NOT MEASUREMENT SENSITIVE

DOE G 413.3-10B
Approved: 4-20-2022

SUBJECT: INTEGRATED PROJECT MANAGEMENT USING THE EARNED VALUE MANAGEMENT SYSTEM

[This guide describes acceptable, but not mandatory, means for complying with requirements. Guides are not requirements documents and are not to be construed as requirements in any audit or appraisal for compliance with associated rules or directives.]

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INITIATED BY:
Office of Project Management

FOREWORD

This U.S. Department of Energy (DOE) guide is for use by all Departmental elements. This guide assists Federal Project Directors (FPDs) in working with contractors to develop, implement, and deliver project-level reports from the Earned Value Management System (EVMS) in compliance with the Electronic Industries Alliance (EIA)–748 industry standard. References to the FPD in this document apply to the FPD and the Federal project management office (PMO) staff.

This guide provides acceptable, but not mandatory, means for complying with the requirements of DOE Order (O) 413.3B, *Program and Project Management for the Acquisition of Capital Assets*. It does not impose, but may cite, requirements. Guides neither substitute for requirements nor replace technical standards that implement requirements. Send citations of errors, omissions, ambiguities, and contradictions found in this guide to PMpolicy@hq.doe.gov.

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1. PURPOSE

This guide provides information for improving the integration of the Earned Value Management System (EVMS) with project management planning, execution, and control processes. It also reviews U.S. Department of Energy (DOE) interpretation, application, and implementation of the Electronic Industries Alliance (EIA) industry standard, EIA-748, for EVMS compliance.[1] The Federal Project Director (FPD) and contractor project personnel should understand these requirements and proactively use EVMS data and information to effectively manage and make decisions within the DOE Order (O) 413.3B set of integrated project management (IPM) requirements.[2]

The ability to integrate the schedule and budget of the entire work scope, anticipate potential cost and schedule growth issues, mitigate unplanned problems, and accurately forecast final costs are hallmarks of the EVMS. These hallmarks give project stakeholders, the FPD, and contractor a means to effectively deal with programmatic challenges and the surrounding environment. The FPD and contractor need to continually voice their joint commitment to use the EVMS as the authoritative source to inform decision making and report performance and progress.

The FPD works with the contractor to

- implement a compliant EVMS before Critical Decision (CD)–2,
- prepare for a certification review (CR) of the contractor's EVMS before CD-3,
- maintain a compliant EVMS through a documented self-governance program,
- review EVMS data output to obtain insight and make informed decisions with contractor project management, and
- ensure the contractor uploads contractually required information monthly into the Project Assessment and Reporting System (PARS) for projects with TPC of $50M or greater.

2. BASIS

2.1 EXECUTIVE BRANCH, OFFICE OF MANAGEMENT AND BUDGET, AND FEDERAL ACQUISITION REGULATION

Using the EVMS is a best practice, recognized across industry and government, for program and project management. Government EVMS requirements are listed in

- Office of Management and Budget (OMB) Circular A-11 (Part 7 of the Capital Programming Guide),[3]
- Federal Acquisition Regulation (FAR) Subparts 34.2 and 52.234-2,[4] and
- agency supplements, such as the Department of Energy Acquisition Regulations

[1] EIA-748, www.sae.org/standards/content/eia748d/.
[2] DOE O 413.3, current version, https://go.usa.gov/xmCBY.
[3] OMB Circular A-11, https://go.usa.gov/xmCBr.
[4] FAR 52-234-2, https://go.usa.gov/xRd9q.

(DEAR).[5]

They direct the Department of Defense (DoD) and civilian Federal Agencies, including DOE, to use a performance-based acquisition management system compliant with EIA-748 to plan, manage, and assess the scope, schedule, budget performance, and progress of major acquisitions.

DOE O 413.3B follows the OMB and FAR requirements for the EVMS on capital asset acquisitions. It requires compliance with the EIA-748 standard (the current version at the time of contract award). It provides definitions and establishes thresholds for initial EVMS compliance assessment via a certification process, followed by ongoing EVMS compliance assessments via the surveillance process. For those projects not exempted or excluded per DOE Order 413.3B, Paragraph 3.c., the Office of Project Management (PM) has responsibility for developing policy, setting compliance and reporting requirements, and establishing guidance to plan and manage capital asset projects using the EVMS. DOE PM is also responsible for establishing, maintaining, and executing EVMS CR and surveillance review (SR) processes following established levels to ensure full compliance with applicable FAR and OMB requirements. Compliance requirements in DOE O 413.3B include the following:

- For projects with a total project cost (TPC) between $50 million and $100 million, the contractor maintains an EVMS compliant with EIA-748.
- For projects with a TPC of $100 million or more, DOE PM conducts the CR process and certifies the contractor's EVMS compliance with EIA-748 or as indicated in the contract.
- On an exception basis, or at project management support office (PMSO) request, DOE PM may review the EVMS compliance of projects that have a TPC between $50 million and $100 million.

The outcome is an assessment of the EVMS capability to provide objective schedule, cost, and technical performance measurements; it does not verify how well projects are performing or progressing.

2.2 ADAPTING AN EVMS TO THE PROJECT

Adapt (tailor or scale) the EVMS consistent with the project's size, complexity, scope, risks, and execution method, as well as with business processes, tools, systems, work and contract type (e.g., management and operations (M&O)). This helps ensure the adapted EVMS is both effective and efficient in meeting management needs at all organizational levels for useful, timely, and actionable information for management decisions. Preferably, the adaptation strategy should be initially developed between CD-1 and CD-2; this can save re-work for the project later on as EVMS implementation is finalized. The FPD may be interested in reading additional guidance;[6] if applicable, discuss this with DOE PM to ensure adherence to requirements.

The idea of tailoring or scaling an EVMS can also be explained by defining what the tailoring and scaling of an EVMS is not. It is not the wholesale elimination of EIA-748 Guidelines or essential management processes, but rather the practical application of the compliant Earned Value Management (EVM) system description to match the level of complexity and risk of the project. This would include the levels of work definition of the work breakdown structure

[5] Department of Energy Acquisition Guide, current version, https://go.usa.gov/xFwRG.
[6] NDIA *Earned Value Management System Guideline Scalability Guide*, current version, www.ndia.org/divisions/ipmd/division-guides-and-resources.

(WBS), the level of the detailed schedule, streamlining the approval process for baseline changes, the level of generating variance analysis, the frequency of developing ETC/EACs, the levels and frequency of performance status reporting, and the like. In order to accommodate the idea of tailoring or scaling the contractor's EVM system description should define the range of applications to where tailoring and scaling would be appropriate. Tailoring or scaling the implementation of the EVMS should be coordinated with the local customer and DOE PM to provide for its continued effectiveness well in advance of making any changes to established protocols. To be effective, address EVMS tailoring from the top down. Do *not* omit DOE O 413.3B and EIA-748 compliance requirements; address them to the extent necessary and practical. Guideline application and implementation may be scaled in a way that recognizes that projects differ in complexity and, therefore, data detail levels; use appropriate project control rigor for assessing EVMS compliance with EIA-748.

In the case of a multi-site collaboration project with one site contractor acting as the integrator using its certified EVMS, coordinate with PM-30 as appropriate to ensure compliant implementation for the project across all sites and contractors. For software and information technology projects, it should be noted that the application of the EVMS is not limited to just projects that follow the traditional waterfall methodology and a sequential development process where each phase (i.e., design, development, and testing) is completed before the next phase begins. For those projects following an agile methodology, for example, the EVMS can be applied in a manner to plan, budget, measure, forecast, and control work efforts to incrementally deliver functionality to the customer. Regardless of project type and management methodology, the contractor must fully define its approach and the processes thereof in the EVM system description and project execution plan (PEP) as applicable.

To be efficient, also address EVMS tailoring from the bottom up through the requirements that reflect business processes, tools, and systems (the way the contractor manages its business). Make this interface an intrinsic process to identify within the EVMS. Then integrate these bottom-up business requirements with top-down compliance requirements to obtain a compliant (effective) EVMS reflecting the contractor's business execution model (efficient).

3. BACKGROUND

The EVMS is based on the premise that Federal and contractor project teams make the best decisions when they have the best information. The EVMS is a key project management method to plan, execute, and control throughout the project's life cycle, from inception to completion. Successful project management teams use EVMS data in the acquisition decision-making process and understand the EVMS and project management relationship. DOE PM provides access to further EVMS guidance, aids and training materials.[7]

Integrated Project Management Process and EIA-748 EVMS Guidelines

The 32 EIA-748 EVMS guidelines, while not prescriptive, establish a framework for an adequate integrated management system by simply describing desired outcomes and integrated performance management capabilities. Figure 1 shows the interdependency of these guidelines, across a holistic and integrated project management process, through both the implementation

[7] PM-MAX DOE PM EVMS Guidance, https://go.usa.gov/xmCP5.

and execution phases.[8]

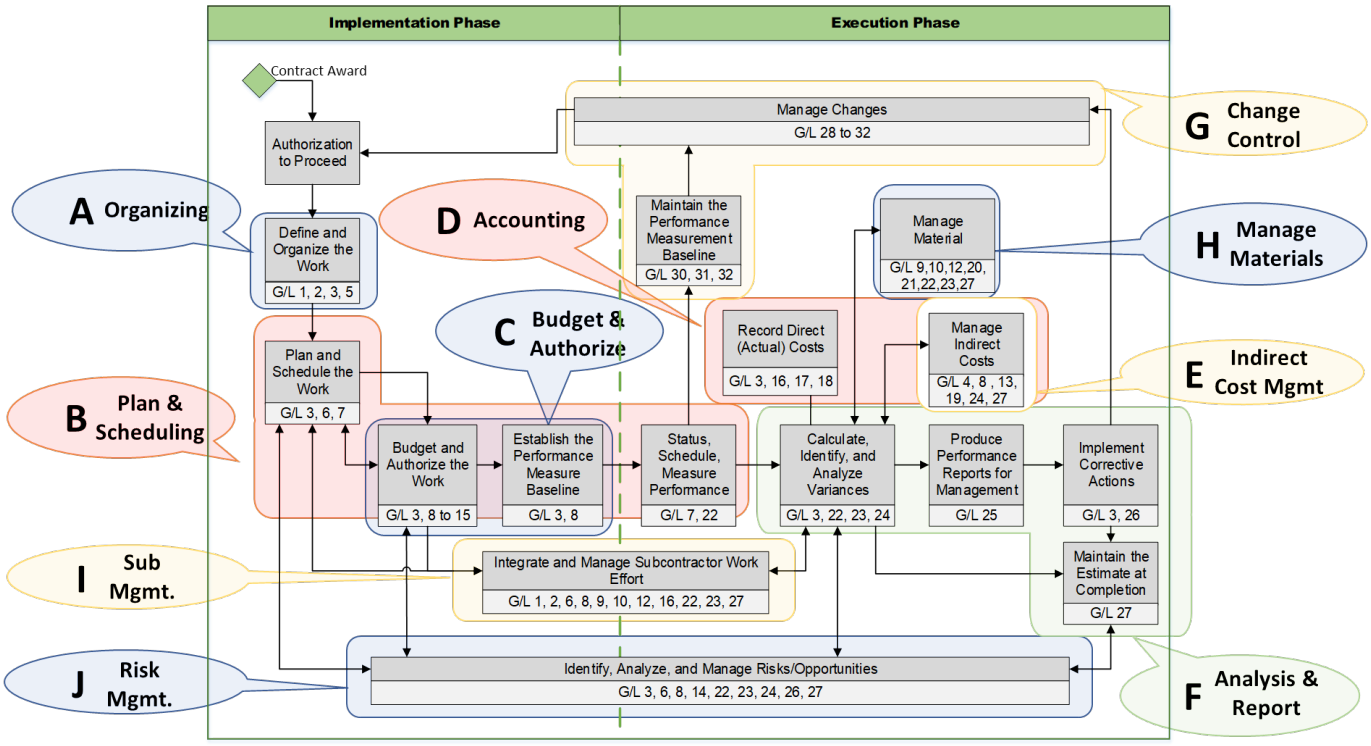

Figure 1. Interdependencies of EVMS Guidelines in the IPM Process

The guidelines are general enough to allow for common sense application, yet they are specific enough to assure the Government of reliable performance data and information. They do not purport to address all contractor needs for daily internal controls, such as informal communications, internal status reports, and similar management aids. These management aids are an important function of the contractor's operations, augmenting the EVMS as an effective element of project management. EVMS data and information serve as significant resources for any management action.

A contractor's EVMS comprises 10 management processes:[9]

A. Organizing

B. Planning and scheduling

C. Budgeting and work authorization

D. Accounting considerations

E. Indirect budget and cost management

[8] See Footnote 6.

[9] Integrated Project/Program Management (IP2M) Maturity and Environment Total Risk Rating (METRR) using EVMS, current version, https://go.usa.gov/xt8Eq.

F. Analysis and management reporting

G. Change control

H. Material management

I. Subcontract management

J. Risk management

Although each may appear to operate independently, the overarching expectation is that they are integrated as part of the EVMS. The integration of each process individually and collectively is accomplished through the development of a documented set of policies, procedures, and practices. With a properly integrated EVMS, all users—including control account managers (CAMs), project controls staff, FPDs, contractor project managers, acquisition executives, and contracting officers—are assured that the resultant schedule, budget, and technical performance data

- accurately reflect actual operations and current status,
- credibly predict completion estimates,
- identify programmatic risks or other project issues requiring corrective action, and
- support reliable decision making.

The EVMS measures actual work scope performance and the associated schedule and costs against an approved time-phased budget baseline plan maintained through consistent use of a disciplined change control application. It compares cost and schedule performance with the technical baseline plan as an early warning indicator of project execution problems. The integrated system allows the project team to gain cost and schedule performance insights on the work that has been done. It enables the team to understand what "done" looks like rather than just what work has been "done." By measuring completed scope, schedule, and budget performance, the EVMS enables managers to predict outcomes easily and understandably on the basis of a project's current trajectory.

4. ROLES AND RESPONSIBILITIES

The deliverables cited in Section 6 have application at all project management levels. Critical EVMS responsibilities include the following (see Appendix B of DOE O 413.3B for a complete list).

The FPD, contracting officer, and PMSO are involved from early in the project to project closeout. They ensure the requirements, clauses, and deliverables are identified in the solicitation and contract award relative to an EVMS-applicable project. Throughout the project's life cycle, they work together to evaluate and ensure the change control process is documented in the project baseline and contract when necessary. As emergent situations occur, they assess and provide approval for the contractor to proceed as appropriate.

When considering EVMS implementation, one of the first things an FPD should do is define the project's management method in the PEP. The PEP is the governing document that establishes the means to execute, monitor, and control capital asset projects subject to DOE O 413.3B. The

FPD prepares and maintains its contents with input from the contractor. The PEP is a living document, updated to reflect changes in requirements and strategy. It serves as the main communication tool, ensuring everyone - stakeholder, customer, and contractor - knows how project objectives, derived from the mission need statement, will be accomplished. The preliminary PEP is part of the CD-1 approval package and updated as part of the CD-2 approval package. At CD-2, the PEP should contain greater depth and breadth of information, including an explanation of the management systems and processes needed to support the project's management and oversight approach. The key to this approach is the EVMS. The PEP should describe how the EVMS will be implemented and tightly integrated with the acquisition plan. DOE Guide 413.3-15A, *Project Execution Plans*[10], provides further guidance on PEP content.

Starting after CD-2 approval and continuing through completion of CD-3, the FPD is responsible for ensuring EVMS project data are uploaded into PARS by the contractor, are timely and accurate, and reflect the reality of physical progress at the site. Supported by this information, the FPD projects performance trends and reports to program leadership and DOE PM, which further evaluates all projects' status for senior leadership.

The contractor is responsible and accountable for delivering the project on schedule and within budget to the correct technical specifications. **The Government** is responsible and accountable for delivering the project within a specified funding and schedule profile and has the necessary authority to execute that responsibility. This system of checks and balances, an important part of the EVMS, holds each of the stakeholders accountable to the others to perform their responsibilities. Each mission-delivery partner checks the performance of the others to ensure that the EVMS is effectively and efficiently enabling project delivery. Starting at CD-2, the contractor is responsible for monthly uploads into PARS to satisfy contractual reporting requirements, such as the integrated program management report (IPMR), contract funds status report (CFSR),[8] and integrated master schedule (IMS).[11]

DOE PM independently monitors, assesses, and reports on the contractor EVMS. They initially verify EVMS compliance with EIA-748 requirements through a CR. Thereafter, DOE PM collaborates with the FPD in ongoing surveillance of the EVMS to address implementation issues and continuous improvement initiatives (see Subsection 6.4).

5. SCHEDULE OF DELIVERABLES

A timeline for DOE O 413.3B EVMS requirements is depicted in Table 1, indicating specific actions and deliverables that assist the Government and the contractor in implementing a compliant and, where applicable, certified EVMS in accordance with DOE O 413.3B. After CD-1 approval, for projects with a TPC of $50 million or more, the implementation of a compliant EVMS is required.

[10] DOE G 413.3-15, *Project Execution Plans*, current version, https://go.usa.gov/xmCBY.
[11] GAO-16-89G, *Schedule Assessment Guide*, current version, https://go.usa.gov/xt8Ew.

