established variance thresholds. When the thresholds are reached, variance analysis and corrective actions are performed. **5.1.1 Schedule Status** The project schedule is updated at least monthly as part of the Schedule Turnaround Process. The Project Manager/CAM analyzes the schedule and is responsible for determining: ✓ Work accomplished or completed, ✓ Actual start and finish dates (for discrete Work Packages), and ✓ Remaining duration of activities outstanding. The Project Manager/CAM collects performance status at the activity level, as appropriate, for work performed during the current period. The Project Controls staff records the percentage of the work completed for both performance-based and Level of Effort (LOE) activities in the project management software. As noted in Section 3.7.1, for LOE activities, BCWP is always calculated to equal BCWS. LOE activities (generally supportive functions) comprise a minor portion of the schedule. **5.3.2 Variance Analysis** Variance analyses provides the means for the CAM to communicate cost, schedule, and Estimate at Completion (EAC) divergences from the Performance Measurement Baseline (PMB). Root cause analysis is performed at the Control Account level. For example some variance may be due to factors outside the control of the Project Manager such a supply and transportation delays. The Control Account structure is integral with the WBS (i.e., it mirrors the WBS). As a result, project variances can be “rolled-up” to the appropriate WBS level for Sandia or DOE/NNSA reports.

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Guideline 24: Identify budgeted and applied (or actual) Indirect costs at the level and frequency needed by management for effective control, along with the reasons for any significant variances.	Overhead budgets are the responsibility of the Sandia Finance department. They bear the responsibility of developing overhead pools, and tracking actual indirect expenditures. Indirect and Service Center Overhead (SCOH) costs are tracked. SCOH and Corporate Assessments are Corporately established. **3.6 Overhead Budgets** There are two types of overhead that apply to projects: Facilities Service Center Overhead (SCOH) and Corporate Assessments. These are applied at the activity level. SCOH costs are established and tracked by Facilities Business Systems Department and Corporate Assessments are the responsibility of the Sandia Controller Center (10500) (Corporate Finance). Corporate Assessments are applied to SCOH. Therefore, there are no Sandia Overhead budgets per se to consider as a Control Account.

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Guideline 25: Summarize the data elements and associated variances through the program organization and/or work breakdown structure to support management needs and any customer reporting specified in the contract.	Data element and variance analysis is summarized at higher or lower levels depending on the hierarchy of the project, and the needs of external customers. For example, reporting to DOE require variance analysis at Level 3 of the WBS when a specified threshold is breeched. Internal management, on the other hand, is supplied data elements and variance analysis at lower levels as required. **5.6.1 Management Monthly Reports** Sandia's Project Managers generate Monthly Reports for all Line Item construction projects. The purpose of the Monthly Report is to provide Sandia Project Manager, Sandia Senior Management, and DOE/NNSA a periodic assessment of each project by which to monitor and manage the project. **5.7.1 Management and Accountability for Sandia Facilities Projects** Each project will define and document its organization and accountability structure. … **5.8 Management Oversight** The Project Manager will provide regular reports to Management on project status. The reporting cycle will be determined on a risk-based approach that will include such factors as project size, complexity, the number and volume of tasks, as well as the point in the project's life-cycle. …Once the project has obtained Critical Decision 2 approval, the reporting cycle will be at least on a monthly basis. Reports will be sent to the appropriate management levels as defined in the project's Organizational Breakdown Structure (OBS).
Guideline 26: Implement managerial actions taken as the result of earned value information.	Variance analysis includes corrective action, as appropriate. Prior to implementing corrective actions, the Project Manager needs to review how the change will affect project risk, and if so document and track any new risks, or positive or negative changes to already identified risks. **5.6.2 Variance Analysis Reports** A variance analysis report will be generated when cost and/or schedule variances exceed pre-established thresholds. The report will include alternatives for corrective actions that will address the variant conditions for management actions. **5.7.1 Management and Accountability for Sandia Facilities Projects** Each project will define and document its organization and accountability structure. …

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	5.8 Management Oversight … The reporting cycle will be determined on a risk-based approach that will include such factors as project size, complexity, the number and volume of tasks, as well as the point in the project's life-cycle.
Guideline 27: Develop revised estimates of cost at completion based on performance to date, commitment values for material, and estimates of future conditions. Compare this information with the performance measurement baseline to identify variances at completion important to company management and any applicable customer reporting requirements including statements of funding requirements.	Sandia prepares Monthly Project Summary reports that provide cost and schedule variances, cost and schedule performance indices (CPI and SPI), and the Estimate At Completion (EAC), Estimate to Complete (ETC), Variance at Completion (VAC), and the Current Working Estimate (CWE) taking into account the CAM's assessment of known future changes. First, project ETCs and EACs are calculated using industry and government accepted EVMS techniques and methods as detailed in the formulas and algorithms below. Cost and schedule variances are quantified and assessed to identify root causes. **5.4 Project Cost Estimates** This section describes the process for establishing and maintaining an Estimate at Completion (EAC) based on cumulative costs and the Estimate to Complete (ETC), both of which are calculated estimates, as well as a more subjective Current Working Estimate (CWE) based on the Project Manager's and/or CAM's overall monthly assessments. First, project ETCs and EACs are calculated using industry and government accepted EVMS techniques and methods as detailed in the formulas and algorithms below. However, the final estimate will take into account the Project Manager's and/or the CAM's personal assessment(s) of the remaining work to be completed and whether the calculated amounts have considered all known factors. Therefore, they may change the calculated amount based on these up-to-date factors to determine the best overall estimate. **5.6.2 Variance Analysis Reports** A variance analysis report will be generated when cost and/or schedule variances exceed pre-established thresholds. The report will include alternatives for corrective actions that will address the variant conditions for management actions.

