

**Earned Value Professional (EVP)  
Planning & Scheduling Professional (PSP)  
Certification Workshops**

Hosted by:  
AAACEI – CSRA Section

Mally's Restaurant  
10/28/05

# Welcome – Ashok Pillai

---

- n Workshop to prepare candidates to sit for the Earned Value Professional and the Planning & Scheduling Professional certification exams
  - i Session 1 Earned Value Management 8:00 – 12:30
  - i Session 2 Planning & Scheduling 1:00 – 5:30
  
- n Exits, fire safety equipment, restrooms
  
- n Sponsored by AACE International, CSRA Section
  - i Co-sponsored by Augusta State University (1.0 CEU)
  - i Instructors and course materials provided by the Savannah River Site

---

# Earned Value Professional (EVP) Workshop

# Introduction

---

## n Instructors

- i Terry McNew, SRS Chief Cost Engr.  
(803) 952-9738 [terry.mcnew@srs.gov](mailto:terry.mcnew@srs.gov)
- i Kathy Bell, Principle Program Planner, SRS  
(803) 952-9501, [kathlene.bell@srs.gov](mailto:kathlene.bell@srs.gov)

# EVP Workshop Overview

---

- n Introduction and History of EVMS
- n Earned Value Principles
- n EVMS 32 Criteria
- n EVMS Terminology
- n EVMS Framework
  - i Pre-planning
  - i Execution of Work
  - i Analysis and Reporting
- n Case Study
- n Wrap-up

# Purpose

---

- n Earned Value Professional (EVP) certification by AACEI is a new endeavor
- n Two beta exams given this Spring
- n Workshop will pass on the “lessons learned” from these beta exams
- n Will address subject area highlights
- n Will not cover everything – independent study required

# EVP Test Format

---

- n Exam given in one day (~8 Hours)
- n Four sections of 1 hour 45 min each
- n First two sections are multiple choice on EVMS and related subjects
- n Third section is a number of problems with multiple choice questions
- n Fourth section is a case study

# What is Earned Value Management?

---

EVM is a systematic approach to integrating and measuring the progress of a project

- i EVM integrates scope, schedule, and cost
- i Performance is objectively measured based on the physical work accomplished

# What is Earned Value Management?

---

Earned Value Management provides data from a management system in standard data elements that...

- n Relates time-phased budgets to project tasks
- n Integrates cost, schedule, and technical performance
- n Indicates work progress objectively
- n Is valid, timely and auditable
- n Is at a practical level of summarization

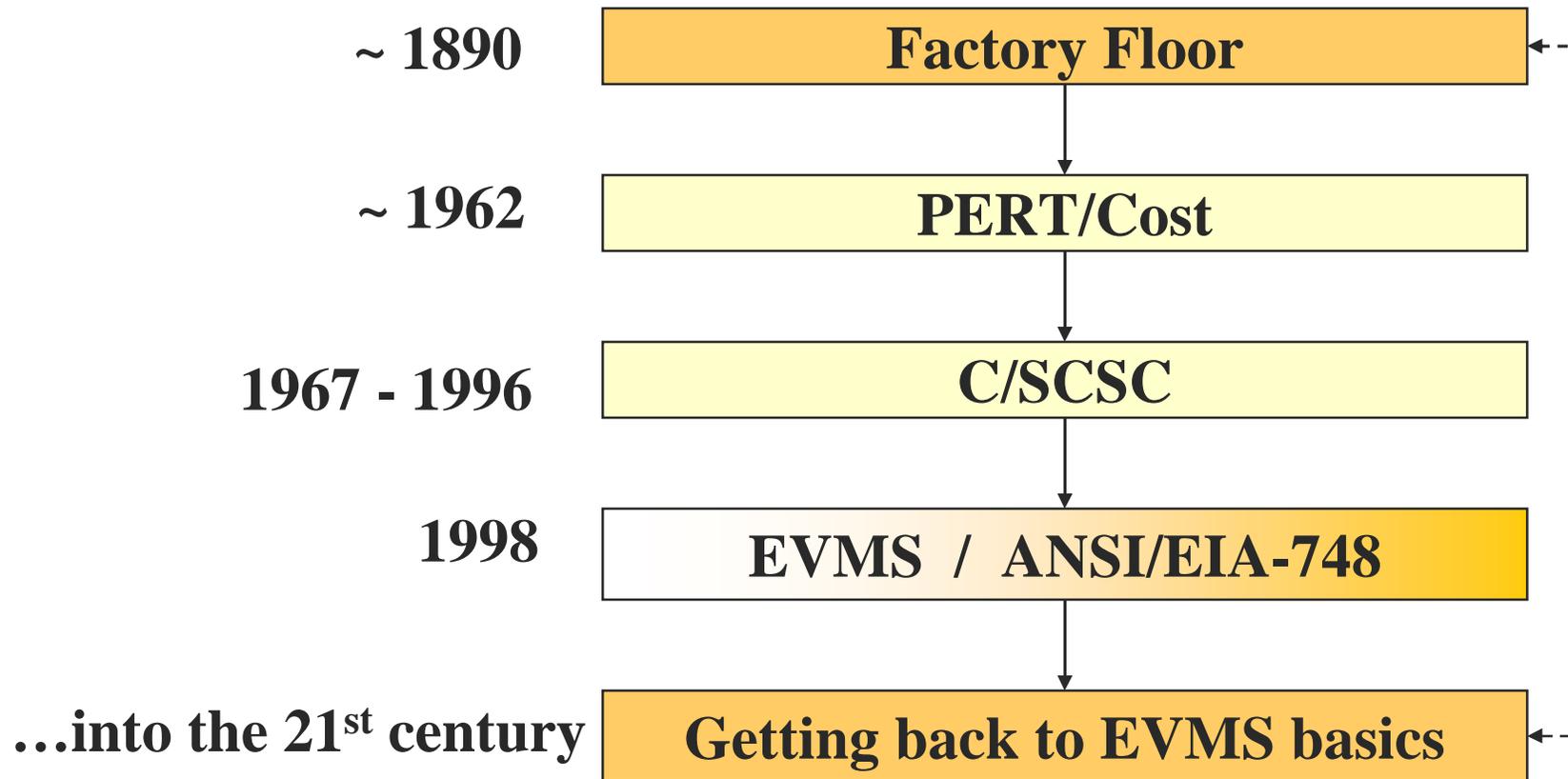
# Why use Earned Value Management?