PRE Action or Deliverable	CD	POST Action or Deliverable
Consider EVMS data and information requirements during the development of the acquisition strategy plan.	1	For projects with a TPC of $50 million or more, all solicitations need to address any necessary/applicable EVMS requirements.
For projects with a TPC of $50 million or more, ensure the contractor implements and uses an EVMS, including an IMS (both resource-loaded and with a longest continuous critical path), that complies with EIA-748 for planning, executing, reporting, and management.	2	For projects with a TPC of $50 million or more, ensure EVMS data the contractor uploads into PARS accurately reflect current project status and provide acceptable forecasts, including a separate FPD estimate at completion (EAC) or forecasted TPC, to facilitate the project management and decision-making processes.
For projects with a TPC of $100 million or more, ensure the contractor's EVMS is reviewed and certified by DOE PM as compliant with EIA-748, contractor conducts annual surveillance to maintain EVMS compliance, and DOE PM conducts risk-based, data-driven surveillance during the tenure of the contract, during contract extensions, or as requested by the FPD or Program or Project Management Executive (PME).	3	
	4	

Table 1. Timeline

Figure 2 depicts how the EVMS is applied to the various phases of the project management acquisition life cycle:

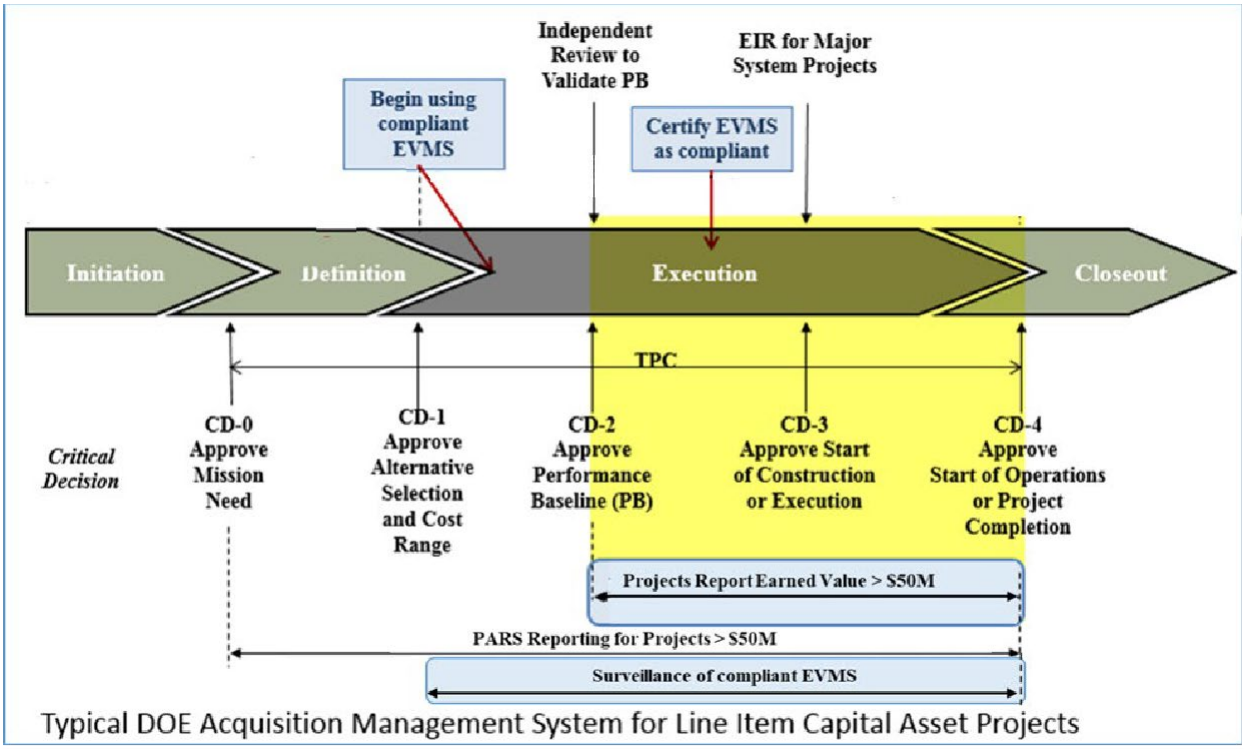

Figure 2. Typical DOE Acquisition Management System for Line-Item Capital Asset Projects

- Beginning after CD-0, the FPD factors EVMS data and information use into the acquisition strategy plan by ensuring appropriate EVMS-related requirements—including FAR clauses, the Special H Clause for non–M&O contractor business systems, and required EVMS data reporting—are addressed.
- Between CD-1 and CD-2, the project uses (or is in the process of implementing) an EIA-748 compliant EVMS, to include initial development of the project's performance measurement baseline (PMB) through project completion consistent with the approved cost range. The high end of the approved cost range should be considered to determine whether the EVMS threshold applies. The best practice is to implement a compliant EVMS shortly after CD-1, since documented EVMS processes are used in the front-end planning and development of the WBS and IMS (for estimating, budgeting, work authorization, and risk management). This leads to the development of a PMB, which will continue to evolve with progressive development of the design and execution planning as the project moves through successive CD gates. Furthermore, this best practice supports Federal staff's use of the EVMS data and information to understand the risks for major deliverables and to use an appropriate strategy to manage the project. All parties should consider appropriate use of variance threshold levels, reporting frequency, and content to render the appropriate visibility into emerging issues and timely decision making.
- By no later than CD-2 approval, the performance baseline (PB), including the contractor's PMB, covers the entire project life cycle, that is, through CD-4, using a fully compliant EVMS.

- Prior to CD-3 (or a combined CD-2 and CD-3) approval, the EVMS is certified as EIA-748 compliant as required by DOE O 413.3B.
- Active post-CD-2 projects with a TPC of $50 million or more provide EVMS data reporting in PARS.

6. DELIVERABLES

6.1 CONTRACTING FOR THE EVMS

Table 2 shows actions and deliverables that assist the Government in incorporating applicable EVMS clauses, terms, and conditions in solicitations and contracts. The prime contractor complies with the requirements, including subcontractor flow-down requirements where appropriate. Typically, this is in the form of schedule and cost reporting.

Source: DOE Order 413.3B,[2] Appendix B, 11.g., and Attachment 1, Contractor Requirements Document (CRD)	**Applies to:**
For projects with a TPC of $50 million or more, ensure applicable EVMS clauses, terms, and conditions are incorporated in solicitations and contracts and that the prime contractor complies with the requirements, including subcontractor flow-down requirements of this Order, FAR clauses, and EVMS-related terms and conditions.	Post-CD-1 through post-CD-4

Table 2. Contracting for the EVMS

During the development of solicitations for award (or modification) of cost-reimbursable contracts for projects with a TPC of $50 million or more, the applicable FPD and contracting officer should identify and incorporate

- solicitation FAR clauses required for the EVMS,
- Strategic Integrated Procurement Enterprise System (STRIPES) corporate provision DOE-K-2001,[12] and
- STRIPES corporate clause DOE-H-2024.[13]

6.1.1 Acquisition Planning Phase Considerations

Beginning in the acquisition planning phase, the responsible program office's acquisition staff consulting with DOE PM personnel should identify the EVMS requirements to be used on a project. They plan and structure the solicitation to ensure it appropriately addresses the EVMS requirement for every step of the acquisition process. This effort continues through solicitation, source selection, and post-award, and then throughout the execution phase.

The project scope and its associated risk primarily determine the contract type and dollar value, and how and whether to employ an EVMS. All major acquisitions with development effort require contractors to use an EVMS compliant with EIA-748 to manage the project and influence

[12] DOE-K-2001, in STRIPES.
[13] DOE-H-2024, in STRIPES.

performance. EVMS determination, rationale, and planning are key in the acquisition strategy. An EVMS is not required on firm fixed-price prime contracts for capital asset projects. However, when there is a prime contractor EVMS requirement, cost and schedule reporting requirements are typical for firm fixed-price subcontracts (where there is privity between the prime contractor and subcontractor) to integrate this information into the prime contractor's EVMS.

The FPD recognizes the importance of the contractor's ownership of an EVMS and emphasizes this point to the contractor project management team and senior leadership. The use of the EVMS primarily assists the project team in effective project management and delivery, fostered through corporate commitment and established internal controls, to maximize system efficiencies and ownership via self-governance.

6.1.2 Contractual Requirements

The FPD works with the Federal contracting officer to ensure the applicable solicitations contain DOE-H-2024 and Notice of Earned Value Management System. Key EVMS requirements of DOE-H-2024 include the following:

- Establish, maintain, and use an integrated performance management system (EVMS) compliant with EIA-748, including an EVM system description. Link to and support the EVMS with the contractor's various management systems, including work definition, planning and scheduling, work authorization and budgeting, performance measurement and analysis, change management, materials and subcontract management, cost estimating, accounting, and risk management.
- Develop, maintain, and submit management reports.
  - Maintain an IPMR (including all seven format elements) and IMS that logically network all project activities, reflecting the National Defense Industrial Association (NDIA) *Planning & Scheduling Excellence Guide (PASEG)* and the U.S. Government Accountability Office (GAO) *Schedule Assessment Guide: Best Practices for Project Schedules*.[14] [15]
  - Develop and submit a CFSR quarterly, reconciled with the IPMR.
  - Submit IPMR and CFSR data (upload into PARS) following the "Contractor Project Performance Upload Requirements"[16] document maintained by DOE PM.
- Submit notification of all proposed changes to EVMS procedures and their impact to the contracting officer.
  - Unless DOE grants a waiver, any contractor-proposed EVMS change receives DOE approval before implementation. DOE advises the contractor of its acceptance of such change as soon as practicable (generally within 30 calendar days) after receiving the contractor's notice of the proposed change.
  - If DOE waives the advance approval requirements, the contractor discloses EVMS

[14] NDIA *Planning and Scheduling Excellence Guide,* current version, http://www.ndia.org/divisions/ipmd/division-guides-and-resources.
[15] GAO-16-89G, *Schedule Assessment Guide,* current version, https://go.usa.gov/xt8Ew.
[16] Contractor Project Performance (CPP) Upload Requirements for Project Assessment and Reporting System (PARS), current version, https://go.usa.gov/xFRPv.

changes to DOE at least 14 calendar days before the effective date of implementation.

- Execute integrated baseline reviews (IBRs) or similar technical reviews of the PMB following contract requirements.
  - DOE will conduct this review consistent with the NDIA *Guide to the Integrated Baseline Review (IBR)*[17] at the time most appropriate as part of the PB approval process (consistent with FAR 34.202, it can be either pre- or post-CD-2). The project may also require an IBR at the exercise of significant options or the incorporation of major modifications.
  - During the review, the Government and contractor jointly scrutinize the PMB to ensure complete coverage of the statement of work, logical scheduling of the work activities, adequate resourcing, and identification of inherent risks.
- Provide access to all pertinent records and data requested by the contracting officer or duly authorized representative to permit surveillance to ensure continuing EVMS compliance.
- Determine and request approval for restructuring actions if the contractor concludes the PB TPC and CD-4 date no longer represents a realistic plan, and an over-target baseline (OTB) and/or over-target schedule (OTS) action is necessary. Contracting officer approval is required before implementing such restructuring actions, including detailed schedules and implementation actions consistent with the applicable EVM system description. DOE acknowledges receiving the request promptly (generally within 30 calendar days). While determination of the OTB value may not require current funding to be in place before approving or implementing the OTB/OTS, if the contractor OTB/OTS or EAC values exceed the current funding or authorization levels, the contracting officer and FPD must take prompt actions (e.g., obtain approval of a baseline change proposal (BCP) for the PB, obtain additional funding, execute applicable contract actions) to avoid project expenditures exceeding the approved PB TPC and contract amounts, and prevent potential Anti-Deficiency Act violations.

6.1.3 Subcontractor EVMS Flow-Down and Schedule and Cost Reporting

The CRD, found in DOE O 413.3B,[2] Attachment 1, and DOE-H-2024 clause, provides instruction to prime contractors to flow down the appropriate CRD requirements to the subcontractors when the TPC to the prime contractor is $50 million or more. The prime contractor ensures the performance measurement data and information reported, including schedule and budget data from its subcontractors, are reliable and in accordance with the governing policies, guides, procedures, and practices, regardless of the subcontract dollar value. To the extent that the prime contractor issues subcontracts for resources or material in the performance of the contracted project's work scope, it is responsible for flowing down the appropriate schedule and cost reporting requirements to the subcontractors, enabling the prime contractor to report schedule and cost data from and manage with an EIA-748 compliant EVMS. Using EVMS certification and SRs, DOE requires the prime contractor to demonstrate how it ensures the validity of the baseline, progress earned, actual costs incurred, and the estimated

[17] *Guide to the Integrated Baseline Review (IBR),* current version, https://www.ndia.org/divisions/ipmd/division-guides-and-resources.

value of work remaining, including that of its key subcontractors.

The prime contractor develops and demonstrates an effective method for managing the integration of subcontractor performance data, from a formal flow-down of an EIA-748 EVMS compliance requirement or obtained through monthly schedule and cost reporting. The latter is most frequently the case for DOE prime contractors. The FPD, contracting officer, or contractor does not conduct or grant EVMS certifications for a subcontractor with an EIA-748 compliance requirement. However, the prime contractor has full responsibility for the timeliness and reliability of the subcontractor's schedule and cost performance data and its integration into the EVMS. For all firm fixed-price subcontracts, the prime contractor is responsible for ensuring the subcontractor's invoiced amounts are itemized and validated.

6.2 INTEGRATED PROJECT MANAGEMENT PRINCIPLES

IPM is a disciplined framework for successful project execution in a way that benefits all levels of the organization; IPM is also key in maintaining a compliant EVMS. The EVMS supports IPM through the integration of 10 management processes (previously identified in Section 3), which collectively contribute to the structuring, analysis, decision making, and communication of project performance (see Figure 1). The adequacy of these processes, both individually and collectively, serves as the foundation for effecting a system of principles (or behaviors) needed for achieving the desired outcome.

The Project Management Institute and GAO have developed general project management principles and best practices, including *A Guide to the Project Management Body of Knowledge Guide*, *Cost Estimating and Assessment Guide*, and *Schedule Assessment Guide*. From these sources, DOE has identified the following 13 IPM principles, which rely on the EVMS to support effective management and decision making:

1. *Establish a culture of shared values and accountability for project execution and self-governance*.
2. *Train for IPM proficiency*.
3. *Establish a project strategy and organization structure*.
4. *Establish project authorities and responsibilities.*
5. *Develop the schedule and establish the time-phased baseline budget plan*.
6. *Integrate project scope, schedule, and budget with the quality of work.*
7. *Authorize work for the baseline budget plan.*
8. *Maintain the schedule and baseline budget plan through change control*.
9. *Distinguish between maintaining the baseline budget plan and funds management*.
10. *Execute and evaluate performance against the baseline budget plan.*
11. *Accumulate costs for the baseline budget plan*.
12. *Forecast the future costs for the baseline budget plan*.
13. *Manage risks, make decisions, solve problems, and create opportunities by taking action.*

The 13 IPM principles give the FPD and contractor a blueprint for successfully managing their efforts. They encompass all of the GAO's EVM fundamental activities and also directly influence the project's ability to meet the DOE O 413.3B requirement for an EIA-748 compliant

EVMS. Figure 3 shows a matrix of the relationship of each of the EIA-748 guidelines to the primary corresponding IPM principle; there are also secondary relationships that are not shown.

EIA-748 Guideline	Description	Principle 1: Establish a Culture of Shared Values & Accountability for Project Execution & Self Governance	Principle 2: Train for Integrated Project Management (IPM) Proficiency	Principles Mapping to EIA-748 Guidelines										
				Principle 3: Establish a Project Strategy & Organization Structure	Principle 4: Establish Project Authorities & Responsibilities	Principle 5: Develop the Schedule & Establish the Time-Phased Baseline	Principle 6: Integrate Project Scope, Schedule, & Budget with Quality of Work	Principle 7: Authorize Work for the Baseline Budget Plan	Principle 8: Maintain the Schedule & Baseline Budget Plan through Change Control	Principle 9: Distinguish between Maintaining the Baseline Budget Plan & Funds Management	Principle 10: Execute & Evaluate Performance Against the Baseline Budget Plan	Principle 11: Accumulate Costs for the Baseline Budget Plan	Principle 12: Forecast the Future Costs for the Baseline Budget Plan	Principle 13: Manage Risks, Make Decisions, Solve Problems, & Create Opportunities by Taking Action
GL	Description													
1	Define WBS	ALL ENCOMPASSING	ALL ENCOMPASSING	●										
2	Define OBS				●									
3	System Integration						●							
4	Indirect Cost Manager				●									
5	Establish Control Accounts				●									
6	Establish Schedules					●								
7	Establish Objective Measures										●			
8	Create PMB					●								
9	Budget by EOC							●						
10	Create Work Packages										●			
11	WP CA Budgets Equal					●								
12	Control LOE										●			
13	Overhead Budgets					●								
14	Identify MR/UB Budgets					●								
15	Reconcile Project					●								
16	Cost Consistent											●		
17	Collect Cost by WBS											●		
18	Collect Cost by OBS											●		
19	Collect Overhead Costs											●		
20	Identify Unit/Lot Costs											●		
21	Material Performance										●			
22	Calculate Variances										●			
23	Variance Analysis										●			
24	Indirect Variances										●			
25	Summarize Perf Data & VARs										●			
26	Management Use													●
27	Develop EACs												●	
28	Timely Baseline Changes								●					
29	Maintain Baseline									●				
30	Limit Retroactive BL Changes								●					
31	Authorize BL Changes								●					
32	Document BL Changes								●					

Figure 3. IPM Principles Relation to EVMS Guidelines

6.2.1 IPM Principle 1—Establish a Culture of Shared Values and Accountability for Project Execution and Self-Governance

An organization's environmental factors are internal and external events, people, systems, structures, and conditions that influence the implementation of the EVMS. They fall into four general categories:[18]

- **Culture.** A system of common assumptions, values, and beliefs (or the lack thereof), which govern how people behave in organizations. Organizational values and beliefs should align with the development and outcomes of a successful EVMS.
- **People.** The individuals who represent the interests of their respective stakeholders, including project business managers, project control analysts, project schedule analysts, acquisitions/subcontracts, CAMs, integrated project teams (IPTs), and line or resource management. They are adept in the relevant subject matter and contribute to the process, leading to favorable project control outcomes.
- **Practices.** Internal and external procedures and processes that positively or negatively influence the outcome of a project or program. Internal business practices and methods are specific to a given organization, including internal standards, requirements, and best practices. External business practices, regulations, requirements, procedures, and methods cross organizational boundaries (such as government to contractor, software provider to contractor, and subcontractor to prime).
- **Resources.** The availability of key tools, data, funding, time, personnel, and technology or software to support the EVMS process.

The development and execution of an EVMS self-governance plan is a critical element of any DOE O 413.3B capital asset project. Self-governance refers to the capacity of a contractor to govern autonomously and, by doing so, ensure EIA-748 compliance. When a contractor instills IPM principles and maintains compliance, EVMS output then guides management decisions and improves project performance, which should result in less Government oversight.

The FPD is accountable for the oversight and validation of EVMS-generated data. The FPD's active involvement, therefore, in encouraging and establishing a culture of contractor self-governance is essential to an effective EVMS. Self-governance is a repeatable process in which the contractor (as the EVMS owner) oversees itself and controls its affairs.

An important part of a contractor's credible self-governance plan is the self-reporting of EVMS issues that need attention. The contractor should use judgment and perception to determine what a reasonable person who relies on the performance data/information and financial statements might need. The contractor makes materiality judgments by considering surrounding circumstances and involving both quantitative and qualitative considerations, including the number of deficiencies observed, associated absolute dollar-value impact, issue importance, and potential impact on project funding requirements.

An objective and independent self-governance approach ensures the long-term sustainability of a continuously improving EVMS and is visible, structured, and endorsed by management. Key

[18] ASU Integrated Project/Program Management (IP2M) Maturity and Environment Total Risk Rating (METRR) using EVMS, current version, https://go.usa.gov/xtKgx.

characteristics and features include the following:

- Leadership engagement (to include the FPD and DOE stakeholders), which encourages continuous improvement and defines and enforces a culture of compliance
- A chartered authority structure with cross-organizational engagement (financial office, procurement, quality assurance, etc.), which reports to and interacts routinely with institutional leadership
- A method for routinely assessing system health via clearly defined and independently positioned oversight that has a clear line to senior management
- Effective, consistent, and defined processes that are repeatable and enduring
- A learning organization capable of maintaining and improving workforce skill via proven techniques such as peer-to-peer mentoring
- Above all and incorporated throughout—transparency and openness to feedback, both critical and complimentary.

These controls and processes ensure both the contractor and DOE receive current and accurate project progress and performance data. Effective controls reduce the risk of EVMS noncompliance and help ensure performance information is complete and repeatable, financial records and reports are auditable, and the EVMS complies with FAR 52.234-4 EVMS requirements, OMB Circular A-11 guidance, and applicable DOE EVMS policies.

6.2.2 IPM Principle 2—Train for IPM Proficiency

The IPM process can be tailored to meet each project's unique needs; IPM and EVMS proficiency increase when training is a part of the project culture (for both the FPD and contractor) from conception to closeout. The proficiency of the entire PMO in executing an integrated process for project management enables the FPD to successfully manage the project from start to finish. Furthermore, the FPD should be proficient in effective oversight of contractor project performance using the EVMS.

DOE PM-generated instructional training snippets on a variety of EVMS and project management topics should be reviewed by the FPD and contractor alike. These are available on a variety of DOE online learning platforms, such as the Learning Nucleus,[19] PM-MAX,[20] and the DOE PM EVMS website.[21] EVMS online training references industry standards for EVMS use on projects. DOE ensures the EVMS training and proficiency programs made available to Federal employees and contractors incorporate commercial and Government best practices.

EIA-748 compliance requires the contractor to develop an internal training program to ensure the technical competency of project personnel during EVMS development, implementation, and maintenance. The FPD and contractor should discuss the importance and necessity of establishing a formal training regimen for new EVMS personnel and for refresher training for current personnel.