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REVISIONS & DATA MANAGEMENT	
Guideline 28: Incorporate authorized changes in a timely manner, recording the effects of such changes in budgets and schedules. In the directed effort prior to negotiation of a change, base such revisions on the amount estimated and budgeted to the program organizations.	Authorized changes should be incorporated in the Performance Management Baseline (PMB) as soon as practical. Project Baseline Change Control (BCC) procedures will specify the approved changes to be implemented and incorporated into Project Baseline within the current period. Approved changes may not be entered into the Sandia Financial System within the monthly reporting period. Typically, those baseline changes will be recorded in the Sandia Financial System in the following reporting period. **6.1 BCC Procedure, Thresholds & Approvals** …To remain a useful PPM tool, the PMB needs to be maintained in order that it represents the actual plan (BCWS) and work accomplished (BCWP) (e.g., timely). Consequently, it is necessary to manage and update the PMB through a formal, traceable BCC process. *(This includes – item E):* **E.** Timely incorporation of authorized changes is essential to ensure accurate reporting of the PMB. At a minimum, performance reporting on approved changes will be implemented during the period in which they are incorporated, or consistent with other project functional capabilities (e.g., financial, procurement, contracts, etc.), within the next month's reporting cycle.
Guideline 29: Reconcile current budgets to prior budgets in terms of changes to the authorized work and internal re-planning in the detail needed by management for effective control.	The Project Baseline Change Proposal (BCP) forms and the Project BCC Log are the management mechanisms for reconciling current and past budgets to the PMB, and for all related budget transactions, including Contingency/Management Reserves use and/or reconstitution. **6.1 BCC Procedure, Thresholds & Approvals** … To remain a useful PPM tool, the PMB needs to be maintained in order that it represents the actual plan (BCWS) and work accomplished (BCWP) (e.g., timely). Consequently, it is necessary to manage and update the PMB through a formal, traceable BCC process. *(This includes – item A):* **A.** A formal project change control procedure will be established so that scope, cost, and schedule Baseline changes are identified, controlled, and managed through a traceable, documented process prior to initiation of revisions. All accepted changes to the PMB (scope, cost, and schedule changes) will be formally logged, documented, and filed for the life of the project after which all project

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	documentation is archived and sent to Sandia's long-term storage.
Guideline 30: Control retroactive changes to records pertaining to work performed that would change previously reported amounts for actual costs, earned value, or budgets. Adjustments should be made only for correction of errors, routine accounting adjustments, effects of customer or management directed changes, or to improve the baseline integrity and accuracy of performance measurement data.	Retroactive changes to prior performance data are avoided. Required adjustments to prior data are rare and carefully controlled. The only justifications are adjustments to project or Corporate accounting methods to improve accuracy of data and for accounting errors. Care is taken to ensure that variances are not masked and the PMB is not changed. **6.1 BCC Procedure, Thresholds & Approvals** …To remain a useful PPM tool, the PMB needs to be maintained in order that it represents the actual plan and work accomplished (e.g., timely). Consequently, it is necessary to manage and update the PMB through a formal, traceable BCC process. *(This includes – item F):* **F.** Changes to prior period baseline performance data (retroactive changes) should be limited to accounting adjustments, to correct data errors or to incorporate customer (DOE/NNSA) Directed Changes.
Guideline 31: Prevent revisions to the program budget except for authorized changes.	The "program budget" is the Total Project Cost (TPC). Any change to the TPC above Level 3 requires NNSA/SSO approval. The Sandia BCCB approves changes at Level 3. Below Level 3, the Project Manager reviews and approves all proposed budget baseline changes originating from within the project. Such changes are controlled and managed in accordance with the PEP and Project BCC Procedure. **6.1 BCC Procedure, Thresholds & Approvals** …To remain a useful PPM tool, the PMB needs to be maintained in order that it represents the actual plan and work accomplished (e.g., timely). Consequently, it is necessary to manage and update the PMB through a formal, traceable BCC process. *(This includes – item C):* **C.** Change control thresholds (defined for scope/cost/schedule) and approval levels shall be in accordance with the project change control guidelines specified in the PEP. For projects greater than $20M, the BCC approval authorities are as follows: ✓ Level 0 – DOE/NNSA Secretarial Acquisition Executive (SAE)