---

Earned Value Management provides project management objective answers to the following:

- n Where have we been?
- n Where are we now?
- n Where are we going?

# Where did EVMS come from?



# Earned Value Principles

---

- n ANSI/EIA-748 Criteria
- n EVMS Terminology
- n Framework of EVMS
  - i Pre-Planning
  - i Execution of Work Using EVMS
  - i Analysis and Reporting

# Earned Value Principles

---

- n Plan all project work scope to completion
- n Break down the scope into manageable pieces that can be assigned to a responsible person or organization
- n Integrate project work scope, schedule, and cost objectives into a baseline plan against which accomplishments may be measured

# Earned Value Principles

---

- n Collect and record
  - i Actual costs, and compare those costs to the performance baseline in the same manner as planned
  - i Physical progress, and compare that progress to the performance baseline
- n Objectively measure performance

# Earned Value Principles

---

- n Analyze significant variances and implement management actions to mitigate risk and manage cost and schedule performance
- n Incorporate authorized changes to the baseline in a controlled and timely manner

# Earned Value Management System Criteria

---

- n Industry Standard EVMS Guideline (ANSI/EIA-748).
  - i Identifies 32 Criteria framework within which an adequate integrated cost / schedule / technical management system will be determined to be acceptable.
  - i Describes a system, but does **not** mandate hardware/software requirements.

# ANSI/EIA-748

- n ANSI/EIA-748 guidelines identify 32 EVMS Criteria Categorized into 5 functional areas:
  - i Organization (5)
  - i Planning and Budgeting (10)
  - i Accounting Considerations (6)
  - i Analysis and Management Reports(6)
  - i Revisions and Data Maintenance (5)

# EVMS Criteria - Organization

1. **Work Breakdown Structure (WBS) – Define the Work Scope**
2. **Organizational Breakdown Structure (OBS) Responsibility Assignment Matrix (RAM)**
3. **Project Integration - Establish Performance Measurement Baseline (PMB) Cost Accounting Standards (CAS) Work Authorization System (WAS)**
4. **Indirect Cost Control**
5. **Control Account (CA) with Vertical and Horizontal roll-up within both the WBS and OBS**

## Industry Standard Earned Value Management System

- **Organization**
- Planning & Budgeting
- Accounting
- Analysis & Management Reporting
- Revisions & Data Maintenance