During the contract development phase, requests for proposals include the EVMS requirement

[19] DOE Learning Nucleus, https://ess.doe.gov/.
[20] PM-MAX, https://go.max.gov/doe-pm.
[21] DOE PM EVMS, https://go.usa.gov/xmCP5.

for DOE contract bidders. Contractor success relies on obtaining EVMS training and certification as early as possible after award to gain a solid foundation in the EVMS, from concept through the application. Proficiency attainment begins with formal education and extends into the subsequent experience. Upon completing EVMS training, personnel acquire an adequate understanding of the EVM system description, operations of key management subsystems and processes, and 32 EVMS guidelines and associated attributes to perform their responsibilities proficiently.

The FPD ensures the contractor understands the timeline for executing its internal training program as it relates to formal certification and SRs for all project processes, and particularly for CAM readiness. Through daily control account (CA) management, CAMs use the EVMS as a vital tool to anticipate variances in schedule, cost, and quality. All potential and current CAMs need to receive ongoing training and demonstrate increasing levels of proficiency. CAMs maintain and rely upon notebooks (electronic or hard copy) to ensure they are prepared and capable of reporting on project status as early as possible in the project life cycle. Early warning of project challenges motivates the team to sustain strong project performance. Therefore, the training process should include four fundamental traits:

1. Designated project personnel "learn the book" through a formal EVMS workshop and testing. EVMS training workshops build the foundation.
2. Active mentorship between experienced EVMS project personnel and less experienced CAMs facilitate the transfer of experience.
3. Proficiency and skill result from immediate application of EVMS knowledge in assessing the health of a real-world project. Practical EVMS application fortifies this knowledge and empowers new CAMs through experiential learning.
4. CAM surveillance interviews validate EVMS competence and serve as continuous learning and education opportunities. They also sustain technical expertise and knowledge transfer to the next generation of EVMS leaders.

Formal training for both Federal and contractor employees should emphasize the importance of using the EVMS as a tool to anticipate and prevent performance problems. More important, the development of training should help contractors gain proficiency in how best to address and actively work toward eliminating variances in the project's early stages to prevent longer-term adverse performance.

Federal personnel responsible for certifying or conducting EVMS surveillance—or relying on its data and information quality for generating analyses, forecasts, and decision making—should be well versed in IPM using the EVMS. Those personnel also should have a practical understanding of the local contractor's management subsystems and processes and maintain knowledge of current DOE EVMS requirements and guidance.

The effectiveness of an organization's training is best measured through testing to evaluate competence and knowledge. Contractor project managers sustain EVMS readiness and CAM skills, while the contractor maintains an active lessons-learned program within its EVMS to regularly communicate these lessons to all project personnel, including the contractor project manager, CAMs, and project controls personnel. Contractors ensure appointed CAMs can immediately apply their training through EVMS problem-solving applications, surveillance interviews, CAM notebook setup, and other EVMS knowledge opportunities.

For CAMs who are continuously trained and gain EVMS proficiency, surveillance readiness is never in doubt. They can achieve and demonstrate competence and knowledge through formal testing, essential reading, and job-related competence reviews. This prepares CAMs for their role and confirms their competence.

6.2.3 IPM Principle 3—Establish a Project Strategy and Organization Structure

The complete definition of work scope is the critical starting point for developing a product strategy. Prior to CD-2, the product strategy is made clear in terms of defining the product or deliverable to satisfy customer needs. The creation of a WBS to define the scope of the final product ensures its delivery meets the project's stated objectives and outcomes. A product-oriented WBS, required by EIA-748 and a best practice in the GAO Cost Estimating and Assessment Guide, organizes the total work scope of the project through elements grouped on descending levels that increasingly detail the project work extended down to the CA level. Additional information about DOE product-oriented WBS is also available.[22]

Just as no two projects have the same scope, no two projects have the same WBS. However, common to all projects, the first level of the WBS contains one element representing the entire project. The WBS is further arranged in a logical hierarchy to allow for clear groupings of work scope. Throughout the hierarchy, each element should have a unique identifier indicative of the level on which it resides and the asset it supports. The number of WBS levels depends on project size and complexity. The lowest levels of the WBS contain work packages (WPs) and planning packages (PPs). Begin developing the project's WBS in conjunction with the analysis of alternatives before CD-1, but finalize the WBS just before baselining the project at CD-2. Following CD-2, maintain the WBS through change control.

The WBS provides the framework for technical scope, schedule, and budget planning and control throughout the project's life cycle. It breaks down all authorized work scope into elements used to formulate the project baseline useful for planning, assignments to responsible organizations, authorizations to begin work, scheduling and budgeting, cost accumulation, performance analyses, and any baseline planning revisions. The WBS also provides a framework for data collection and reporting.

A product-oriented WBS decomposes elements into a hierarchical structure that relates elements to one another as well as to the overall product. The elements in each decomposition (child) level represent 100 percent of work applicable to the next higher (parent) element. The WBS gives the IPT the necessary framework of elements for creating cost estimates and scheduling resources at the most detailed and accurate level possible. Figure 4 shows a capital asset acquisition project WBS example with second level WBS elements comprised exclusively of capital assets. It also depicts further decomposition/disaggregation from one level's parent to the next level's children.

[22] https://go.usa.gov/xtK4v.

Figure 4. Example of WBS Hierarchy for Construction

6.2.4 IPM Principle 4—Establish Project Authorities and Responsibilities

A clear organizational framework defining project roles, responsibilities, authorities, and accountabilities for the Federal PMO and contractor underpins successful project planning and execution. The Federal organization should be described in the PEP, including an organization chart that identifies the various participants, their interfaces, and their roles and responsibilities. Whatever the context, the roles and responsibilities for project oversight and governance need to be clear and appropriate to establish the right project environment, including all formal and informal activities and practices in which the PMO directly or indirectly is engaged with the contractor.

The contractor organizational breakdown structure (OBS) identifies its project responsibilities. Often, the prime contract (such as for a project executed through a FAR contract) or PEP (such as for an M&O contract) describes the organizational relationship between the Federal PMO and the contractor OBS. In every case, the relationship is described in the context of a partnership for mission delivery between the Federal PMO and the contractor.

The contractor's project organization is defined by the responsibility assignment matrix (RAM), which integrates the OBS and WBS. The intersection of the OBS and WBS identifies the CA structure used to plan, execute, monitor, and control project scope. Each CA is assigned a CAM responsible for planning and executing the authorized scope within that CA from within the project's OBS hierarchy. The OBS defines the organizational element (the *who)* responsible for planning and executing the work (the *what*) as defined by WBS elements assigned to the CA. The resulting RAM forms the basis for the CAM's formal authorization to execute work within the CA by the project manager, consistent with the prime contract or PEP, as appropriate.

The CA is the primary management control point for work authorization, planning, budgeting, cost accumulation, and performance measurement. The WBS level at which a CA is established depends primarily on project size and product type. CAs can be established at different levels within the WBS. Work within the WBS is decomposed as far as needed to enable appropriate management, insight, and control. Identifying CAs within the RAM is how the project manager aligns work responsibilities and accountabilities with the appropriate CAM role, which then defines CAM authorities to manage, control, and facilitate resource allocations to accomplish work scope specific to that CA. As a result, proper RAM definition and CAM assignment ensure the contractor project management team's responsibilities, accountabilities, and authorities for relevant roles are assigned, communicated, and understood for each major role in the project.

The CAM is responsible for planning (including resources) and schedule execution, budget, and technical performance associated with accomplishing work assigned and authorized in the CA. The CAM has responsibility, authority, and accountability for CA planning and performance.

CAMs understand and execute their responsibilities and authorities as project leadership team members (previously covered in Subsection 6.2.2). They may delegate authority to the organization's lower structure levels to assist with managing the CA. For example, a technical manager who assists the CAM may be responsible for other personnel assigned to the CA. Regardless of any delegated authorities, the CAM has a complete and current understanding of CA details, including the technical scope, planning, work authorization and budgeting, execution status, forecasting, and change control actions affecting the CA. The CAM controls changes or revisions that influence the baseline, the foundation used to measure actual accomplishments. Baseline changes or revisions occur in concert with the approved change control framework and

process.

The technical scope's size and complexity and the number of resources simultaneously involved influence a CAM's span of control and responsibilities. Although there are no dollar or management span-of-control thresholds, the project manager's assignment of the CAM depends on technical background, experience, and the time needed to comply with the many EVMS responsibilities, in addition to other simultaneous CAM assignments elsewhere across the RAM.

The EVMS storyboard, a recognized best practice, is a graphical representation to exhibit how the entire system functions at the individual management process level. It typically uses a single control account to clearly illustrate individual responsibilities and the interactivity of the system's administrators, managers, project controls personnel, and executives. Each management process flow displays reports, forms, and exhibits from the initial process step to the last to indicate the respective function involved, including customer interfaces. The development of a logical sequence of steps, their precedence, and involvement and actions of participants and decision-makers should result in the complete definition of management processes, both individually and collectively. The EVMS storyboard is meant to facilitate internal and customer understanding of how, who, when, and what the entire system does. An example of an actual storyboard's process steps for the development of a variance analysis report is shown in Figure 5.

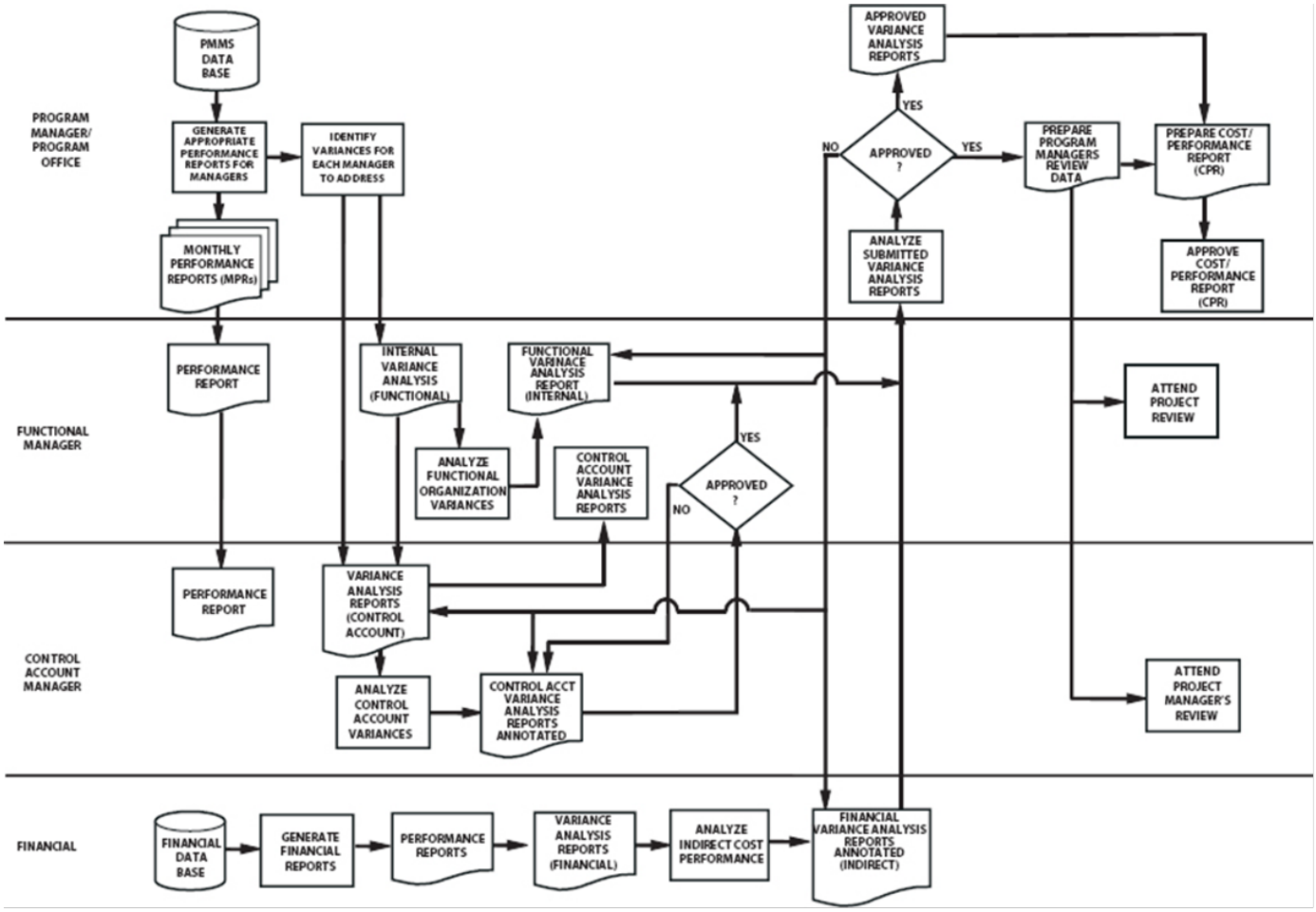

Figure 5. Storyboard Example

6.2.5 IPM Principle 5—Develop the Schedule and Establish the Time-Phased Baseline Budget Plan

Once the work scope is defined via the WBS, the project team develops the schedule by considering the timing and resources needed. The schedule is then used to develop the contract budget base (CBB)/project budget base (PBB). The PBB is the sum that represents the cost of authorized contractor scope for a project. The interdependent relationship among the work scope, schedule, and budget (each mutually reliant on the others) forms the basis of the project's time-phased baseline budget plan, defined as the PMB by EIA-748. Once it is established, the Government and contractor have a common reference point for managing project progress and success. Additional EVMS information is included on the DOE EVMS Gold Card.[23]

Budgeting is the process of creating a money-spending plan that determines in advance whether the project has enough money (or funding) to execute the work required to accomplish a project's approved scope. EIA-748 compliance ensures planned spending is in alignment with planned work. An integrated schedule helps establish the time-phased budget or spend plan and ultimately determines what work can be done when and by whom. The time-phased baseline budget plan is the plan for accomplishing the project's work scope requirements in full alignment with resource planning and the project schedule. Commonly referred to as the budgeted cost for work scheduled (BCWS), or the sum of the CA budget for all work scheduled to be accomplished within a given period, the time-phased baseline budget plan is typically a detailed plan for CA activities scheduled to start within a specified planning horizon, usually 6 months. Budgets beyond this time frame are distributed to a PP. Converting PP budgets into precise WP budgets—that is, work starting within the next 6-month period—typically starts 30–45 days before the planning horizon.

A fully integrated, networked schedule is integral to the time-phased baseline budget plan and critical in project success. EIA-748 compliance requires developing an integrated, time- and resource-based schedule containing the logic network of activities that accomplish the work scope. Building predecessor and successor logic relationships at the activity level renders the execution strategy and road map for timely product or deliverable completion. For the time-phased baseline budget plan to be meaningful, the schedule represents all work and activity durations, identifying the costs and resources to perform the full work scope. Identifying the critical path in the schedule is a key factor in determining the time phasing of the baseline budget plan, an EIA-748 requirement. If an activity on the critical path is delayed, by definition, the project is delayed, with impacts on the time-phased baseline budget and project spending plan.

The project schedule is based on a hierarchical structure with discrete work and level-of-effort (LOE) activities at the lowest level, next summarized to the WP/PP level through the CA, and finally to the total project level. The schedule is expected to have more granularity in the near term (typically the next 6 months) with less detail moving into the future. Figure 6 shows how traceability between the various schedule levels is designed to ensure milestones and activities at the WP level, representing completion of either all or part of a WP, are time integrated at ascending schedule levels and terminate at a corresponding next-higher-level schedule milestone. The number of schedule levels (or tiers) is a function of project complexity and size.

[23] Earned Value Management System (EVMS) Gold Card, http://go.usa.gov/xFRyz.

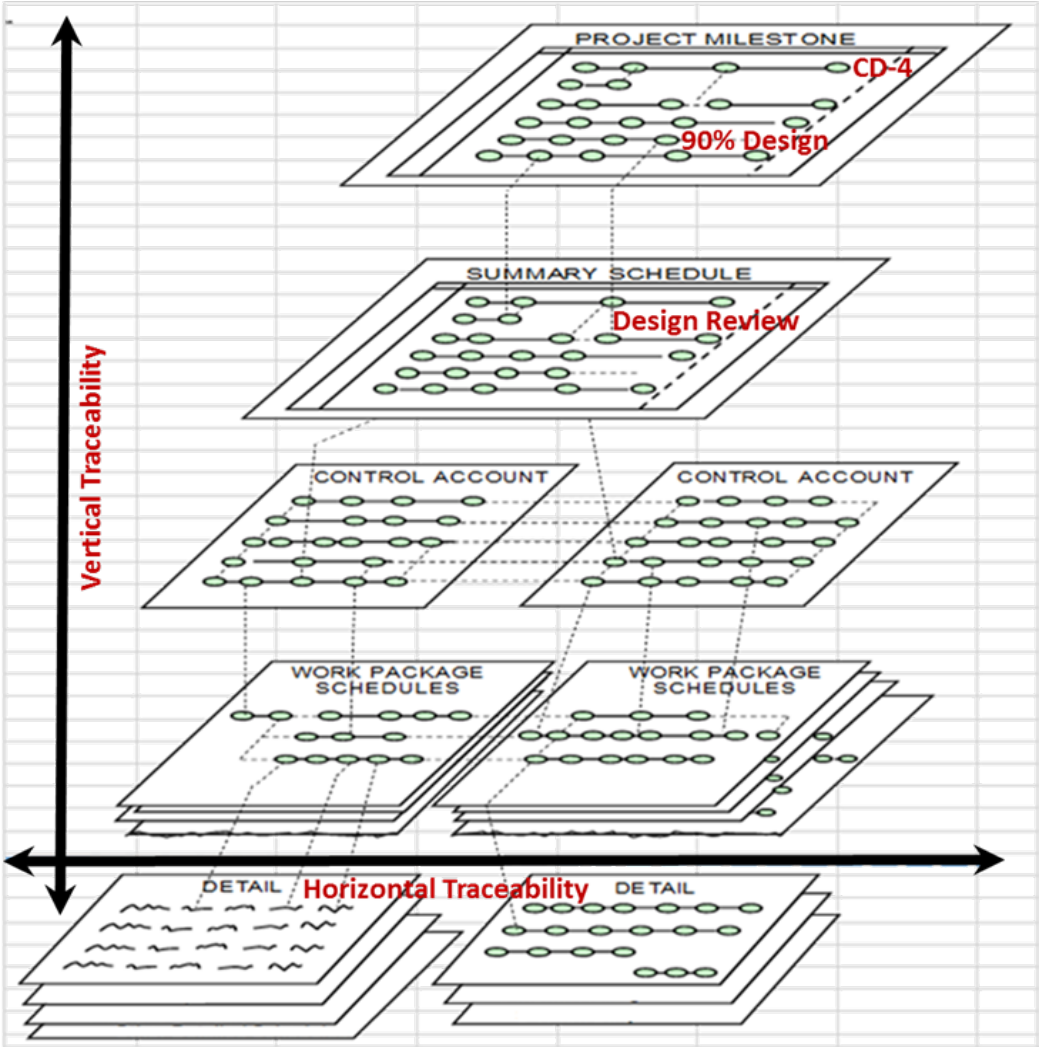

Figure 6. Horizontal and Vertical Traceability Schedule Levels

Projects integrate their schedules horizontally (as evidenced by networks with critical and near-critical paths) and vertically (as evidenced by the inclusion of all work regardless of the performing entity). A schedule achieves horizontal traceability when the logic connecting predecessors and successors creates a logical and realistic whole. Logic includes the relationships for the sequencing of the events for a logical forward and backward reasonable plan of execution. A schedule achieves vertical traceability when its information rolls up logically and consistently. Horizontal and vertical traceability demonstrates realism in the schedule.

When developing the time-phased baseline budget, using zero-budget activities is disallowed with the following two exceptions:

- schedule visibility tasks, which capture external activities that may impact the project; these activities are not part of the PMB;
- schedule of values activities, which identify subcontractor milestone deliverables.