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	✓ Level 1 – DOE/NNSA Program Secretarial Officer (PSO) ✓ Level 2 – DOE/NNSA Site Office Manager/Deputy Manager ✓ Level 3 – Contractor (Sandia) Figure 6-1 illustrates the BCC process flow and approval authorities for *formal* BCPs implemented at threshold Levels 0, 1, 2, and 3. Figure 6-2 illustrates the Below Level 3 Configuration Change Request (CCR) process for project changes that do not affect the Baseline (below Level 3). However, all requested changes are initiated through the CCR process and then elevated to the BCP process, as applicable. During the construction phase, it is expected that the contractor will submit many Requests for Information (RFIs) directed to the A/E for clarification of design and construction issues. Some RFIs that require a configuration change may generate a CCR. *(This includes – item G):* **G.** Reallocation and/or use of project Contingency/Management Reserve as a result of Baseline changes will be recorded in the project BCC Log. **6.3 Change Control Responsibilities** The responsibilities for personnel directly responsible for BCC activities are summarized as follows: **Sandia Project Manager** ✓ Approve and direct all Baseline changes within Site Level authority. ✓ Endorse Level 2 or higher BCPs to DOE/NNSA for review and approval. ✓ Authorize budget allocations from project Contingency/Management Reserve as required by the approved BCP. ✓ Approve Level 4 changes (i.e., “Below Level 3” changes). **Project Controls Staff** ✓ Assist Control Account Managers (CAMs) in developing and preparing BCPs, as required. ✓ Schedule Sandia Baseline Change Control Board (BCCB) to review site Level 3 or higher BCPs. ✓ Establish new Project/Tasks and/or close existing ones, as required. ✓ Update the Project Baseline schedules, resources, and budgets in accordance with the approved

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	BCP. ✓ Allocate the project Contingency/Management Reserve as required per the BCP. ✓ Update and maintain the BCC Log for both "Below Level 3" and formal BCP changes. Track all approved Contingency/Management Reserve changes.
Guideline 32: Document changes to the performance measurement baseline.	All changes to the PMB are documented on approved BCP forms and recorded in the Project BCC Log. **6.1 BCC Procedure, Thresholds & Approvals** …To remain a useful PPM tool, the PMB needs to be maintained in order that it represents the actual plan and work accomplished (e.g., timely). Consequently, it is necessary to manage and update the PMB through a formal, traceable BCC process. *(This includes – item B):* **B.** The established BCC process shall be prepared in accordance with the BCC guidelines. Change control processes will begin: ✓ After CD-1 for Design (scope/cost/schedule); and ✓ After CD-2 for the PMB.

Appendix D –

Work Authorizations

Sandia uses several types of Work Authorization vehicles depending on the entity, the type of work to be performed, and whether the work is conducted internally or externally.

The Work Authorization Document (WAD), which is required prior to initiation of work, is used for internal work agreements within Sandia.

Work Authorization Document (WAD)

Project: Brief project title.

- **WBS No.:** Number assigned to the relevant WBS element.
- **WBS Title:** Title assigned to the relevant WBS element.
- **Task No.:** Project and task number from the **Sandia Financial Accounting System** .
- **Deputy Project Manager (DPM) or Project Lead:** Name of the individual issuing the Work Authorization.
- **Issue Date:** Calendar date the work authorization is issued.
- **Responsible Individual (RI) Organization:** The SNL organization number of the RI.
- **Statement of Work (SOW):** A narrative description of the work assigned by the work authorization. Provide sufficient detail to map to the WBS element.

Budget:

- **Total Labor Hours:** The total labor hours allocated to complete the stated work. Can be identified as an entire FTE, multiple FTEs, or some portion thereof.
- **Total Dollars:** The fully loaded budget allotted to complete the stated work.

Schedule:

- **Planned Start Date:** The calendar date the work is expected to start.
- **Planned Completion Date:** The calendar date the work is expected to finish.

Approvals:

- **DPM or Project Lead:** Signature of the person issuing the Work Authorization.
- **Date:** The calendar date when signed by the DPM or Project Lead.
- **Responsible Individual (RI):** Signature of the RI receiving the Work Authorization.
- **Date:** The calendar date when signed by the RI.
- **RI Manager:** Signature of the RI's SNL Manager.
- **Date:** The calendar date when signed by the RI Manager.

WORK AUTHORIZATION DOCUMENT (WAD)	
Project:	**WBS No.:**
WBS Title:	**Task No.:**
Project Manager:	**Issue Date:**
Responsible Individual (RI) Organization:	
STATEMENT OF WORK	
BUDGET	
Total Labor Hours:	**Total Dollars:**
SCHEDULE	
Planned Start Date:	**Planned Completion Date:**
APPROVALS	
Project Manager:	**Date:**
Responsible Individual (RI):	**Date:**
RI Manager:	**Date:**
Signing of this agreement implies RI and Department Manager commitment to provide and allocate the time to complete each task as scheduled and within the allocated budget.	

Figure D-1 Example of a Work Authorization Document (WAD)