# EVMS Criteria – Planning and Budgeting

6. Integrated Work Schedules (Master, Summary, Detailed)
7. Project Milestones (Key Events, Technical Performance Measures)
8. Performance Measurement Baseline (PMB/BCWS)
9. Work Authorization (WA)
10. Work/Planning Packages
11. Reconcile CA Budgets (Work/Plan Pkg=CA Budget)
12. Level of Effort (LOE) – Apportioned to Work Packages
13. Establish Indirect Budgets
14. Management Reserve/Undistributed Budget (MR/UB)
15. Total Project Costs reconcile with sum of internal budgets and Management Reserves

## Industry Standard Earned Value Management System

- Organization
- Planning & Budgeting
- Accounting
- Analysis & Management Reporting
- Revisions & Data Maintenance

# EVMS Criteria – Accounting

16. Direct Costs (Formal Cost Accumulation System)
17. Map costs to WBS (Rollups)
18. Map Cost to OBS (Rollups)
19. Record All Indirect Costs
20. Identify Unit Costs
21. Material Accountability System (Material Cost Accumulation)

## Industry Standard Earned Value Management System

- Organization
- Planning & Budgeting
- Accounting
- Analysis & Management Reporting
- Revisions & Data Maintenance

# EVMS Criteria – Analysis & Management Reporting

- 22. Earned Value Data Report (Cost/Schedule Variance)**
- 23. Prepare Variance Reports**
- 24. Report on Indirect Costs (BCWS & ACWP)**
- 25. Associate Variances with WBS and/or OBS**
- 26. Management Action (Control Variance Trends)**
- 27. Revise EAC and Identify Variance at Completion (VAC)**

## Industry Standard Earned Value Management System

- Organization
- Planning & Budgeting
- Accounting
- **Analysis & Management Reporting**
- Revisions & Data Maintenance

# EVMS Criteria – Revisions & Data Maintenance

## 28. Incorporate Authorized Changes Formal Change Control

- Baseline
- Funding

## 29. Track baseline changes (Reconcile new with past budgets)

## 30. Control Retroactive Changes

## 31. Prevent Unauthorized Revisions to the baseline

## 32. Document Changes to the baseline

### Industry Standard Earned Value Management System

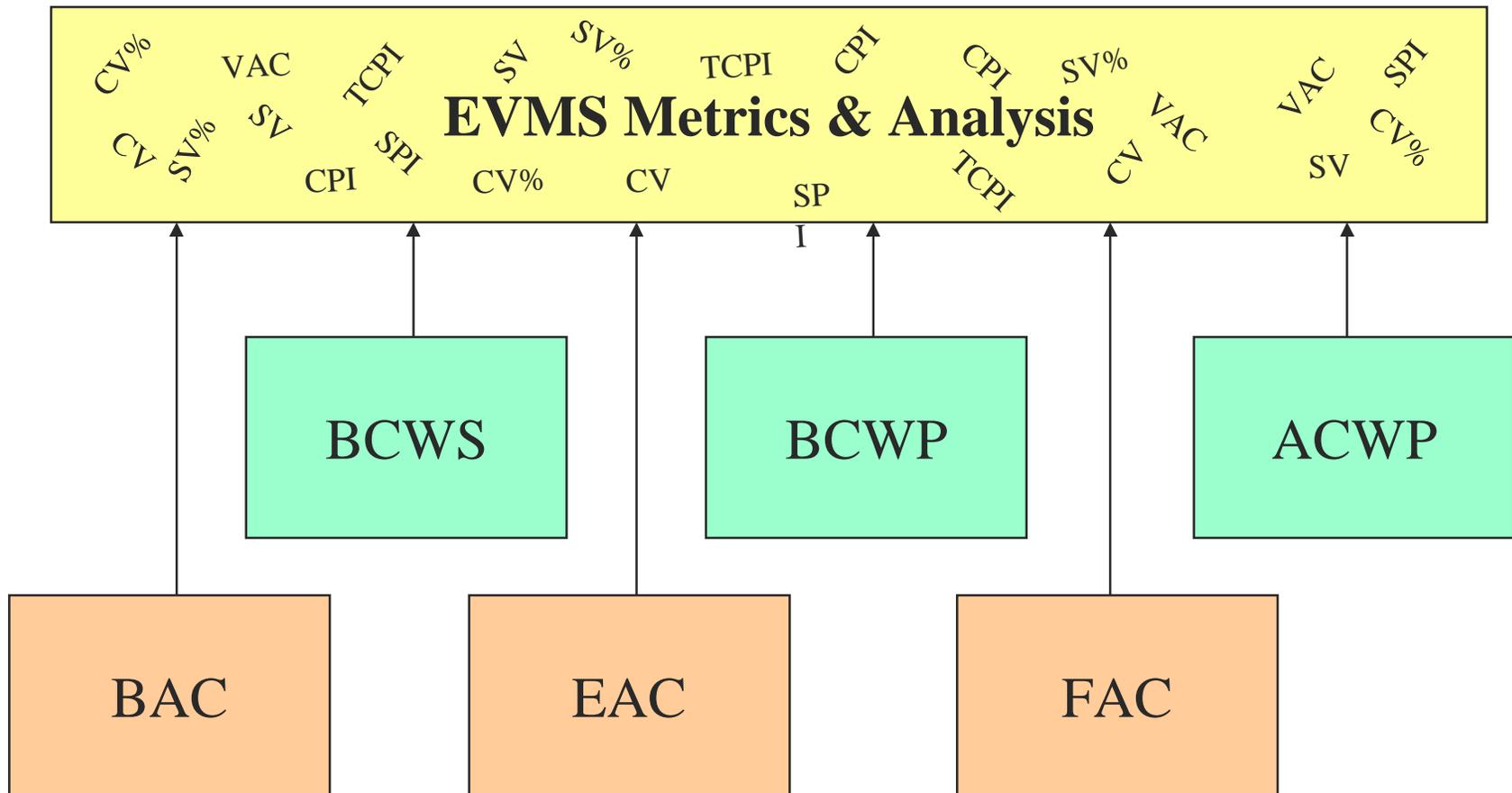
- Organization
- Planning & Budgeting
- Accounting
- Analysis & Management Reporting
- Revisions & Data Maintenance