6.2.6 IMP Principle 6—Integrate Project Scope, Schedule, and Budget with the Quality of work

Any zero-budget activities that represent discrete work the contractor performs are not EIA-748 compliant because they provide no performance measurement value. If the contractor recognizes that an additional budget is necessary to accomplish the project's objectives, the budget value can be increased to create an OTB (Subsection 6.2.8) with DOE approval. EIA-748 compliance requires that the EVMS provide complete work integration through the contractor's various management subsystems and processes. Project managers rely on data and information consistency from a variety of subsystems when making decisions.

The triple constraint (Figure 7) illustrates the relationship between project scope, schedule, and budget: as one changes, the others change in a defined and predictable way. Managing a project is often a series of tradeoffs and compromises to keep things moving toward successful completion. The triple constraint provides a framework for decision making related to tradeoffs and how they influence the project. For example, if the project is running behind schedule, the project could compensate by reducing the performance parameters or reducing/eliminating scope. Dedicating more resources to moving the schedule ahead may increase the cost associated with the planned budget. The Government and contractor working together and using the EVMS as a single, integrated system can manage the multiple aspects of project constraints.

The triple constraint method balances the project constraints of scope, schedule, and budget (which collectively create the PMB) and provides a tool for making decisions throughout the life cycle of the project-based EVMS performance metrics:

- The scope constraint refers to what is done to produce the product or the project's result to customer specifications (quality).
- The schedule constraint refers to the time available to complete a project.
- The budget constraint (also referred to as cost constraint) refers to the budgeted cost of the project.

Figure 7. Triple Constraint

The integration necessary for a fully functioning EVMS is designed to help manage the project

using this triple constraint approach. EVMS implementation—the integration of the contractor's management subsystems and processes—necessitates that the budget associated with a project is closely related to its scope and schedule parameters. If the scope or schedule parameters change, the actual cost budgeted is likely to also change predictably. The same is true for the impact on any constraint if assumptions defining one or both others change: one constraint is often compromised to meet the other two. EIA-748 compliance requires integrating the contractor's planning, scheduling, budgeting, work authorization, and cost accumulation processes and, as appropriate, with the WBS and organizational structure. This integration creates consistent and relatable performance data and information through a unique coding structure (generally the WBS) to facilitate linkages among the project's EVMS, manager, and scope, schedule, and budget constraints. Fragmented, misaligned management subsystems and processes inevitably produce an inconsistent, unreliable EVMS for identifying and quantifying tradeoffs and compromises and thus weaken the CAM's ability to make informed decisions about the project's constraints using information generated from the management system.

The triple constraint is used at all EVMS levels but most notably at the CA level. The CA is a natural management point to plan and control scope, schedule, and budget because it represents the work assigned to one responsible organizational element for a single WBS element within the project. At a minimum, the triple constraint approach is valid within each CA. Also, each CA is assigned to a single manager—the CAM—within the project who has cognizant authority and responsibility. The CAM has ultimate responsibility for integrating the scope, schedule, and budget parameters.

6.2.7 IPM Principle 7—Authorize Work for the Baseline Budget Plan

EIA-748 compliance requires the start of project work and cost expenditure to be initiated through a documented authorization process starting with the initial PMB development between CD-1 and CD-2 (see Section 5). A primary EVMS responsibility is to verify and ensure compliance with this requirement. Quite simply, do *not* begin any work before the effort is authorized by an initial work authorization. This process gives the project manager budget authorization to start work.

Project managers ensure no work begins before an approved work authorization document (WAD) is issued. Formally authorizing the work ensures that scope, schedule, and budget objectives—the triple constraint—are documented, and all resources to complete the work are budgeted and acknowledged before the work commences. Budget is established for work that is then further planned by the elements of cost (EOCs) for labor, material, subcontractor, and other direct costs required to accomplish it. Ensuring CA budgets are authorized and budgeted by EOCs facilitates the required insights into project performance at the resource level. Inadequate authorization increases the risk of performing unauthorized work and can result in the poor execution of contracts and cost overruns.

Authorization for the entire TPC value begins by establishing the PB at CD-2. Inadequate authorization increases the risk of performing unauthorized work and can result in poor contract execution and cost overruns. The authorization process extends from the project level to the CA; WP and PP budgets within the CA are the CAM's responsibility (Subsection 6.2.4). Figure 8 diagrams the typical hierarchical authorization flow-down.

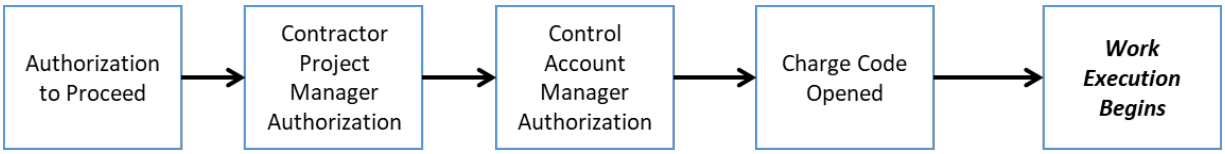

Figure 8. Authorization Flow

The principle of authorization is applied at various project maturation stages:

- **Critical Decisions.** At each CD, a contractor may receive authorization for that project phase following DOE O 413.3B.[2] The DOE National Nuclear Security Administration (NNSA) typically gives contractors authorization via a contracting officer letter of authorization. CDs may include CD-3A, where long-lead procurement, site preparation, site characterization, etc., are authorized before full project CD-2 approval. Formal customer authorization occurs before the execution of the scope included in CDs.
- **With Addition of Customer-Directed or -Driven Scope.** During project execution, DOE/NNSA may identify new project scope, may realize a Federal risk, or have other situations that add scope to a project. Upon formal direction from the Government contracting officer, the addition of new scope must follow the work authorization process (as documented in the EVM system description) to ensure work is not initiated before authorization. EIA-748 states, "WADs reflect the incorporation of all authorized changes."
- **With In-Contract Scope Changes Using Management Reserve (MR).** MR, which has no assigned scope, is a budget amount within the CBB/PBB set aside by the contractor project manager for unexpected growth within the currently authorized work scope, rate changes, risk and opportunity handling, and other project unknowns. MR is used for new work within the overall project's scope (e.g., to expand a CA plan's requirements/parameters) but *not* within the scope of an existing CA. After MR is applied, the new work and associated budget becomes a part of the PMB. MR use follows the contractor's internal authorization process; federal involvement isn't required (Subsection 6.2.8).

For cases of emerging work associated with authorized unpriced work (AUW), at least partial authorization is required by the contracting officer before the work is performed and expenditures are incurred. For new in-scope work, this authorization may extend more than a month. EIA-748 compliance requirements allow for interim authorizations by the contractor project manager for time-sensitive and mission-critical work to later be supplemented by formal work authorization documentation. However, do *not* perform work or incur expenditures without formal Government authorization for new out-of-scope work.

In conditional situations, the customer may provide partial contractor authorization via AUW. This partial authorization condition may be expressed as a not-to-exceed (NTE) value, limited-time authorization, or limited-scope authorization. Flow down this limited authorization to appropriate CAMs to ensure it is clearly understood, documented, and not exceeded.

The contracting officer typically identifies the contractual work scope changes and AUW budget value on the basis of estimates from contractor-provided, rough-order-of-magnitude or certified pricing data representing the entire scope. In some circumstances, the contracting officer identifies an NTE funding value limit. Do *not* confuse the NTE funding value limit with the AUW budget value. The amount of the NTE is often considered a constraint and usually represents a limited funding value to last until the change order is definitized. As an important administrative tool, a budget serves as a plan of action for achieving quantifiable objectives and the standard for measuring performance. The AUW budget value must represent a realistic plan to capture the entire project contract's work scope. Just as incrementally funded project contracts establish a budget baseline plan for the entire work scope, AUW incorporation into the project contract represents the entire work scope of the contracting officer's action.

A portion of the work scope may be held in undistributed budget (UB) until negotiations are completed. The AUW budget value is the estimated cost (excluding fee or profit) for a project contract change before negotiations. This allows the contractor to add the AUW budget value to the CBB/PBB and plan the near-term work scope in detail while retaining the balance of the budget value in UB. Start near-term work scope execution while the contract modification is being negotiated (Figure 9, Note 1). The contractor reports the AUW budget value for the full-work-scope change in the IPMR.

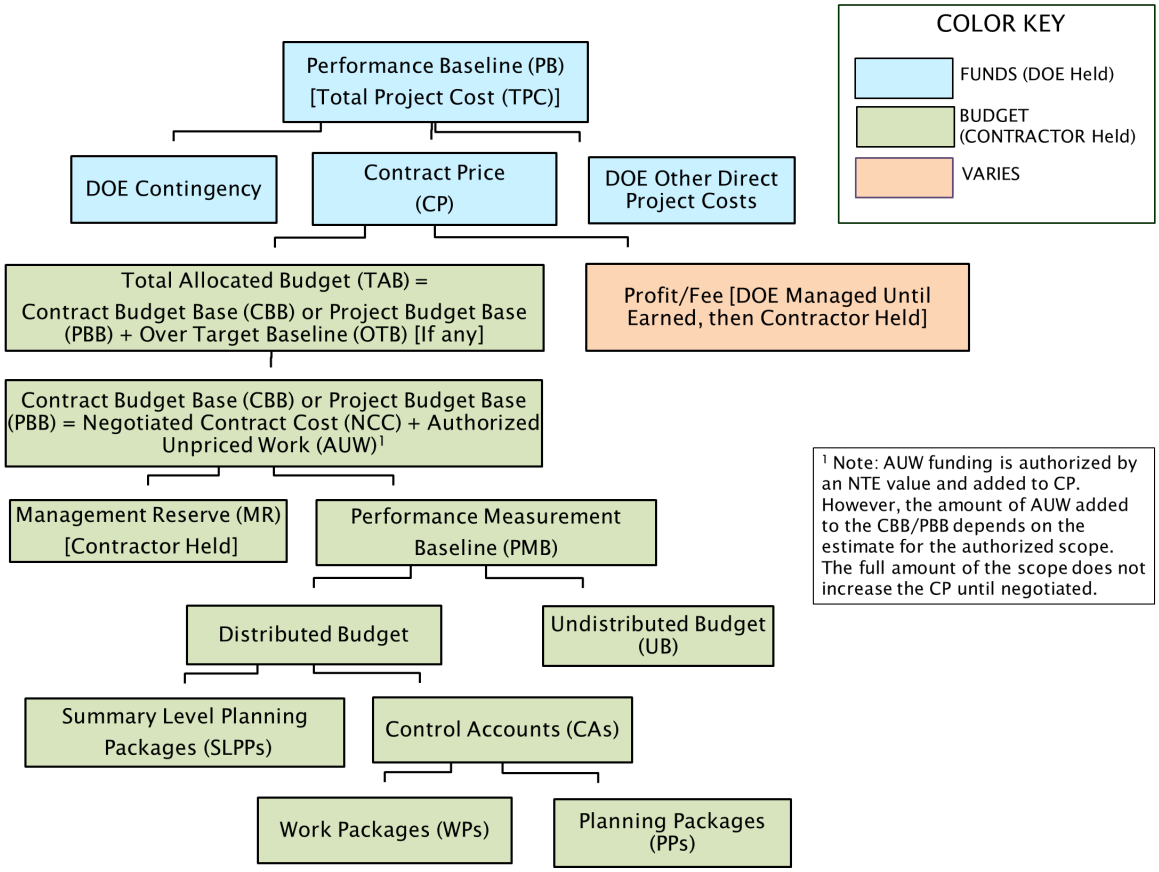

Figure 9. Project Hierarchy

6.2.8 IPM Principle 8—Maintain the Schedule and Baseline Budget Plan through Change Control

Integrated contract and project change control is a process that

- determines when a change is required,
- ensures the required change is agreed upon at the appropriate level,
- manages the actual change when and as it occurs,
- ensures the contract remains reconcilable with the project, and
- identifies who approves the changes at the various scope, schedule, and cost thresholds.

Because projects are executed through contracts, project changes may also mean contract changes. Distinguish the types of baseline changes because they may refer to changes in the PB, CBB/PBB, or PMB. The terms PB, CBB/PBB, and PMB differ, as shown in Figure 10. The original PB, established and documented at CD-2 approval, represents the Department's top-line commitment to deliver the project's defined scope by a specific date (CD-4) at a specific cost. The CBB/PBB and PMB manage project schedule and cost during execution using the EVMS.

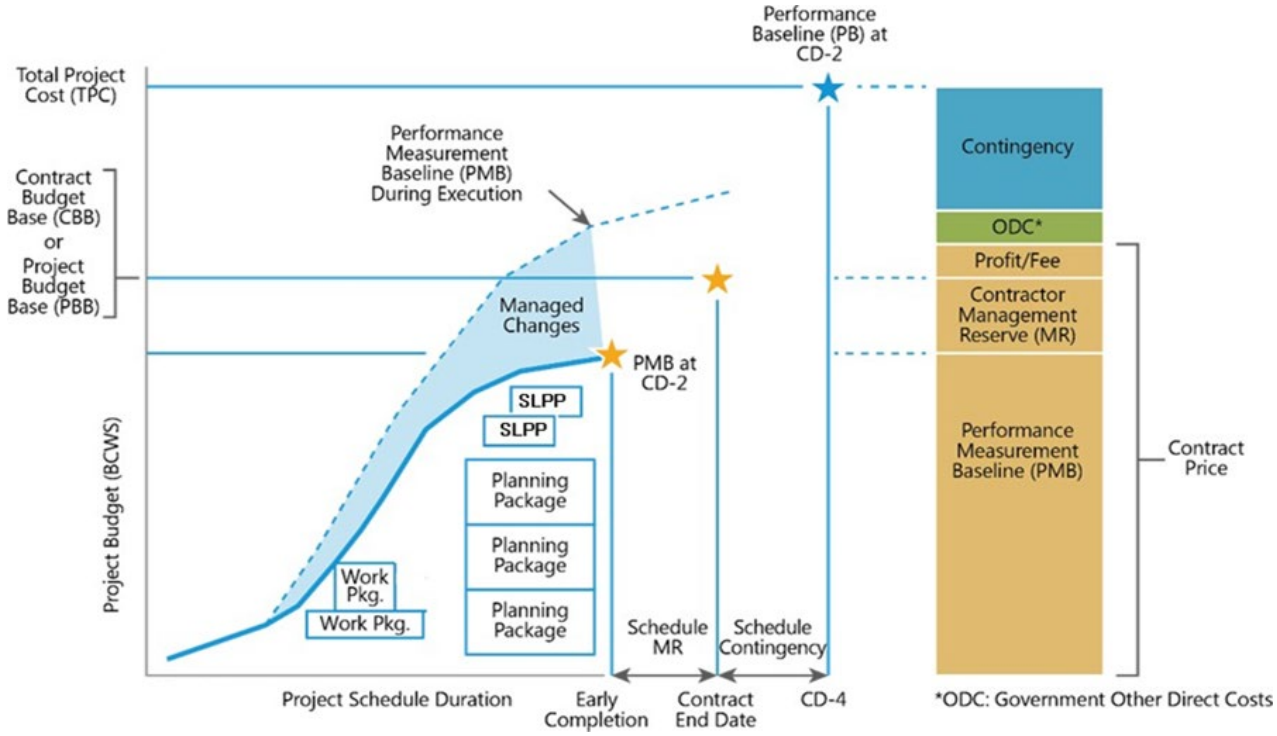

Figure 10. Project and Contract Budget Base-Key Terms and Relationships

EIA-748 compliance requires incorporating authorized contractual changes into affected schedules, budgets, work authorizations, and other documentation promptly - before commencing that work - to ensure the PMB reflects the most current time-phased budget for accomplishing all authorized work. Retroactive PMB changes must be limited to maintain performance measurement data accuracy and validity for use in making reliable schedule and

cost projections. EIA-748 compliance also requires reconciliation of the PMB change to the prior value.

The PMB (established between CD-1 and CD-2 with the implementation of the EVMS and updated through change control at CD-2 approval) can only be used as the basis for measurement and a departure point from which work begins after

- the time-phased budget is defined to execute the project's work scope requirements, and
- a resource-loaded schedule is developed.

Please note the difference between the PMB (an integral part of the contractor's EVMS) and the PB, which includes the entire project budget (TPC, including fee, other government direct costs and contingency) representing DOE's commitment to Congress. The contractor performing the project work scope is *not* responsible to use EVMS to manage the PB elements outside of the CBB/PBB.

EIA-748 compliance requires preserving EVMS data and information integrity using a formal change control process to maintain an accurate and reliable PMB. The PMB reflects the most current time-phased budget for accomplishing all authorized work, upon which management can rely for making project-related decisions. The purpose is to ensure all changes are appropriate and documented and project resources are used efficiently. Change control is a systematic approach to managing all changes made to or within the CBB/PBB. A mature, rigorous, and integrated contract and project change control process includes changes (1) within the CBB/PBB and (2) to the CBB/PBB resulting from the addition or deletion of scope at the Government's direction. Follow established change control procedures for authorizing, documenting, tracking, and reporting baseline changes in the designated change control logs.

DOE Authorized Changes

The contracting officer authorizes externally driven changes (those outside the contractor's authority) (Subsection 6.2.7). The PEP defines authorization levels for utilization of DOE cost and schedule contingency.

The change may be scope-driven—to add, delete, or alter the contract effort—or it may be to alter contractual milestones and the final delivery or completion date. Realization of a Government-owned risk is an appropriate change to the PMB, through the application of Federal contingency following approved change control procedures.

The budget provided for external changes comes from DOE-budgeted contingency and changes the CBB/PBB. Such changes usually result in contract realignment, influencing not only the CBB/PMB but DOE contingency and possibly the PB. A key goal of integrated contract and project change control is to ensure the PB is not exceeded.

A BCP is a document that comprehensively describes a contractor's proposed change to an approved PB, including the resulting impacts on project scope, schedule, design, methods, and cost baselines. The BCP relates to one or more elements of a project's PB, including the TPC, DOE contingency, CD-4 completion date, or some feature of the project's scope and key performance parameters (KPPs). The applicable PME (identified in the change control framework in the PEP) approves the BCP. After approval, the contracting officer modifies the

contract accordingly.

Finalization of a BCP will likely result in the generation of Budget Change Requests (BCRs) as the BCP is implemented; this is part of the contractor's internal replanning process and is further described below.

A BCP may or may not result in a change to the CBB/PBB. If the BCP results in scope changes to the contract, the CBB/PBB is affected, and the contracting officer then modifies the work authorization or contract. If the BCP only addresses an overrun, the contracting officer modifies the contract to address funding, but the CBB/PBB does not change—a key example of budget versus funds and how DOE contingency may be used for either: to add more scope than originally planned to the contract or add funding to cover overruns.

An OTB is an agreement between the customer and the contractor to allow additional budget to be added to the CBB/PBB to regain an executable PMB and report meaningful performance data. Implementing an OTB improves managerial control and decision making for the remainder of the project. It may also lead to corresponding change actions to the PB, the contract and congressional budget request.

Consider an OTB when (1) the original PMB is no longer realistic or (2) the performance measurement information from an unrealistic PMB is of marginal value and should not be used for decision making. A contractor OTB requires DOE approval.

Information on separation of budget and funds is covered in Subsection 6.2.9.

Contractor Internal Replanning

Internal replanning is limited to the contractually authorized work scope within CBB/PBB budget constraints and the schedule supporting project completion. Changes in the contract's scope may be outside the scope of a CA. The budget for these changes may come from internal transfers between CAs (the PMB) or MR.

Internal changes do *not* require a contract modification; however, the FPD is notified of significant changes as defined in the change control framework of the PEP. Usually, this occurs through variance analysis reporting (Format 5 of the IPMR). Obtain contractor project manager approval for internal changes per the EVM system description.

Replanning is limited to future effort. Replanning past or current period effort as retroactive is done only under specific circumstances as stated in EIA-748.