# Summarizing Earned Value Management

---

- n Earned Value Management integrates cost, schedule, and technical (scope)
- n Performance is measured based on the physical work accomplished
- n Earned Value is expressed in terms of the budget assigned to that scope of work

# EVMS Terminology



---

## Earned Value Terminology

---

**Actual Cost of Work Performed (ACWP):** The costs actually incurred and recorded for the work accomplished through the status date. ACWP consists of the costs for labor, material, and other direct resources.

**Budget at Completion (BAC):** Sum of the budgets for work to be accomplished.

BAC<sub>(PMB)</sub> does not include Contingency.

BAC<sub>(TPC)</sub> includes Contingency

**Budgeted Cost of Work Performed (BCWP):** The physical work performed to date expressed in terms of the budget assigned to that work. Also known as Earned Value.

**Budgeted Cost of Work Scheduled (BCWS):** The sum of the approved cost estimates for activities (or portions of activities) scheduled to be performed during a given period (usually project to date). Also known as Planned or Budgeted Value.

**Control Account (CA):** Management control point at which actual costs are accumulated and performance determined.

**Cost Performance Index (CPI):** Indicates whether the cumulative actual costs during the assessed period are higher or lower than budgeted for the work completed.

$CPI = BCWP/ACWP$

CPI >1.0 indicates cost is less than budgeted

CPI <1.0 indicates cost is greater than budgeted

**Cost Variance (CV):** The difference between budgeted cost of work performed and actual cost of the work performed.

$CV = BCWP - ACWP$

Positive CV = "Cost Underrun"

Negative CV = "Cost Overrun"

**Cost Variance % (CV)%:** The percentage of cost variance from what has been earned to date.

$CV\% = (CV/BCWP) \times 100$

**Estimate at Completion (EAC):** An EAC includes the actual cost incurred to date plus a to go estimate for the remaining scope of work.

$EAC = ACWP + ETC$

**Estimate To Complete (ETC):** An estimated cost to complete the remaining work on the project .

---

## Earned Value Terminology

---

**Fiscal Year Forecast (FYF):** Forecasted estimate of the cost of the work to be performed during the current fiscal year.

**Forecast at Completion (FAC):** Includes cumulative to date actual cost plus a projected forward plan through the project completion. Less rigorous than an EAC.

**Funding:** The incremental authorization by DOE for expenditures on programs/projects. Funding generally means the current fiscal year authorized funding amount plus the contractually agreed to GFSI amount for future fiscal years.

**Performance Measurement Baseline (PMB):** The time-phased budget plan that is used to measure performance.

$PMB = BAC_{(TPC)} - \text{Contingencies}$

$BAC_{(PMB)} = PMB = BCWS$

**Schedule Performance Index (SPI):** The ratio of work performed to work scheduled.

$SPI = BCWP/BCWS$

SPI >1.0 indicates the project has completed more work than planned. (Note: Work done out of sequence can lead a team to believe the project is ahead of schedule when it is not.)

SPI <1.0 indicates less work completed than planned

**Schedule Variance (SV):** The difference between work performed and the work scheduled.

$SV = BCWP - BCWS$

Positive SV = more work has been accomplished than Scheduled

Negative SV = less work completed than planned

**Schedule Variance % (SV)%:** The percentage of schedule variance from what has been planned to date.

$SV\% = (SV/BCWS) \times 100$

**To Complete Performance Index (TCPI):** Calculates the efficiency required to achieve the EAC/LRE/BAC.

$TCPI = \frac{\text{Work Remaining}}{\text{Money Required}} = \frac{BAC - BCWP (cum)}{BAC - ACWP (cum)}$

NOTE: May substitute EAC for BAC in denominator to determine efficiency needed to complete within the EAC.

# Framework of EVMS

---

3 phases of EVMS:

- n Pre-Planning to develop the baseline
- n Execution of work using Earned Value Methods - data collection, formulas, metrics, performance measurement, and forecasting
- n Analysis and Reporting

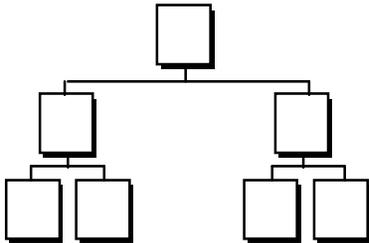
# Pre-Planning steps for developing Baselines and Earned Value Techniques

The following key Pre-Planning steps are necessary to develop Scope, Cost, and Schedule Baselines against which we implement an Earned Value Management System:

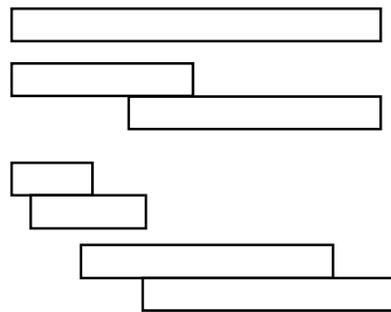
- n Statement of Work (SOW) - the technical scope
- n Work Breakdown Structure (WBS)
- n Organizational Breakdown Structure (OBS)
- n Responsibility Assignment Matrix (RAM)
- n Schedule
- n Risk Analysis and a Risk Management Plan
- n Estimate
- n Time-phased Baseline Budget
- n Resource Planning
- n Earned Value Techniques to be implemented