For internal replanning, a BCR that is approved by the contractor's project manager should be used. A BCR documents events that only require an internal adjustment to the performance baseline components and does *not* change the TPC, CD-4 date, or some feature of the project's scope and KPPs. While BCR is a common industry term, some contractors may use other terms as defined in their EVM system descriptions.

While the following terms and definitions are suggested to provide a common understanding of the different types of BCRs possible, this does not mandate contractor's changing their EVM system descriptions. Objective evidence supporting the change should be maintained with the

BCR, and all changes should be reconcilable and traceable via project documentation and required EVMS budget logs. Typical BCR types include:

- **BCR – PMB:** A type of BCR used by the contractor to maintain configuration control of the PMB for re-planning actions for remaining work scope. A normal program control process accomplished within the scope, schedule, and cost objectives of the project's PMB. A BCR-P requires Project Manager's approval prior to implementation. A BCR-P implements changes to the time phasing of the PMB only. A BCR-P does not include MR utilization and does not modify the contract.
- **BCR – MR:** A type of BCR used by the contractor to allocate MR to Control Accounts within the PMB for authorized purposes. A BCR-M requires Project Manager's approval prior to implementation. A BCR-M does not modify the contract.
- **BCR – Contingency:** A type of BCR used by the contractor after the FPD/CO allocates project contingency to the contract for a change of scope to the contract. It results in a contractual change to the CBB/PBB.

Perform internal replanning actions within the scope of the authorized contract, CBB/PBB, or total allocated budget (TAB) to compensate for schedule, cost, and technical problems that cause the original plan to become unrealistic, result in work or people reorganization to increase operational efficiency, or use different engineering or manufacturing approaches. Internal replanning is intended to maintain an executable baseline for remaining in-scope contract work.

To keep a project on track, the project team monitors and controls changes at each CA and keeps a keen eye on performance, future PPs, and emerging risks (threats and opportunities). The CAM takes proactive steps through the established project and contract change control process to re- plan future work as appropriate. Figure 11 depicts the effect that various types of changes have on the PMB, contract target cost, CBB/PBB, and TAB.

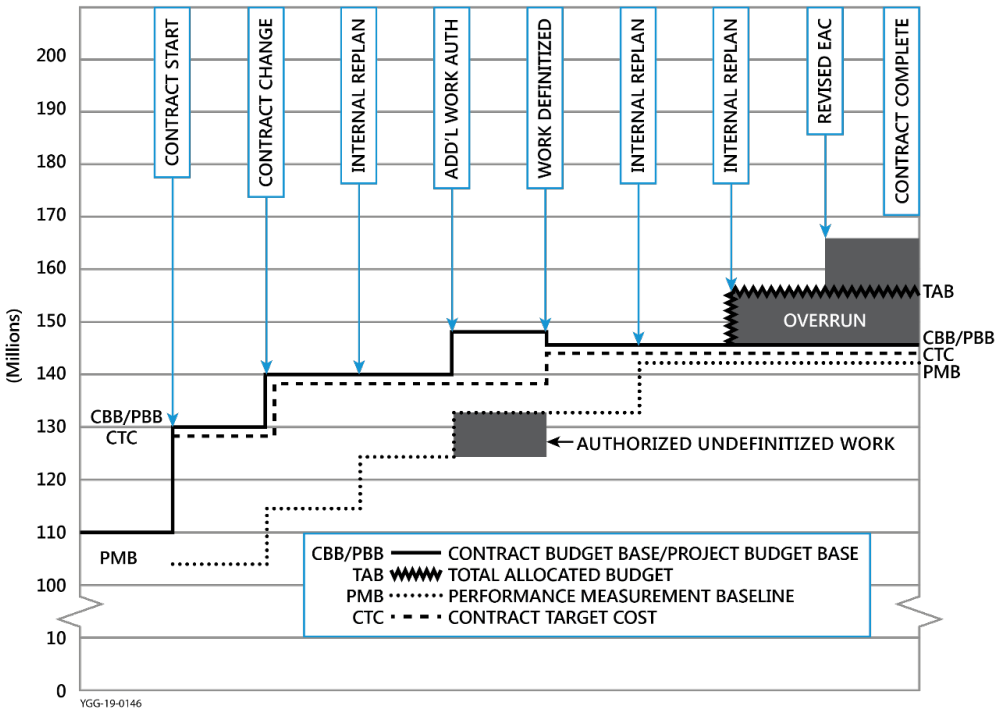

Figure 11. Budget Changes

Establish and Adhere to a Freeze Period

Projects use the term "freeze period" to indicate a restrictive period for baseline changes, minimally defined as the current accounting period plus the next accounting period. The freeze period intends to protect PMB accuracy and reliability and preserve EVMS data and information integrity by limiting the contractor's ability to adjust the time-phased budget (or spending plan) once work is baselined to begin. Baseline changes are highly restricted during the freeze period to maintain a stable and measurable work plan; however, EIA-748 compliance requirements allow for limited changes caused by unique circumstances during this restrictive period, most notably for emerging work scope or emergency work starting immediately due to urgent health or safety concerns. Frequent, continuing, or unallowable adjustments to the PMB within the freeze period result in diminished insight into actual performance levels and the potential for actual cost mischarging. The freeze period eliminates unnecessary and undocumented changes and inefficient resource use. See DOE Guide (G) 413.3-20, *Change Control Management*,[24] for further guidance.

To facilitate efficient execution of the near-term work scope, restricted planning periods encourage detailed CA planning in the baseline to be in place before entering the freeze period for that baseline plan portion. Frequent, continuing, or unallowable adjustments to the baseline within the freeze period suggest poor planning and a poor time-phased budget and spending plan.

[24] DOE G 413.3-20, *Change Control Management*, current version, https://go.usa.gov/xmCBY.

EIA-748 compliance limits baseline changes within the freeze period to the following:

- Routine accounting adjustments, such as the inclusion of estimated actuals
- Customer-approved actions, such as definitization of previously awarded but undefinitized work, or newly authorized work beginning within the freeze period
- Activities associated with requests for equitable adjustment, emerging work, and workarounds not already in the baseline schedule through the BCP process
- UB (directed changes and error correction)
- Routine rate changes, such as recognition of current-year final billing rates
- Economic price adjustments, such as adjustments for inflation on the project
- Error corrections, such as correcting budgeted cost for work performed (BCWP) overreporting, planning errors, or timekeeping errors
- DOE-recognized safety or emergency issues, so budgeted for work to commence immediately (management-approved actions)
- Replanned LOE WPs when few cumulative actuals have occurred.

Emerging project baseline changes and the resultant contractual actions (during the freeze period) requiring formal change control processes via a BCR or BCP include the following:

- Moving budget within CA constraints (no contract change)
- Moving budget between CAs within PMB constraints (no contract change)
- Moving UB into CAs (no contract change)
- Moving MR into CAs (no contract change)
- Moving schedule or cost contingency into CBB/PBB (CBB and PBB = PMB + MR) (contract change for non-M&O contract)
- Establishing a new PMB exceeding CBB/PBB, resulting from a failure to meet original objectives, with no change in scope (OTB) (possible contract change if the TPC is exceeded)
- Changing the project schedule, possibly resulting in an OTS (possible contract change if the CD-4 date is exceeded)
- Changing KPP (possible contract change)
- Increasing TPC (possible contract change)
- Changing work scope (addition or deletion).

6.2.9 IPM Principle 9—Distinguish between Maintaining the Baseline Budget Plan and Funds Management

Budgeting is the process of creating the plan for managing the project's work scope, schedule, and objectives, whereas funding is the act of providing the financial means to support project needs. Creating this budget plan enables advance determination of whether the project has enough time and resources assigned to complete the work; EIA-748 compliance necessitates

separation of budget and funds, while related, to establish, maintain, and measure the time-phased budget against program performance.

The EVMS is not intended as a funds management tool but rather to measure performance against an established baseline budget and facilitate developing the project EAC to indicate funding requirements. Funding considers Government contingency and consists of real dollars used to "pay the bills." Performance measurement and MR, however, relate directly to the budgeting process. Figure 9 (located at end of Subsection 6.2.7) shows where funds differ from the budget in the project hierarchy. Confusing budget and funds may result in suspect EVMS performance data and information:

- Funds are a monetary resource provided to pay for completing a statement of work as agreed to contractually.
- Budgets are time-phased estimates to establish a PMB or "time-phased budget plan."

Confusion commonly arises when the time-phased budget and spending plan are continuously revised to match funding levels. With the EVMS, the time-phased budget value and the funding value do not always match; however, they are reconcilable. Forcing these two values to balance —and the resultant misapplication of EIA-748 compliance requirements —often jeopardizes PMB accuracy and reliability and EVMS data and information integrity, leading to an ineffective EVMS.

Consequently, the Government is responsible for executing the project within designated funding levels to ensure adequate resources are available to cover allowable costs incurred in completing the work, including cost overruns on cost-type contracts. If work scope measurement indicates the final cost value, the EAC, exceeds the budget value, the budget at completion (BAC), do *not* change the budget value in reaction to this inconsistency. EIA-748 compliance requires the EVMS to retain schedule and cost performance variances and cost overruns and use them to assist the Government and contractor in decision making and forecasting rational scheduling and cost for remaining work based on past performance efficiencies. Do *not* offset these variances and overruns with additional budget. Continually changing the PMB to accommodate performance imbalances jeopardizes PMB accuracy and reliability and EVMS data integrity and information for both performance and funding decision making.

The EVMS EAC process (Subsection 6.2.12) is integral to the financial/funds management process. The project's funds management process establishes a documented procedure for administrative control of the designated funding by fiscal year to help the Government team maintain the necessary controls to effectively appropriate Federal funds.

When does the budget (BAC) change?

- As work scope is added or deleted from the project, adjust the budget (or PMB) on the basis of the estimate associated with the altered work scope.
- The budget (represented by the time-phased PMB and collectively as the BAC) changes on the basis of moving MR for future in-scope work efforts that were unplanned but meet the project's technical requirements. If, for example, a CA reports a positive cost variance (CV) and underrunning, do *not* move the positive variance value or unused budget to MR. This errant practice defeats using the EVMS to produce accurate and reliable

performance measurement data and information to generate the EAC value.

- A current year or outyear funding profile change via a contract modification may delay or accelerate existing work scope, resulting in permissible work scope, schedule, and budget re-phasing.
- Re-baselining incomplete work may be warranted if there are significant changes to the technical approach to perform work scope, and the actual performance (either significantly positive or negative) is no longer usable as a performance measurement tool.

DOE O 413.3B, p. C-10, states, "The Department will adopt project management control best practices equivalent to those implemented by the Department of Defense (DoD)."[2] A DoD best practice for major systems acquisition management is to address its funds management stewardship using the CFSR to provide funding data for

- updating and forecasting contract funds requirements,
- planning and decision making on funding changes to the contract,
- developing funds requirements and estimates in support of approved projects,
- determining funds above contract needs available for de-obligation, and
- obtaining rough estimates of termination costs.

Use CFSR and IPMR in tandem as the necessary means to track and manage budgets and funds in an integrated manner while understanding the need for keeping them separated.

Management Reserve

For every project manager, the key to success is keeping risk management at the job's forefront. The more a project manager uses the EVMS to identify and assess risks from the project's start and actively manage them throughout, the better the project's outcome. Project risk is an uncertain event or condition that, if it occurs, can positively or negatively affect achieving a project's objectives. Identified risks are recognized in a risk register, while unidentified risks are not yet known. Most unidentified risks are subsequently recognized when they occur.

To afford the project manager every opportunity to succeed, the EVMS becomes a critical component of the risk management process. EIA-748 compliance requires establishing an MR budget and appropriately distributing it to address emerging risks and uncertainties. MR is budget held outside the PMB but within the CBB/PMB. Do *not* apply MR to cover cost growth or manipulate PMB integrity: it is *not* intended to compensate for or cover up poor initial planning estimates. Manipulating PMB to "harvest" and "redistribute" the budget to influence near-term performance metrics violates the intended purpose of MR.

EIA-748 compliance requires assigning MR for current and future needs; MR is *not* permitted to offset accumulated overruns or underruns. Hold MR at the total project level with authorized distribution at lower management levels. According to EIA-748 compliance requirements, MR is *not* a refundable contingency that can be eliminated from the contract during subsequent negotiations or used to absorb the cost of contract changes. The Government does *not* view the budget value held in MR as a funding source for added work scope.

What are acceptable uses for MR? An MR budget may decrease or increase to reflect realized

risks and opportunities for work effort within the project work scope. The following are examples of permissible MR use:

- Once the newly identified work scope is authorized and assigned and after work scope begins, one or more activities missed in the original planning process now need consideration in the schedule and baseline plan or newly identified work results from internal replanning.
- Activity rework becomes necessary due to such reasons as unanticipated redesign, remake, or retest (within the scope of the project). The rework should be of a magnitude that is significant enough to make the baseline plan otherwise impractical for accurate performance measurement. The project's risk register should identify the potential risks associated with the original activity, and management should be prepared for the realized risk. (Do *not* use MR for rework resulting from poor performance, such as failure to meet planned yields.)
- Make or buy adjustments result in an MR debit or credit.
- The statement of work transfers from one organization to another, resulting in an MR debit or credit.
- Labor or overhead rates for work not completed are significantly adjusted, resulting in an MR debit or credit.

What are unacceptable uses for MR? The following are examples of non-permissible MR use:

- Cover a performance-related cost overrun (within the scope of the project). MR is budget, not funds.
- Increase or decrease the budget for work scope already authorized to eliminate a CV, such as rework caused by poor performance.
- Issued or authorized without a related scope of work.
- Provide the budget for unauthorized work scope.
- Harvest budget from completed tasks that have underrun. When a task is complete and the total actual cost of work performed (ACWP) is less than the total budgeted cost for the task, or BAC, the underrun value is never taken back because all the work was performed. No work was removed, so no budget is removed. The BCWS was performed. Thus, the BCWP now equals the BAC.

Figure 12 is a decision tree to help the contractor and FPD oversee acceptable MR use.

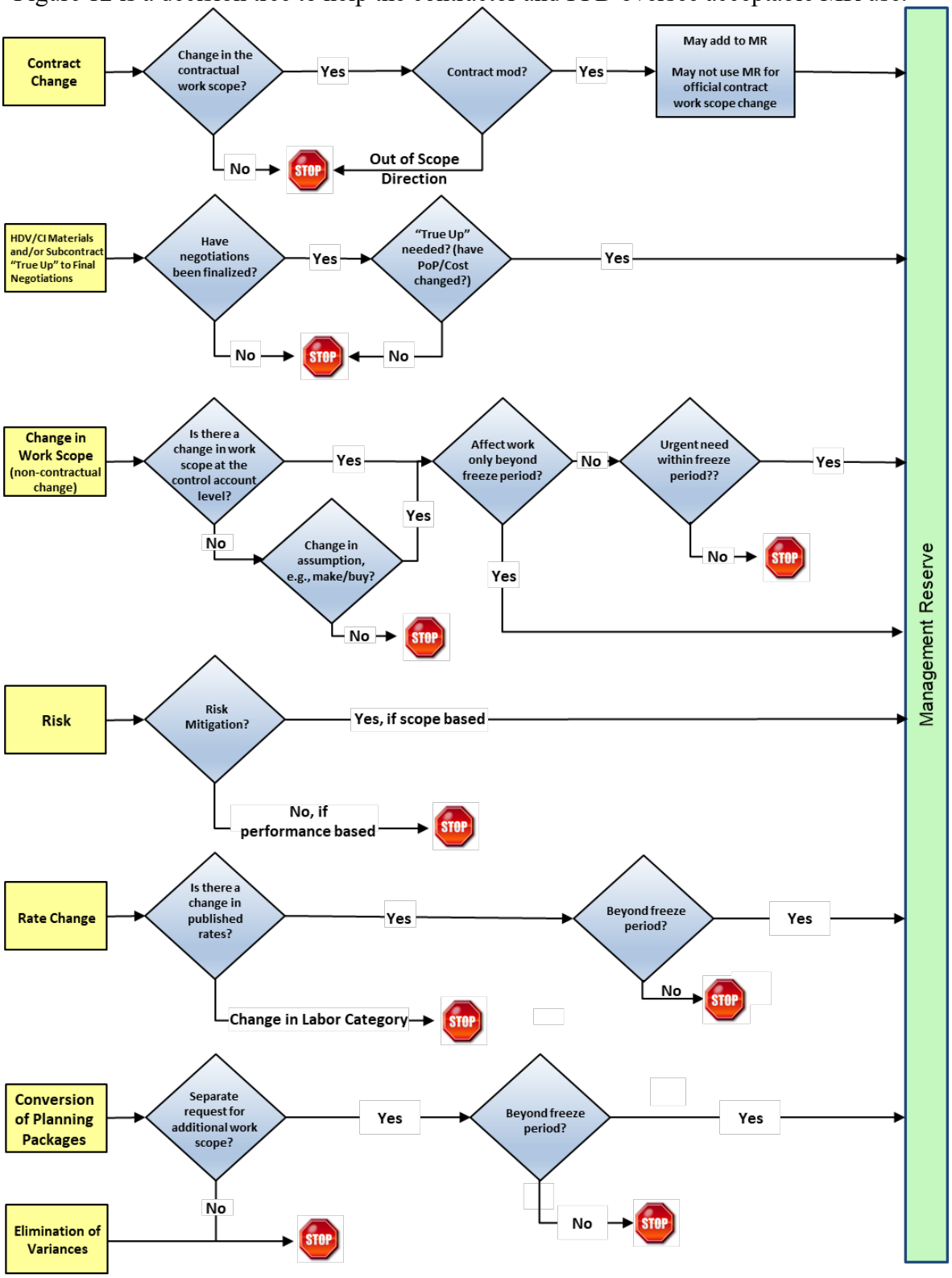

Figure 12. MR Decision Tree

DOE Contingency

DOE contingency refers to the portion of the PB available for risk uncertainty within the project scope but outside the scope of the contract. Contingency is funding that is not placed on the contract and is included in the TPC. Contingency is controlled by the FPD as delineated in the PEP. In establishing the TPC for capital asset projects, the Government accounts for technical and programmatic risks outside the project or contract scope. DOE contingency is held outside the contract price and controlled by the Government as delineated in the PEP. (See DOE G 413.3-7A, *Risk Management Guide*.[25])

DOE contingency allocation may be applied as either budget or funding. For example, when the new scope is added to the project or contract, DOE contingency is used to add the budget to the CBB/PBB for performance measurement purposes. However, if a contractor incurs a cost overrun, DOE contingency can be applied as funding outside the EVMS to cover allowable costs. In the latter situation, the CBB/PBB is *not* changed. In the prior situation, use the baseline change process to apply the DOE contingency.

6.2.10 IPM Principle 10—Execute and Evaluate Performance against the Baseline Budget Plan

EIA-748 defines performance measurement as follows:

> Establish and maintain a time-phased budget baseline, at the control account level, against which program performance can be measured. 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. Budget for far-term efforts may be held in higher-level accounts until an appropriate time for allocation at the control account level. On government contracts, if an OTB is used for performance measurement reporting purposes, prior notification and approval must be provided to the customer.

Once the scope is authorized to the responsible contract program manager, the work is ready for execution. DOE requires contractors to start using their EVMS before CD-2 and, before beginning, establishing a baseline against which performance progress is measured.

This PMB integrates planning, scheduling, budgeting, work authorization, and cost accumulation management processes while identifying work progress, collecting actual costs, and facilitating management analysis and corrective actions. It is the sum of the CAs plus any summary level planning packages (SLPPs) and UB. UB is a transient account distributed to CAs, SLPPs, or MR as soon as practical after definitization. UB is budget that is applicable to specific contractual effort that has not yet been distributed to control accounts or SLPPs. Identification of the project's UB facilitates the ability to account for and report on all authorized scope and budget. UB is a transitional budget that should be distributed in a timely manner as work scope is finalized and distributed to CAs or to SLPPs. Subdivide these summary efforts into CAs at the earliest opportunity. Consider using planning horizons or rolling wave planning to determine the appropriate period in which to convert SLPPs into CAs. CAs and SLPPs span project start through contract end. The PMB gives the Government and contractor a common reference point

[25] DOE G 413.3-7, *Risk Management Guide*, current version, https://go.usa.gov/xmCBY.

for program and project progress and status.