# Pre-Planning for EVMS Implementation

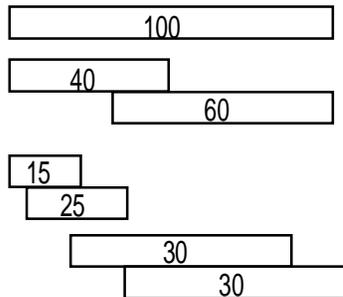
## 1. Define the work



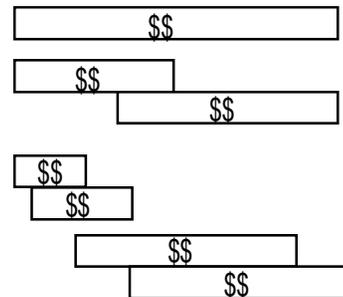
## 2. Schedule the work



## 3. Allocate Resources



## 4. Price the Resources



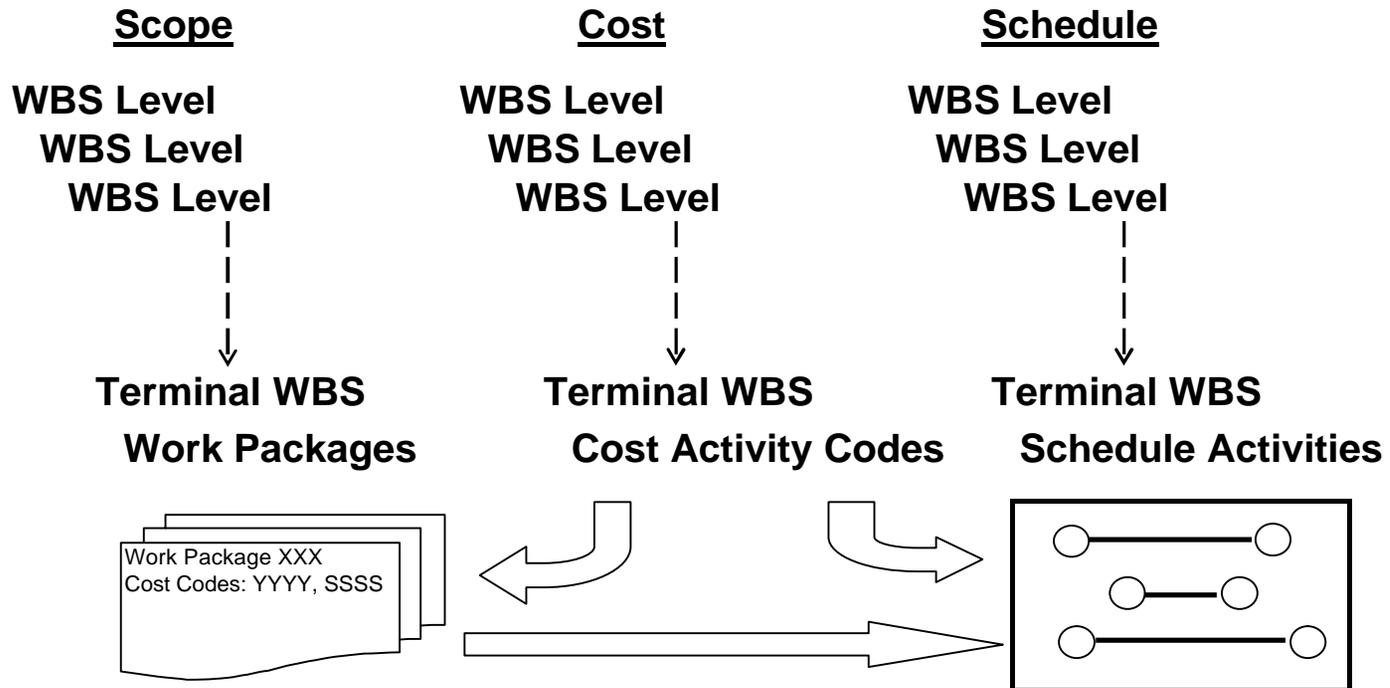
Organize the work  
WBS, OBS, RAM

Time-phase the work  
& estimate resources

Assess risk and impacts

Determine Performance  
Measurement techniques

# Integration Via the WBS



# Pre-Planning Statement of Work

---

- n Scope Definition – the single most important factor to a sound EVM process and implementation.
- n Defining the project and establishing the technical, cost, and schedule baselines identifies what will be performed.

Remember, it is critical to identify, document, and track the Technical Scope to prevent scope creep.

# Pre-Planning

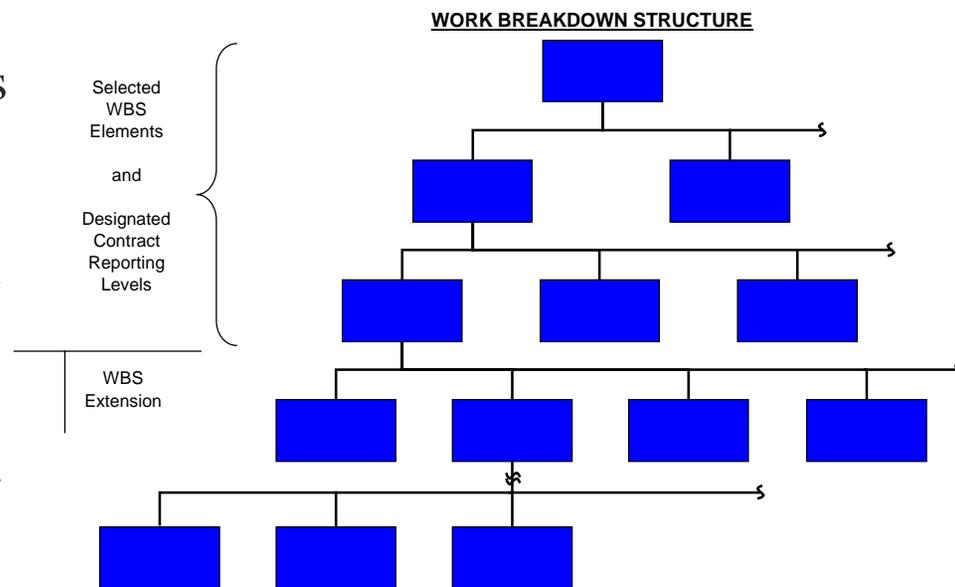
## Work Breakdown Structure (WBS)

WBS: A hierarchical code structure representing the **entire scope** of a project

Establishes the **framework** within which all planning, budgeting, performance measurement and actual costs are collected and reported.