Determine performance measurement using an earned value technique (EVT) to objectively measure work accomplished. During the planning, scheduling, and budgeting process, the CAM pre-defines the performance measurement EVT for a WP, ensuring earned value can be claimed in all months that resources are scheduled. Selecting an appropriate EVT permits accurate and objective performance measurement. Selecting the one that best reflects the activity being performed can provide accurate status and situational awareness for proactively resolving issues affecting schedule and cost and technically achieving project objectives. Contractors may use several types of EVTs for assessing performance.

Discrete work is defined as a specific product or service with distinct and measurable outputs relatable to the project's technical objectives. These measurable outputs are accomplished by planning work scope in manageable segments to provide a more accurate and objective measurement of performance and progress. Discrete work scope can be measured in several ways:

- Units complete/standard hours
- Milestone weights
- Milestone weights with percent complete
- Fixed formula — 0/100, 50/50, 25/75, 40/60, 60/40, 70/30
- Percent complete.

Fixed formula is when a specified percentage of the earned value is assigned to the start milestone of the work package. The remaining earned value is assigned when the work is complete. This method is typically used for smaller work packages planned to start and end within two reporting periods. The formula used (i.e., 40/60) must be addressed in the EVM system description and reflective of the execution of the work.

For the percent complete measurement technique, use quantifiable backup data (QBD), sometimes referred to as "predetermined rationale" or "rules of performance," when the activity is greater than 2 months. QBD essentially establish lower-level milestones, activities, or steps to determine the percent of work scope completed. These steps are established and weighted before beginning the effort.

Apportioned effort is an EVMS term used to categorize the relationship between a "base" program task or group of tasks and a related "support" effort (i.e., a quality inspection on a manufacturing operation). The apportioned effort is associated with discrete work scope and therefore has no specific unique objective indicators; however, apportionment methods are documented, logical, and demonstrable. The percent-complete value reported by the discrete work scope is appropriate for the percent-complete value reported for the apportioned work scope effort.

LOE is limited to activities with no practicable, measurable output or product associated with the technical effort that can be discretely planned and objectively measured at the WP level. In every project, work scope is accomplished that is by its nature unmeasurable. Performance is earned by the passage of time and is equal to the budget scheduled for each period, for example,

BCWP is always equal to BCWS. Therefore, prudent use of LOE is necessary to minimize the distortion of performance measurement data. Assessing each project's work scope effort and determining how progress can be measured to completion is important. Doing so will result in a PMB that provides accurate EVMS performance data and information. Figure 13 is a decision tree to aid in determining the proper EVT.

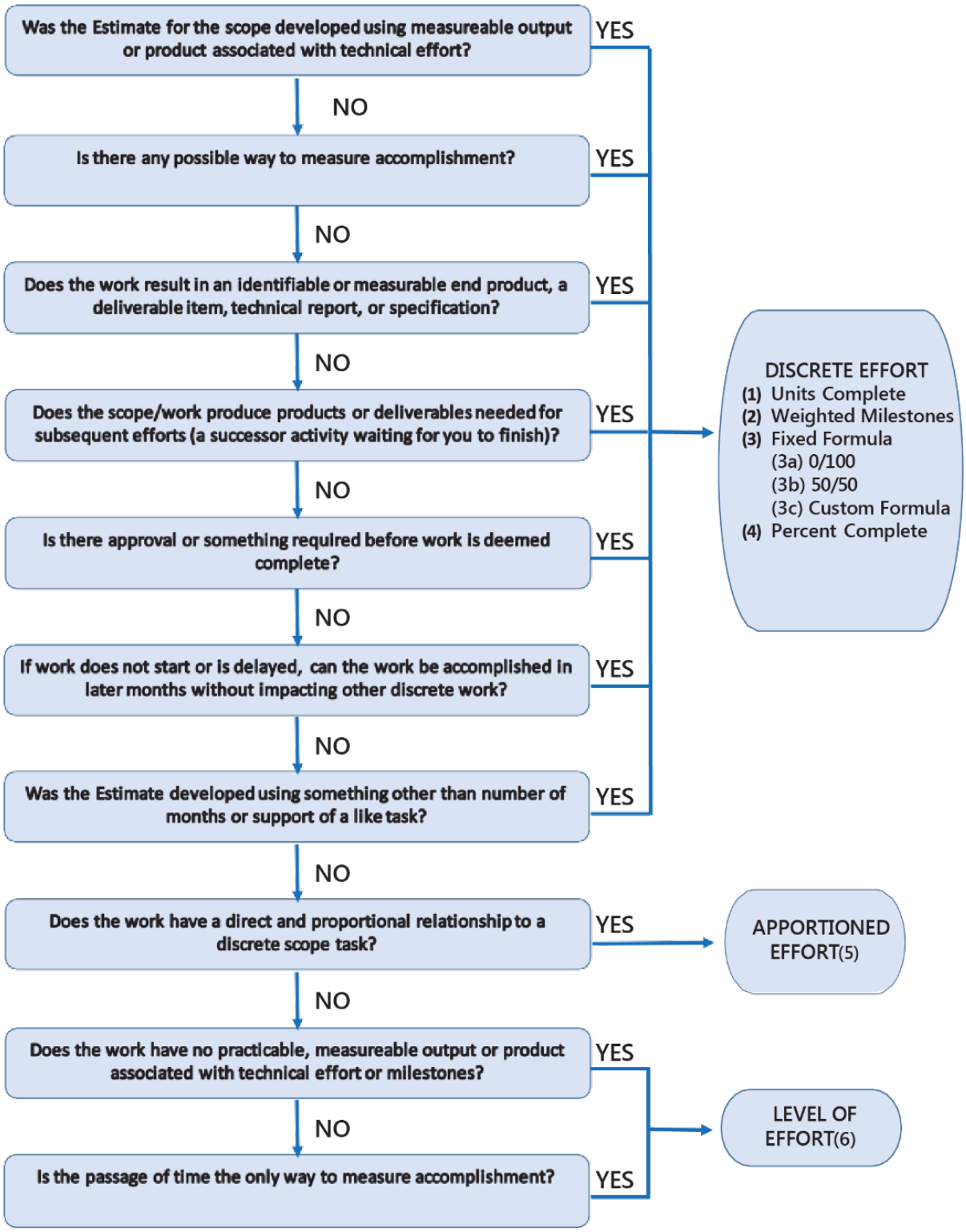

Figure 13. EVT Decision Tree

Avoid mixing large amounts of LOE and discrete work scope in the same CA because LOE work scope can distort evaluations of performance. If combined, the LOE work scope should be segregated by EOCs to enable proper analysis of CA performance. Separate WPs are recommended; never mix LOE work scope and discrete work scope in a WP. The nature of the effort in a WP is either entirely LOE work scope or discrete work scope. Because of the dollar value and unique nature of LOE work scope, it may be replanned within the freeze period if few cumulative actuals (ACWP) are incurred resulting in understating CA costs to coincide with the performance (BCWP) earned. "Few" generally means less than 10 percent actuals to date compared with the cumulative budget (BCWS).

6.2.11 IPM Principle 11—Accumulate Costs for the Baseline Budget Plan

To comply with EIA-748, all direct and indirect costs associated with accomplishing the contract's complete scope of work must be properly transferred to the EVMS at a detailed level suitable for performance analysis; they also must be reconcilable with contract performance reports. Properly document, approve, and record all financial transactions in the financial accounting system on a consistent and timely basis following documented and approved financial procedures. Because the EVMS uses cost data from the contractor's accounting system to record project costs and analyze EVMS performance and variance, the accounting system is critical in ensuring EVMS performance data and information are reliable. Accurate actual cost mapping from the accounting system is imperative.

While BCWP is the budgeted cost for what was accomplished, the ACWP is what was spent to accomplish that work. To be useful, the "work performed" in both BCWP and ACWP are directly comparable. Reasons exist for costs in the accounting system to be recorded in months other than when the work is accomplished, but these occurrences are relatively minor, justifiable, and reconcilable. Record ACWP (within the EVMS) in the same month as BCWP, with no months having significant BCWP without ACWP or vice versa.

Implement and synchronize, through disciplined methods for planning, the accounting for actual costs (including accruals) and reporting actual work performed to accurately manage and report project costs. The contractor EVM system description or associated processes (such as accruing and recording cost before invoice receipt) document these disciplined methods for planning, recording, and reporting actual costs.

Actual costs typically tie to paid invoices, progress payments, and payment milestones. Accruals (as well as "estimated ACWP" or "estimated actuals") represent the cost of work performed but not yet invoiced or costed. When subcontractor invoices lag reported performance and an accrual method is not implemented, material distortion in the costs for performance measurement occurs. This distortion results in inaccurate data and information for management and analysis.

Accrual accounting ensures subcontractor costs (ACWP) are recorded in the same period as performance measurement (BCWP) to preserve data integrity as the actual representation of project performance and progress.

Record accruals directly in the accounting system on the basis of a purchase order, information directly from the vendor, or on some other verifiable record. In the EVMS tool, report all costs recorded in the accounting system with any differences between the accounting system and EVMS justified and reconcilable.

Actual costs accurately accumulate through the project's WBS and OBS. Also, the ACWP reflects all costs associated with the project, including overhead or indirect costs, classified and applied consistently with the contractor's cost accounting standards disclosure statement.

6.2.12 IPM Principle 12—Forecast the Future Costs for the Baseline Budget Plan

The EAC is the current expectation of total cost at the end of a project. The EAC represents the final project cost given the costs incurred to date and the expected costs to complete the project (equal to the cumulative ACWP to date plus the estimate to complete (ETC), or estimate of work remaining). EACs are not constrained by funding or negotiated contract costs but focus on the project work scope's projected cost. An accurate, well-maintained EAC supports the Department's ability to provide enough funding to the project. Predicting the EAC and variance at completion (VAC) is an essential component of the project management and decision-making process. Focus on the final project cost and determine whether additional funding is needed. Report a range of EACs (best case, worse case, and most likely values) monthly. Analyze whether those figures are realistic.

Develop the ETC using EOCs—labor, material, subcontracts, ODCs, etc.—at the WP, PP, and SLPP levels (or lower depending on where resources are identified) for the remaining effort, adding them to the current cumulative ACWP to calculate the EAC. This includes evaluating the type and quantity of resources essential to completing project objectives. At a minimum, collect direct costs at the CA level to calculate ETCs on the basis of time-phased resources corresponding to the scheduled forecast dates accurately summarized through the WBS. To develop an ETC, the forecasted time-phase resource profile must be well-defined and understood. Figure 14 illustrates the EAC and factors that are part of the EAC.

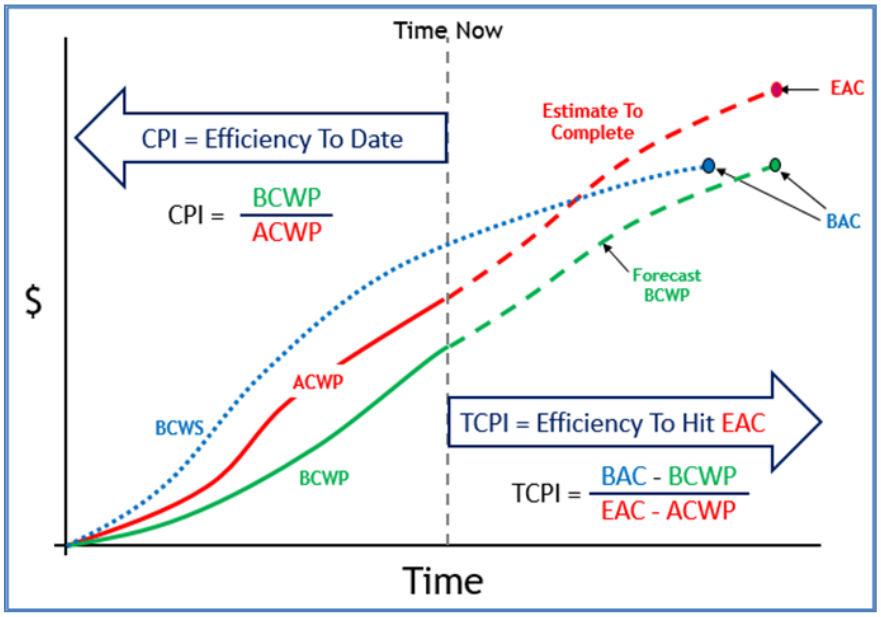

Figure 14. EAC and Factors

CAMs are responsible for reviewing their CA EACs for relevance and currency every month during the variance analysis process. Thresholds do *not* have to be exceeded to change an EAC: the knowledge that the current ETC is no longer realistic and does not accurately represent remaining work is sufficient. An EAC update may be necessary because of within project scope changes, schedule delays, CVs, degrading performance indices, technical performance issues, realized risks, etc. Changes external to the project are not part of the EAC update process.

Focus the monthly EAC assessment on performance to date within the CA, assessment of the effort to complete remaining work, and evaluation of resource type and quantity identified to complete the effort at the WP/PP level. The EAC likely requires an update based on technical trends that may precede significant schedule or cost impacts. Effectively maintaining the CA EAC gives CAMs assurance that the estimated cost for completing the remaining work scope is credible and future decisions regarding resource allocation are based on valid data and information.

A comparison of the to-complete performance index (TCPI) EAC value and the cost performance index (CPI) value is the most common forecasting method used to check the reasonableness of the stated CA EAC. The formulas are as follows:

$$TCPI\ EAC = \frac{(\mathrm{BAC} - \mathrm{BCWPcum})}{\mathrm{EAC} - \mathrm{ACWPcum}}$$

$$CPI = \frac{\mathrm{BCWP}}{\mathrm{ACWP}}$$

The TCPI represents the cost efficiency needed to achieve the EAC value being used in the formula, and the CPI indicates the cumulative cost efficiency at which work was performed (see Figure 14). The TCPI is a forecasting technique, whereas CPI is a retrospective, cost-efficiency measurement technique. Significant differences between these two metrics (with "significant" often defined as more than 0.1) prompts ETC evaluation and subsequent update or justification.

At least annually, prepare a bottom-up comprehensive EAC assessment of the entire project contract work scope to be performed. Assess more often than annually if contractually indicated or performance conditions warrant an update. Different from the monthly EAC update, the comprehensive EAC includes a greater degree of formality and examination. The project establishes ground rules and assumptions for the comprehensive EAC and an overall timeline for completing it and incorporating the results into customer reporting. Identify existing and emerging risks and opportunities. Subcontractors may also play a major role in developing a comprehensive EAC and are included in the assessment process.

Comprehensive EAC evaluation considers many of the same factors included in the monthly CA EAC evaluation, in addition to

- evaluating and incorporating project-level risks and opportunities not yet incorporated into the PMB;
- examining facility improvements and other capital investments that may improve the project's schedule and cost performance;
- estimating future conditions to derive the most accurate EAC value (such as projected rate changes and process improvements) that may result in reduced costs and other economic factors influencing plans and costs;
- evaluating subcontractors' self-assessments of the costs to complete their remaining work efforts (for major subcontracts, the prime contractor CAM is responsible for ensuring timely and reliable EACs, including situations when the subcontractor has not provided its most current information available); and
- reviewing the project work scope, including AUW and UB costs, to determine whether the remaining work scope for generated estimates was addressed.

Use independent estimate at completion (IEAC) calculations to predict final project cost and perform a "realism check" on EACs developed on a project. Typically, calculate an IEAC by taking the remaining work (calculated as *BAC – BCWP*), applying a performance factor based on historical performance, and adding this product to the cumulative ACWP. A variety of performance factors are often used; however, based on its preference to provide a range, DOE uses the following formulas in PARS: (1) cumulative (cum) CPI, (2) CPI × schedule performance index (SPI), and (3) isolating the CPI and SPI for 3 months. Three sample formulas follow:

1. CPI_{cum} Method: $IEAC = \frac{BAC}{CPI_{cum}}$.
2. CPI × SPI Composite Method: $IEAC = \left(ACWP_{cum} + \frac{(BAC - BCWP_{cum})}{(CPI_{cum} \times SPI_{cum})}\right)$.

   Where: $CPI_{cum} = \frac{BCWP}{ACWP}$ *and* $SPI_{cum} = \frac{BCWP}{BCWS}$.
3. 3-Month CPI Method: $IEAC = \left(ACWP_{cum} + \frac{(BAC - BCWP_{cum})}{[(BCWP_4 - BCWP_1)/(ACWP_4 - ACWP_1)]}\right)$.

   Where: 4 means the value at the end of the most recent or last reporting period (such as April) and 1 means the value at the end of three reporting periods before the most recent (such as January).

IEAC formulas are valuable analysis tools, but they do *not* replace the EACs created by the PM and CAMs. *Not* maintaining the EAC process puts the project at risk if trend analyses indicate the CBB/PBB and TPC values may be insufficient. See PARS for EAC projections using IEAC formulas, as well as trends comparing TCPI and CPI values to identify potential project funding concerns.

Why does a senior leader at each level from the project to headquarters need to understand the EAC?

One key EVMS capability is supporting timely and informed decisions. A properly established, maintained, and reported EAC enhances stakeholder and senior leadership visibility (to include the FPD and contractor project manager) into the performance of the project, and consequently the project's funding and resource requirements to complete all work scope. The contractor's EAC process has three parts:

1. The monthly CA EAC developed by the CAM.
2. The monthly best case, worst case, and most likely EAC ranges developed by the contractor project manager for completing the PMB to consider risk as defined per the contractor's EVM system description.
3. The comprehensive annual (or bottom-up) EAC developed by the contractor project manager, working with the contractor team and stakeholders responsible to complete the project.

The contractor project manager can conduct the comprehensive EAC more frequently than annually when project circumstances warrant it.

Both the CA- and PMB-level EACs must foremost be realistic, accounting for actual costs to date, open material commitments, projections of future performance (using earned value management metrics), probable rate changes, and known risks and opportunities. The EAC should not be constrained by funding availability but should reflect the most realistic circumstances for completing all work scope. Once derived, the EAC dollar value should be compared with its respective BAC to identify VACs. This provides continuous visibility into the realism of the project's time-phased PMB, including the realism of CA baseline plans, schedules, and budgets.

Why would the contractor project manager's most likely EAC and the summation of CA EACs differ?

Because the contractor project manager has a holistic view of the project, with greater insight into overarching risks and opportunities, as well as knowledge of current or future project conditions, his or her most likely EAC dollar value need not agree with the total summation of the CA EAC dollar values plus any UB. However, any difference between these EAC dollar values is expected to be explained by the contractor project manager. Conversely, if the contractor project manager's most likely EAC dollar value matches the dollar value of the total summation of the CA EAC dollar values, the contractor project manager should explain why.

How can the realism of the project manager's most likely EAC and the CA EACs be independently assessed?

A formula-generated IEAC of the final total cost (or the total dollar value) of the project, which is based on the project's historical performance and represents an independent second opinion, is an important number to validate the reasonableness of the contractor project manager's most likely EAC dollar value. This independent opinion gives the project (contractor and Federal team) and other DOE stakeholders important information to aid in execution and funding decisions for meeting the cost, schedule, and technical performance objectives of the project and evaluating the potential impacts if the current course of action is not addressed.

DOE utilizes the following four IEAC formulas:

1. CPI_{cum}
2. $CPI_{cum} \times SPI_{cum}$, or composite method
3. 3-month average CPI
4. 6-month average CPI.

Each formula considers how past performance predicts future expected performance and, when compared with CA and PMB EACs, how realistic they are. Typically, the IEAC based on CPI_{cum} provides a lower bound, or the most optimistic outcome. The IEAC composite formula based on CPI_{cum} and SPI_{cum} usually provides an upper bound, or the most pessimistic outcome. These formulas are most accurate when the project is between 15% and 95% complete. Outside of these ranges, the formulas may not predict the most accurate outcomes.

Research by David Christensen at the Air Force Institute of Technology and others offers meaningful insight into the phases of a project's life cycle where certain IEAC formulas are more useful than others.[26] This research indicates that the composite method is more useful earlier in the project (before 40% completion) but can still be useful through the 80% completion mark. The CPI_{cum} method is best used starting at the 40% completion mark, with the likelihood that the composite and CPI_{cum} methods diverge toward the later stages of the project's life cycle. The CPI 3-month average and 6-month average formulas are better in the middle stages of a

[26] Christensen (1999), "Is the Cumulative SCI-based EAC an Upper Bound to the Final Cost of Post-A12 Defense Contracts?" describes several methods for evaluating the predicted final cost of a defense acquisition contract, the EAC.

project's life cycle as the work scope begins to accelerate. These and other IEAC formulas are a key feature in the PARS Empower Analytics tool.

Figure 15 compares the contractor project manager's most likely EAC dollar value and the CPI and CPI × SPI (or composite) IEAC dollar values.

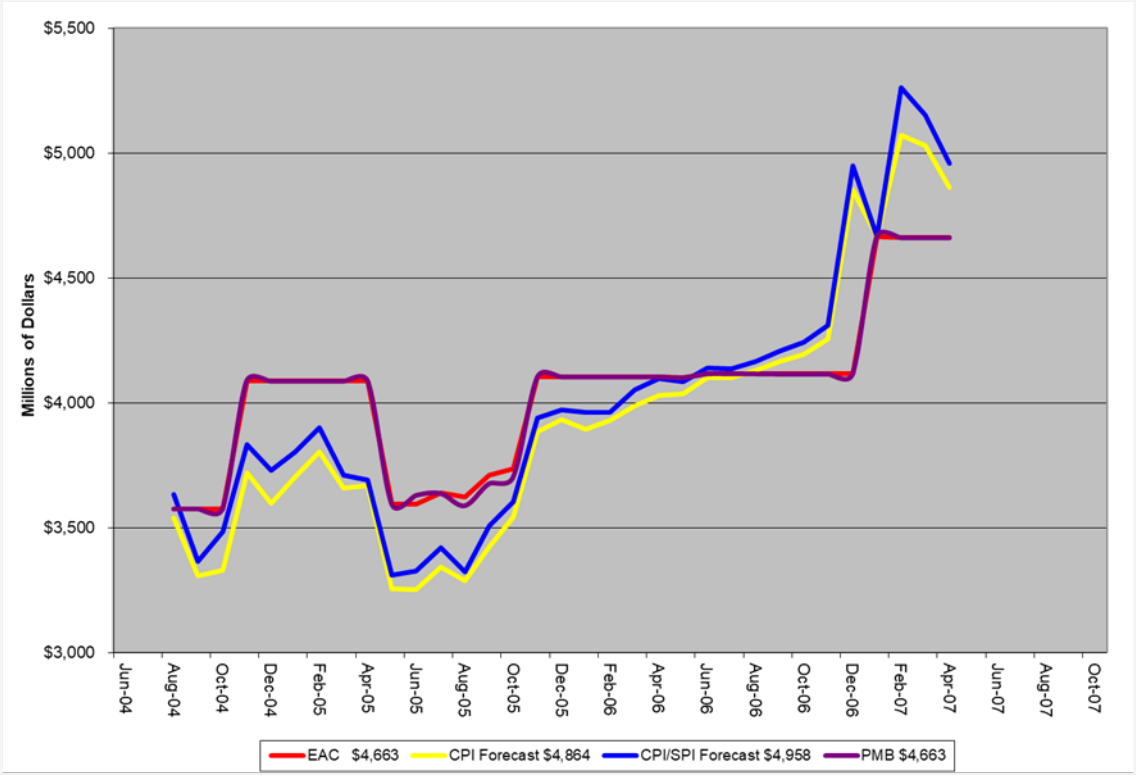

Figure 15. EAC vs IEAC (SPI x CPI)

The positions of the contractor project manager's most likely EAC dollar value (red), CPI (yellow), and CPI × SPI (blue) IEAC dollar values differ distinctly. The differences indicate that the contractor project manager's most likely EAC dollar value is unrealistically low. Further examination of Figure 15 shows that the contractor project manager's most likely EAC dollar value equals the PMB dollar value, indicating that the contractor project manager's EAC is not being maintained as required for a compliant and effective EVMS.

6.2.13 IPM Principle 13—Manage Risks, Make Decisions, Solve Problems, and Create Opportunities by Taking Action

To comply with EIA-748, the EVMS must provide objective project performance, progress status, and forecast completion dates and costs. Starting before CD-2, the project should emphasize the importance of the EVMS as the means to develop CA plans and budgets and to forecast schedule and cost performance. Demonstrating that the PMB is an accurate and success-orientated representation of project scope, schedule, and budget parameters is important. EVMS implementation can be modified to match the level of risks and issues, corporate culture, budget,

time constraints, and project team experience that constitute the overall project environment. In addition to contractor responsibilities, the FPD verifies the EVMS is generating reliable and accurate performance data and the contractor uploads data to PARS promptly. The FPD and contractor validate that the project's status and progress narrative align with EVMS-generated data and information.

Risk

Risk management is the systematic process of identifying, analyzing, and responding to project risk. The need to manage risk increases with the scale and complexity of the project. It is an integral part of an EVMS that provides for continuous risk identification, assessment, planning, monitoring, and response. It implies control of possible future events and is proactive in nature rather than reactive. Project risks and opportunities and mitigation strategies are recorded in a project risk register (or like document) during the development and update of the performance measurement baseline (PMB). EVM relies on the establishment of a baseline against which performance can be measured in terms of schedule, budget, and resource usage. However, this baseline must be based on 'realistic' projections/estimates that have been derived following a rigorous risk management process. Risk Management best practices are described in DOE G 413.3-7A, *Risk Management Guide*.[27]

Data Analysis Process

The analysis of the EVMS schedule, cost, and at-complete variances helps determine whether corrective actions are appropriate. If corrective actions are identified, they must be tracked to closure. To assist in the analysis, the PARS dashboard has indicators of baseline volatility, MR usage, and efficiency of schedule accomplished as measured by the baseline execution index (BEI). Baseline volatility may be an early indicator of issues with the project's time-phasing and budget control, signaling a significant departure from the original plan. Substantial and frequent changes in the baseline time-phasing may indicate an inadequate contractor plan or one that is being modified to match the cumulative actual cost or performance. These practices can disassociate work from its time-phased budget. Analysis of EVMS-generated data addresses

- project schedule and cost status through the WBS and OBS hierarchies;
- forecast costs to complete and completion dates, including forecast major project milestone accomplishment; and
- earned value data validity and reliability.

The contractor project manager and the FPD use EVMS data to begin early corrective actions when problems are indicated. An accurate CPI is extremely helpful; however, focusing entirely on the CPI metric can lead to unwelcome surprises. A key in performance analysis is authenticating the contractor's BAC, EAC, and VAC; total funds and expenditures values; and the project's estimated completion date. Comprehensive performance analysis includes

- data validity assessment,
- variance analysis,

[27] See Footnote 25.

- trend analysis, and
- future performance prediction (predictive analysis).

Data Validity

Assessing EVMS performance data and information accuracy is a critical first step in the analysis process. Data integrity issues may significantly weaken the value of using EVMS performance data for further analysis and decision making. Reviewing EVMS performance data and calculated metrics using a standard formula determines EVMS data validity and reliability, reflecting contractor EVMS trustworthiness. When validity concerns are identified and persist, notify the Department's EVMS certifying authority, DOE PM, to help implement corrective action.

Variance Analysis

Variance analysis is the point where all the effort put into developing an approved baseline plan and determining the status against that plan serves its purpose: to identify significant schedule, cost, and at-completion variances. Examine the project WBS at all levels to identify performance variances at more than just the CA levels. Often, a lower-level negative variance can be hidden by other positive variances as multiple WP performance variances are summarized at the CA level, for example. By conducting lower-level analyses, a potential variance can be identified early and mitigating corrective action taken.

If a variance, whether positive or negative, exceeds the reporting threshold, write an analysis report explaining the variance's nature and cause, its forecast impact, and any corrective actions to be taken if required. In cases where corrective actions are not required, state the reasons. Subsequently, review corrective actions to determine effectiveness in identifying the true root cause, minimizing the impact, and sufficiently preventing recurrence. Do *not* assume that positive variances are good. For example, a positive cost variance resulting from unavailable resources to accomplish LOE type work may lead to a future schedule impact (and elimination of the positive cost variance).

The EVT method used to derive the BCWP should be consistent with the BCWS (the method used to plan and resource associated work). As a result, the direct and indirect cost reporting is directly traceable to actual costs in the contractor's accounting system, thus ensuring schedule variance (SV) and CV validity. This enables stakeholders to trust the EVMS output and subsequently make informed decisions optimizing resource use to accomplish remaining work. A primary purpose of EVMS use is to detect and act upon early technical scope, schedule, or cost deviations from the PMB.

Predictive Analysis

Predictive analysis involves more than reviewing cumulative EVMS data and metrics monthly. The EVMS is designed to generate backward- and forward-looking data and information. Review and understand EVMS performance data and information to gain future project insight. Some EVMS measures (such as CPI, SPI, and BEI) provide a good measure of historical efficiency, but they are not themselves predictive. Predictive measures can be developed, however, by coupling EVMS performance data, such as comparing CPI and TCPI metrics

(Subsection 6.2.12). Applying Monte Carlo simulations to the project schedule, also known as schedule risk assessment, can produce distributions of possible outcome values to determine confidence levels and provide sensitivity analysis. The IMS possesses powerful analysis capability for the EVMS. By using the scheduling system to model probability distributions, CAMs can quickly determine the probabilities of different scope, schedule, and cost outcomes.

Earned value metrics analysis is a valuable management tool to render insight into the physical completion of work; however, do this analysis in conjunction with a schedule analysis to add the perspective of schedule float and critical and near-critical path identification. By itself, the SV metric does not reveal critical path information, so analyze it in conjunction with network-based schedule information, relatable to the schedule status indicated by the project schedule.

What the SV metric does:

- Indicates total work volume, in terms of dollars, not being accomplished per the plan.
- Reflects any bias inherent in the chosen measurement method.

What the SV metric does *not* do:

- Address work sequence impact.
- Address work importance.
- Reflect critical path assessment.
- Indicate the time ahead/behind (or regain) schedule.
- Indicate the amount of time that slips.
- Indicate the cost needed to regain the schedule.

Combine and analyze project schedule total float (TF) values and SPI values for a comprehensive performance view of project status from an integrated schedule and cost perspective. Table 3 shows this relationship's impact.

SPI	TF	Scenario
> 1	**> 0**	Ahead of schedule
< 1	**> 0**	Critical activities ahead of schedule, but project progress is falling behind (this is a priority issue)
> 1	**< 0**	Critical activities behind schedule, but project progress is on track (this is a priority issue)
< 1	**< 0**	Behind schedule

Table 3. SPI and TF Relationship

What the CV metric does:

- Compares your budget that was set before work was started and what was actually spent.

- Expected and actual costs could differ for many reasons, such as underestimating how many hours are needed to complete a job, enabling project managers to measure deviations from the cost baseline and determine what kind of corrective action to take.

There are three types of CV:

- Current period cost variance: describes the difference between actual cost (AC) and earned value (EV) during a single timeframe without considering previous or future variances.
- Cumulative cost variance: describes the difference between the cumulative EV and multiple ACs. Actual cost figures typically come from several consecutive time frames, as opposed to a point-in-time CV.
- VAC: specifically looks at the cumulative CV at the end of the project by comparing the budget at completion (BAC) and the actual or estimated cost at completion (EAC).

What the CV metric must consider:

- If there is no reasonable foundation for a budgeted cost, then the resulting variance may be irrelevant from a management perspective.
- Do not automatically equate favorable and unfavorable variances with a favorable or unfavorable outcome. You must base such an appraisal on the causes of the variance.

Table 4 shows the relationship between CPI and VAC.

CPI	VAC	Scenario
> 1	**> 0**	Cost underrun
> 1	**< 0**	The current cost underrun does not reflect future work inefficiencies resulting in expected cost overrun at completion
< 1	**> 0**	The current cost overrun does not reflect future cost work efficiencies resulting in expected cost underrun at completion
< 1	**< 0**	Cost overrun

Table 4. CPI and VAC Relationship

6.3 REPORTING EVMS DATA AND PARS

The FPD ensures the contractor submits an EVMS data upload from the contractor's schedule system and cost processor into PARS monthly (Table 5). The FPD validates that uploaded data accurately reflect current project status and credibly forecast schedule and cost at completion. The FPD enters Federal-level project data for the contractor fee payments, project ODCs, contingency allocations, FPD EAC, and monthly status assessment narrative as applicable.

Source: DOE Order 413.3B—Appendix A, Table 2.2; Appendix C.20; and Attachment 1 CRD	Applies to:
For projects with a TPC of $50 million or more, ensure EVMS data the contractor uploads into PARS accurately reflect current project status and provide acceptable forecasts, including separate FPD EAC or forecasted TPC, to facilitate project management and decision-making processes.	Post-CD-2 through post-CD-4

Table 5. Reporting EVMS Data in PARS

6.3.1 Current, Accurate, Complete, Repeatable, Auditable, and Compliant (CACRAC) Data and Information/Records

The FPD is responsible for ensuring the data and information produced from the contractor's EVMS and reported into PARS are current, accurate, complete, repeatable, auditable, and compliant (CACRAC)[28] so they can be used for performance measurement and predictive analysis. Because data are seldom used without information, the two are typically inseparable: bad data generally will result in bad analysis and information. Bad data and information are not trustworthy and cannot be used by managers and stakeholders to make informed decisions. A strength of these characteristics is the ability to assess their condition without special training or skill. Unless or until data and information can be demonstrated as CACRAC, they cannot be effectively assessed for compliance against governing policies, requirements, procedures, guides, or practices. This requires an ongoing and objective examination of the EVMS, including the organization's accounting system and financial statements. This examination and evaluation can be done internally, through contractor self-governance, externally by the Government, or both.

Figure 16 shows the hierarchy of data and information essential elements from bottom to top. EIA-748 compliance requires that EVMS-generated data and information have the following six characteristics:

- **Current.** The time now, end of the reporting period, or a predetermined specific point in time. Currency is the lynchpin of the other five characteristics. If not current, data and information cannot be assured as accurate, complete, repeatable, or auditable. Starting over would be better.
- **Accurate**. Without errors, mistakes, miscalculations, or anomalies. If not accurate, data cannot be assured as current, complete, repeatable, or auditable. Starting over would be better.
- **Complete**. Comprehensive, all-inclusive, total, or entire. If not complete, then current, accurate, repeatable, and auditable data do not provide the intended value; the entire picture is unseen.
- **Repeatable.** The ability to reproduce current, accurate, complete, and auditable results. If not repeatable, the process can neither be demonstrated nor validated; deficiencies cannot be pinpointed and resolved.

[28] Courtesy of CT Hewitt Consulting ©2019.

- **Auditable**. The ability to trace the source through the entire system or process to validate the results. The inability to audit data or information places both the process and result in an indeterminate status concerning data, information credibility, and trustworthiness.
- **Compliant**. Demonstrated as meeting the current, accurate, complete, repeatable, and auditable characteristics (above), which meet specific requirements of governing policies, requirements, procedures, guides, or practices.

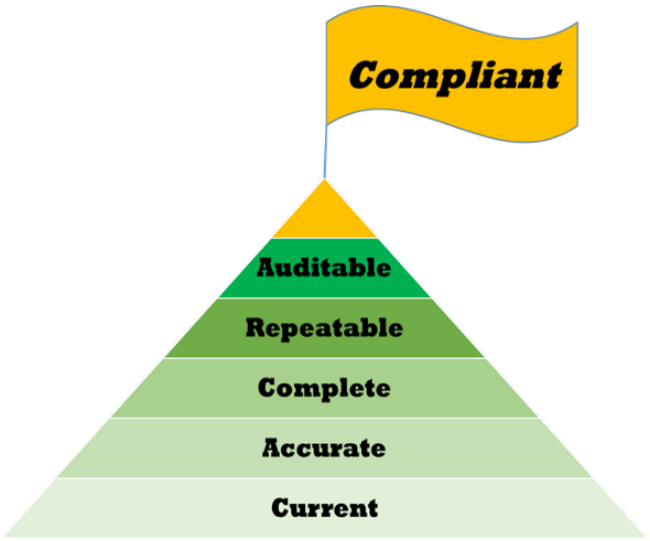

Figure 16. Hierarchy of Essential Elements for the Goal of Compliant Information

The FPD should continuously enforce the contractor's identification of anomalies in the EVMS data and information in order to

- identify the magnitude and effect,
- resolve them at the earliest practical time, and
- reconcile them to avoid any misrepresentation, misinterpretation, misunderstanding, or subject data and information misuse.

6.3.2 PARS

Central Repository

PARS is DOE's central repository for project performance data and information. In accordance with DOE O 413.3B,[2] DOE contractors begin submitting monthly EVMS data and information shortly after CD-2 approval for projects having a TPC of $50 million or more. PARS enables receipt of schedule and cost performance data in the format specified by DOE to ensure consistency across the enterprise and to deploy standard analytical tools. Per DOE O 413.3B, this includes

- EVMS data and information consistent with EIA-748,

- time-phased incremental budget and performance in cost and quantity,
- MR values,
- IMS (both baseline and status),
- variance analysis reports,
- risk management data, and
- formal submission of all DOE IPMR formats to the contracting officer and uploaded to PARS. [2]

Attaching Relevant Performance Documents to Project File

Contractors are encouraged to attach relevant performance documents to their project files in PARS. Attaching the latest version of the DOE PM-approved EVM system description and procedures, baseline budget control logs, and variance analysis reports helps explain and simplify the meaning of posted data. All EVMS data and information in PARS accurately reflect current project status and provide acceptable forecasts to assist project management and decision-making processes:

- The FPD ensures project schedule and cost performance data and information accurately reflect the project's current and future states. Early warning indicators are an essential compliance requirement. Monthly contractor EACs are also an EIA-748 requirement, including an EAC for the TPC by the FPD.
- The FPD or project team, when applicable, is ultimately accountable for contractor performance data and information oversight and validation.

Project- Versus Contract-Level Reporting in PARS

The PB includes the project scope and KPPs, CD-4 project completion date, and TPC. The TPC reflects the amount of funding necessary to complete the project, including fee (where applicable) and DOE contingency, and represents DOE's commitment to Congress. DOE O 413.3B establishes requirements and thresholds based on the TPC.

The relationship is not always one contract per project. For example, three contracts may define one project where contract data are integrated (typically by a designated prime contractor) for reporting into PARS at the project level, as shown in Figure 17, or one contract may encompass three projects, each reported into PARS separately. Each of the prime contractors having a work scope of $100 million or more is certified as having a compliant EVMS. For monthly reporting, each prime contractor reports its EVMS performance data individually by project into PARS. For one-contract-to-one-project instances, the contractor reports the CBB. However, for instances of one contract to multiple projects or one project with multiple contracts, project data are collected at the PBB.