**Defines** a project and **groups** the project's discrete work elements in a way that helps **organize** and define the **total work scope** of the project

**Work Breakdown Structure (WBS)**  
Defines the work to be done in unique logical increments. (THE WHAT)

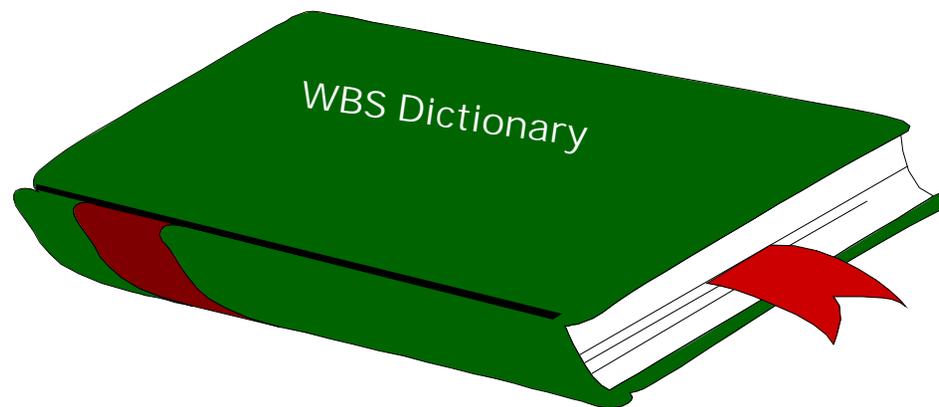


# Pre-Planning WBS Dictionary

---

## WBS Dictionary:

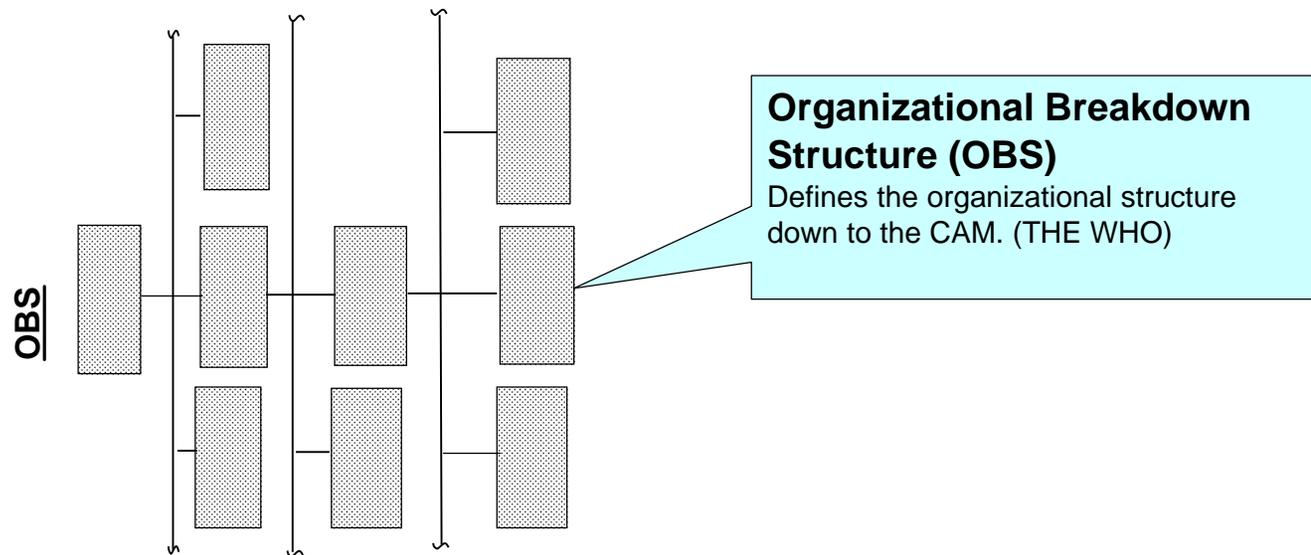
A narrative summary description of each WBS element. Includes a definition of the entire work scope. May also contain additional information and attributes as required by the customer.