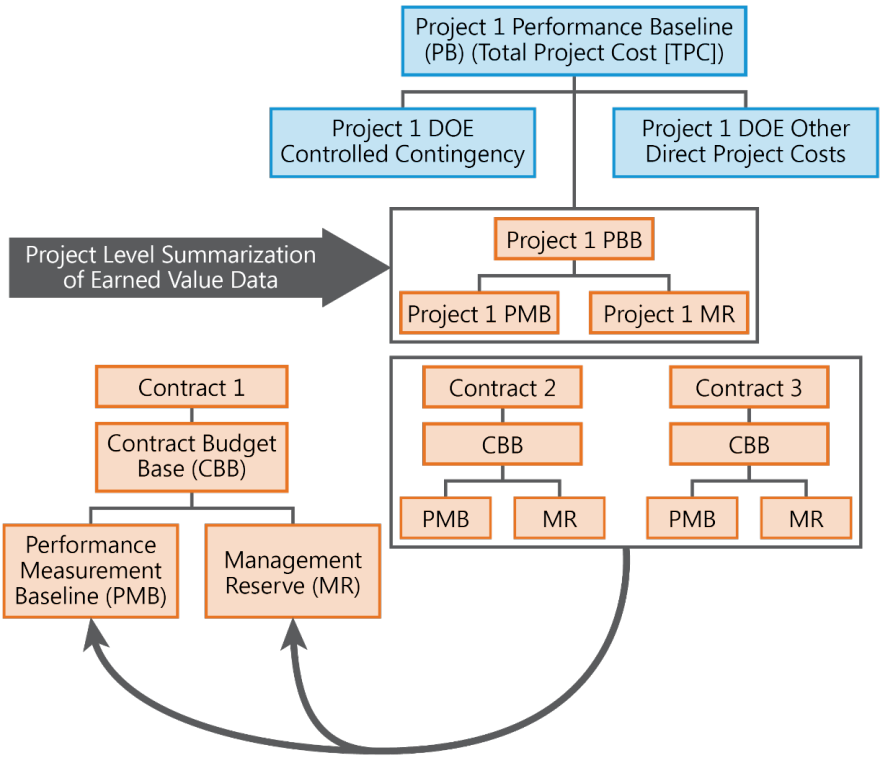

Figure 17. One Project Supported by Three Contractors

6.4 CERTIFICATION AND SURVEILLANCE COMPLIANCE

As previously detailed in Table 1, DOE 413.3B requires the government to verify that the contractor implements a certified EVMS and deploys a comprehensive surveillance plan as follows:

- The FPD meets with the contractor to track progress in establishing a compliant EVMS.
- The FPD communicates with DOE PM to determine contractor readiness for the CR.
- DOE PM conducts the CR.
- The contractor conducts annual SRs.
- DOE PM conducts risk-based, data-driven SRs.

The outcome of the CR and SR is an assessment of the EVMS capability to provide objective schedule, cost, and technical performance measurements; it does not verify how well projects are performing or progressing.

6.4.1 EVMS Compliance Reviews—Process Overview

The purpose of the EVMS review is to assess the compliance of the contractor's EVMS and involves three steps:

1. Verify the contractor's system description meets contractual and/or EI-748 requirements

(it adequately documents the processes and procedures which support how its system meets the intent of the 32 Guidelines).

2. Verify the contractor is executing their EVM system description (i.e., the contractor's ability to demonstrate the EVMS implementation as described in the EVM system description and supplemental procedures).
3. Validate the EVMS output (i.e., the EVMS is providing timely, accurate, and reliable data).

Compliance is determined from the results of all three steps.

The type of EVMS review depends on many factors; as a result, it may address some or all of the three steps. Types of EVMS reviews include the following:

- **Certification Review (CR).** Formally determines whether a contractor's EVMS, on all applicable projects, complies with EIA-748, following DOE O 413.3B and applicable EVMS contract clauses (such as FAR Subpart 52.234-4, DOE-H-2024, or as stated in the contract).
- **Implementation Review (IR).** Performed in place of a CR, as a special type of surveillance, when EVMS compliance is a requirement. Extends the certification of a contractor's previously certified system to another facility, from one project to another project after a period of system non-use or from one certifying entity to another when the certified system has been significantly changed, or when a new contractor assumes without change (sometimes referred to as "blue-sheeted") the prior contractor's certified EVMS**.**
- **Review for Cause (RFC).** An SR of specific elements of the contractor's EVMS that display as lacking discipline in application or risk no longer meeting EVMS guideline requirements. RFC is used to determine the possible withdrawal of the company's EVMS certification.
- **Surveillance Review (SR).** Reviews a contractor's EVMS, on all applicable projects, to assess continuing compliance with EIA-748, or as specified by the contract, and following FAR Subpart 52.234-4, EVMS, or other applicable contract clauses. Surveillance begins when the contractor implements a compliant system.

6.4.2 Key Compliance-Related Terms

EVMS Certification

EVMS certification is a process used to determine whether a contractor EVMS complies with EIA-748 requirements, or those specified by the contract, following FAR clause 52.234-4 and DOE-H-2024. EVMS certification requires an assessment of the adequacy of the EVMS, compliance of the contractor with the EVMS, and process effectiveness of the EVMS outputs. EVMS elements are evaluated individually and at the system level.

When a contractor has multiple projects with an individual TPC of $100 million or more, each applicable project's performance data and information can be sampled and analyzed to determine

EVMS certification. When a certified contractor is replaced on a site by a non-certified contractor (as in the case of a re-competed contract), a CR is required. However, the scope and process may be streamlined depending on the extent of the new contractor's use of the outgoing certified contractor's EVM system description, people, processes, and tools.

To reduce costs associated with EVMS implementation, DOE PM recognizes a contractor's DOE EVMS certification indefinitely for a specified site or location while the system remains active and continues to meet EIA-748 EVMS compliance requirements. DOE O 413.3B allows a contractor to adopt its existing DOE-certified EVMS for application under a new contract regardless of location.[2] For a preexisting certified EVMS to be considered, implement the DOE PM-certified EVMS with only minor changes in the written EVM system description and procedures. The implementing contractor provides all prior certification documentation along with the updated EVM system description and procedures with all changes highlighted in the beginning stages of the certification process. When the EVMS has been previously approved, DOE PM conducts an EVMS IR no later than CD-3 approval. This approval process does not apply to a new entity, such as a limited liability company (LLC), unless the new entity has already been certified and is already doing business under a contract at another location. In this case, DOE PM conducts an EVMS IR no later than CD-3 approval.

Although DOE uses the term "certification," other cognizant Federal Agencies and DoD use review processes with a synonymous intent and refer to them as validation, compliance, or acceptance reviews. The list of contractors with DOE-certified EVMSs is maintained in PARS.

DOE Certifying Authority

Per DOE O 413.3B,[2] DOE PM is the cognizant DOE organization to certify a contractor's EVMS as compliant with EIA-748 for a project portfolio with at least one project having a TPC of $100 million or more. This guide uses the term DOE certifying authority to identify EVMS roles and responsibilities performed by DOE PM. As defined by dollar thresholds in DOE O 413.3B,[2] for a contractor with a project portfolio with at least one project with a TPC between $50 million and $100 million, EVMS certification by DOE PM is not required; however, the EVMS must remain compliant with EIA-748 requirements. Contractors are expected to conduct assessments to confirm their EVMS compliance with EIA-748 requirements in these cases. Although this compliance determination is the contractor's responsibility, assessments may be coordinated with the site field office or use support contract subject matter experts; in this case, the method of determining compliance must be identified and should not be cited as "self-certification".

Interpretation of EIA-748 Compliance Requirements

A consistent approach to the interpretation, assessment, and documentation of EIA-748 EVMS requirements is a major element in DOE's effort to improve the acquisition process. Also, a uniform interpretation and assessment of EIA-748 compliance support an OMB directive to utilize reciprocal agreements with other agencies to consider, as appropriate, their EVMS compliance determination for a mutual contractor. DOE PM and Energy Facility Contractor Group (EFCOG) member companies have discussed the importance of uniform interpretation while considering both the project's scope and contract management needs. As a result, EFCOG has recognized and endorsed the DOE PM data-driven approach.

Consistent with other government agencies that leverage technology and analytics to improve their operations, DOE emphasizes a data-driven, analytics-based approach to assess EVMS compliance requirements. This process leverages data, information, and technology to effectively and efficiently test EVMS reliability from project beginning to end. DOE's data-driven approach remotely monitors and tests the EVMS wherever possible using contractor data and information previously submitted, eliminating the need for multiple assessments and the labor and travel costs associated with numerous personnel visiting the contractor location. The data-driven, analytics-based metrics reveal vital information about subsystem or management process reliability and deficiency causes, providing an invaluable technique for all parties to detect symptoms early and monitor any corrective action results. Automated processing of EVMS data and information shortens the EIA-748 compliance assessment cycle. DOE has integrated its use of data-driven metrics into the PARS repository (discussed in Subsection 6.3.2).

In addition to this data-driven approach, a DOE-sponsored Joint Research Study has developed a tool to assess a spectrum of EVMS maturity and environment issues centered around the 32 EIA-748 EVMS Guidelines.[9] This effort was led by Arizona State University and included participation from numerous government and industry organizations (including EFCOG). It defines 56 attributes (descriptive characteristics) of an EVMS and groups them into the 10 management processes:

A. Organizing
B. Planning and scheduling
C. Budgeting and work authorization
D. Accounting considerations
E. Indirect budget and cost management
F. Analysis and management reporting
G. Change control
H. Material management
I. Subcontract management
J. Risk management.

A project's compliance with EIA-748 can be assessed and summarized through evaluation of the maturity levels of these EVMS attributes, both individually and collectively.

This approach can further be used to evaluate the project's environment for both the government and contractor (previously discussed in Subsection 6.2.1). Evaluation of four categories of environmental factors (culture, people, practices, and resources) can provide valuable insight into its influence on the effectiveness of the EVMS implementation.

Through assessment of both the maturity and environment of their project/program's EVMS, project leaders and personnel can understand the efficacy of their EVMS to support integrated project/program management; this approach also helps identify opportunities for improvement. The ultimate goal of performing this assessment is to assure project/program participants are working with accurate, timely, and reliable information to manage their work, leading to successful project/program performance. Furthermore, the combination of a data-driven, analytics-based approach and an assessment of maturity attributes and environmental factors can

offer more objectivity to the EVMS compliance process. Traditional manual assessments can be reduced, which can minimize EIA- 748 compliance misdiagnoses (and the accompanying efforts to implement corrective action). Instead, a standard testing method is emphasized to identify potential areas of concern; this focuses compliance activity on areas identified. Such routine use of automation and the data- driven, analytics-based approach enables both the contractor and Government to comply with EIA-748 requirements more transparently, effectively, and efficiently, thus avoiding unnecessary implementation costs. This approach is also expected to transform the Government-contractor relationship by supporting the contractor's evolution to a self-governance process.

Contractor Self-Governance/Assessment and Surveillance

Contractors are encouraged to self-assess in preparation for DOE PM-led EVMS reviews. DOE PM uses this information, along with the EVM system description and additional data and information analysis, to determine review readiness. Furthermore, certified DOE contractors with active EVMS projects are expected to annually surveil their EVMS. Contractors without certified systems (projects with a TPC between $50 million and $100 million) are also expected to assess whether their EVMS remains EIA-748 compliant. Share these SR results with DOE PM (Subsection 6.2)

Noncompliance

As defined in Subsection 6.4.1, the objective for all EVMS compliance reviews is to assess the compliance of the contractor's EVMS. The review examines its utility, along with its compliance with the intent and requirements of EIA-748, via the combined analyses of EVMS data, artifacts, and information; EVM system description and operating procedures review; and discussions between contractor and Government personnel.

EVMS compliance assessments may result in noncompliance determinations against the

- process—the written EVM system description or process,
- implementation of the written EVM system description or procedures, or
- both the process and the implementation.

A process does not comply when the EVM system description and supporting procedures or instructions do not adequately address EIA-748 compliance requirements. An implementation does not comply when either a properly designed process is not operating or being implemented as intended or the persons performing a process do not possess the necessary authority or qualifications to execute the process effectively. When an insufficiently defined process results in implementation noncompliance, the noncompliance addresses both process and implementation aspects. EVMS noncompliance examples range from inconsequential concerns to material weaknesses.

Documenting Noncompliance or Areas for Process Improvement

After a compliance review, corrective action requests and discrepancy reports are used to document noncompliance. In addition, a continuous improvement opportunity can be used to identify a potential process improvement - based on best practices, lessons learned, or other efficiency or effectiveness measures. Table 6 lists the characteristics of each.

Feature/Type	Corrective Action Request	Discrepancy Report	Continuous Improvement Opportunity
Materiality	High dollar or risk; recurring; pervasive	Low dollar, minimal risk; isolated	Not applicable
Impact	Significantly influence data integrity	Insignificant; but possible if uncorrected	Not applicable
Requires Corrective Action Management Plan (CAMP)	Yes	Yes	Recommended but not required

Table 6. Characteristics of Noncompliance and Process Improvement

Materiality and Impact

After noncompliance has been identified, materiality is assessed. Materiality addresses the impact of noncompliance on the EVMS's ability to produce CACRAC information for project management. Materiality addresses both process (the written word) and implementation (the act of doing) deficiencies.

The materiality impact is a matter of professional judgment and perception; it is influenced by what a reasonable person who relies on the performance measurement reports and financial statements might need. Materiality judgments consider surrounding circumstances and involve both quantitative and qualitative factors, including the number of deficiencies observed, associated absolute dollar value impact, item importance for accomplishing contract requirements, and potential impact on Government funding. For instance, similar noncompliances may be pervasive yet have a combined minor magnitude, while a single noncompliance can be of high magnitude.

CAMP Implementation, Verification and Timeline

After an EVMS review is completed, if corrective action is required, the certifying authority and the contractor should have open communication during the creation, evaluation, and closure of the CAMP. As the contractor proceeds with the CAMP development, the certifying authority should provide a written evaluation of the contractor's draft CAMP to verify all elements (both the content and the proposed timeline) have been satisfactorily addressed. This is an iterative effort. Some corrective actions may be straightforward responses to simple findings, others may be more complex. Either way it is important to reach a mutual agreement of the CAMP contents and timeline.

The contractor then proceeds with the CAMP to correct the identified deficiency. Upon completion of the CAMP, the contractor should provide evidence/supporting documentation to:

- verify that the actions of the CAMP were completed, and
- validate that the actions corrected the deficiency.

Depending on the corrective action required, the evidence may include 3 months of supporting documentation (including CPRs). Based on the evidence submitted by the contractor, the certifying authority should then determine if the deficiency is corrected and if the issue is closed.

It is expected that an EVMS deficiency should be corrected within six months of the transmission of the deficiency by the government to the contractor. Included in this timeframe is the development and execution of the CAMP and the accumulation of supporting documentation to validate the correction of the deficiency. If the time between the transmission of the deficiency and closure of the issue is longer than six months, then another review may be necessary.

Post-Certification Surveillance

After EVMS certification, the contractor is responsible for adequately maintaining (and, as necessary, demonstrating) the system's quality. Three types of compliance reviews pertain to post-certification surveillance: the IR, RFC, and ongoing surveillance. As the data-driven, risk-based approach becomes increasingly automated, it permits EVMS data and information to be analyzed more frequently, so the ongoing surveillance process becomes more efficient and effective. Potential noncompliance areas can be quickly identified and resolved before the EVMS and project management and decision-making process experience major impacts.

As project data are uploaded into PARS each month, certain automatic tests can assess possible issues that align with prescribed test steps and metrics. The contractor should evaluate test results on the basis of predetermined thresholds as the first gate toward identifying potential concerns. As these items are identified, subject matter experts further review EVMS data for additional monitoring and investigation to determine whether a formal desktop or on-site review is necessary.

7. ABBREVIATIONS

AC	Actual Cost
ACWP	Actual Cost of Work Performed
AUW	Authorized, Unpriced Work
BAC	Budget at Completion
BCP	Baseline Change Proposal
BCR	Budget Change Request
BCWP	Budgeted Cost for Work Performed (Earned Value)
BCWS	Budgeted Cost for Work Scheduled (Planned Value)
BEI	Baseline Execution Index
CA	Control Account
CACRAC	Current, Accurate, Complete, Repeatable, Auditable, and Compliant
CAM	Control Account Manager
CAMP	Corrective Action Management Plan
CBB	Contract Budget Base (applies when one project per contract exists)
CD	Critical Decision
CFSR	Contract Funds Status Report
CPI	Cost Performance Index
CPP	Contractor Project Performance
CR	Certification Review
CRD	Contractor Requirements Document
cum	Cumulative
CV	Cost Variance
DEAR	Department of Energy Acquisition Regulations
DoD	Department of Defense
DOE	U.S. Department of Energy
EAC	Estimate at Completion
EFCOG	Energy Facility Contractor Group
EIA	Electronic Industries Alliance
EOC	Element of Cost
ETC	Estimate to Complete
EV	Earned Value
EVM	Earned Value Management
EVMS	Earned Value Management System
EVT	Earned Value Technique
FAR	Federal Acquisition Regulation
FPD	Federal Project Director
G	Guide
GAO	U.S. Government Accountability Office
IBR	Integrated Baseline Review

IEAC	Independent Estimate at Completion
IMS	Integrated Master Schedule
IP2M	Integrated Project/Program Management
IPM	Integrated Project Management
IPMR	Integrated Project Management Report
IPT	Integrated Project Team
IR	Implementation Review
KPP	Key Performance Parameter
LLC	Limited Liability Company
LOE	Level of Effort
M&O	Management and Operating
METRR	Maturity and Environment Total Risk Rating
MR	Management Reserve
NDIA	National Defense Industrial Association
NNSA	National Nuclear Security Administration
NTE	Not to Exceed
O	Order
OBS	Organizational Breakdown Structure
ODC	Other Direct Cost
OMB	Office of Management and Budget
OTB	Over-Target Baseline
OTS	Over-Target Schedule
PARS	Project Assessment and Reporting System
PASEG	Planning & Scheduling Excellence Guide
PB	Performance Baseline
PBB	Project Budget Base (applies when a contract has multiple projects or a project has multiple contracts)
PEP	Project Execution Plan
PM	Office of Project Management
PMB	Performance Measurement Baseline
PME	Project Management Executive
PMO	Project Management Office
PMSO	Project Management Support Office
PP	Planning Package
QBD	Quantifiable Backup Data
RAM	Responsibility Assignment Matrix
RFC	Review for Cause
SLPP	Summary Level Planning Package
SPI	Schedule Performance Index
SR	Surveillance Review
STRIPES	Strategic Integrated Procurement Enterprise System
SV	Schedule Variance
TAB	Total Allocated Budget
TCPI	To-Complete Performance Index

TF	Total Float
TPC	Total Project Cost
UB	Undistributed Budget
VAC	Variance at Completion
WAD	Work Authorization Document
WBS	Work Breakdown Structure
WP	Work Package

8. SOURCES CITED

The sources listed below were used to create this document. It is recommended that they are used for reference; in addition to each listed document, it may also include a more recent version, or a replacement document (to include statutes and codes).

1. Federal Acquisition Regulations 34.2 and 52.234, Earned Value Management Systems, https://go.usa.gov/xRd8u and https://go.usa.gov/xRd9q.

2. H Clause—DOE-H-2024 Earned Value Management System, STRIPES Corporate Clause.

3. DOE Project Management Terms & Acronyms, https://go.usa.gov/xtA44 or https://go.usa.gov/xzKmM.

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6. DOE G 413.3-7, *DOE Risk Management Guide*, current version, https://go.usa.gov/xzega.

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9. *EVMS Guideline Scalability Guide*, NDIA Integrated Program Management Division, current version, www.ndia.org/divisions/ipmd/division-guides-and-resources.

10. GAO-16-89G, *Schedule Assessment Guide*: Best Practices for Project Schedules, current version, https://go.usa.gov/xt8Ew.

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13. *Planning and Scheduling Excellence Guide (PASEG)*, NDIA Integrated Program Management Division, current version, https://www.ndia.org/divisions/ipmd/division-guides-and-resources.