# Pre-Planning

## Organizational Breakdown Structure (OBS)

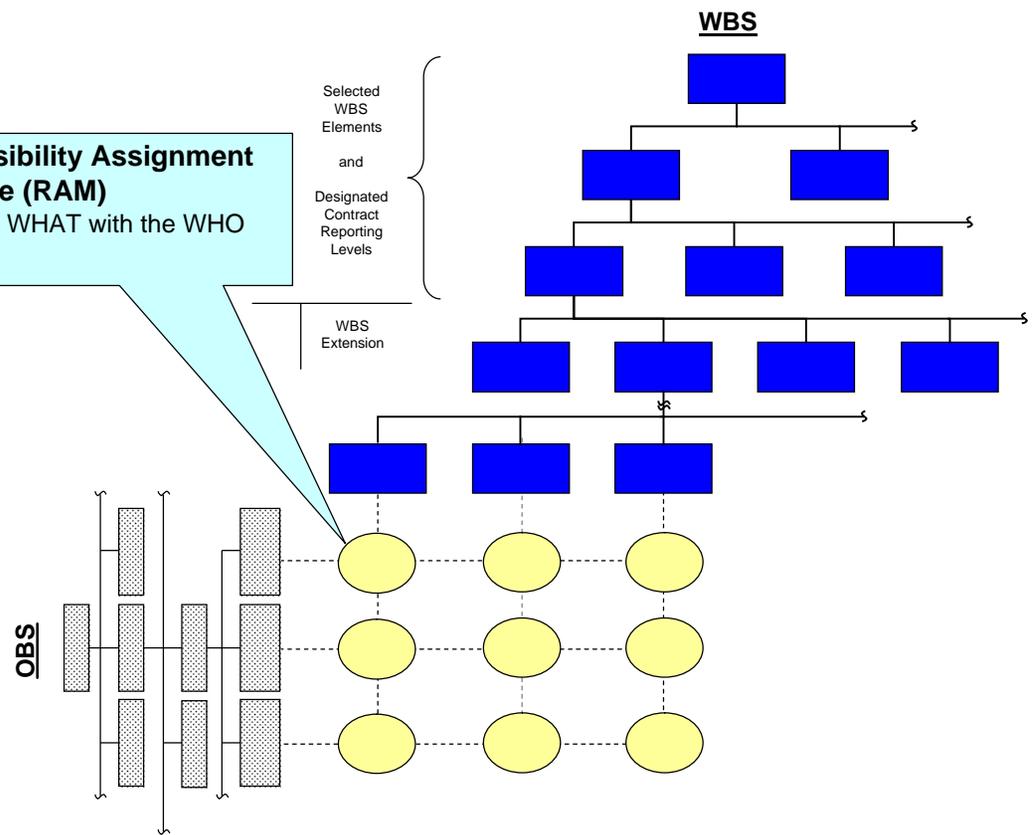
OBS: Defines the organization by functional discipline, assigned responsibility for the scope performance.



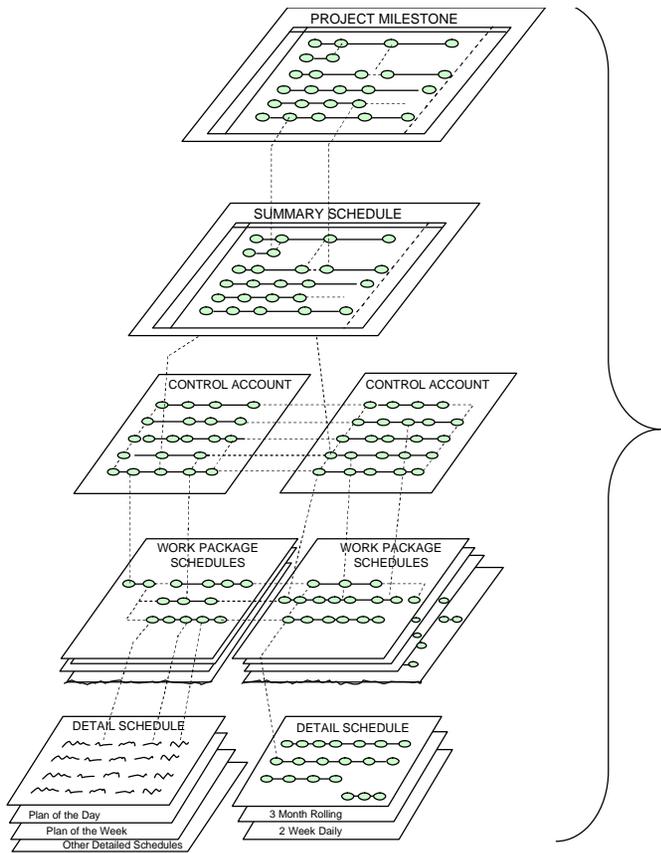
# Pre-Planning Responsibility Assignment Matrix (RAM)

RAM: Intersection of the WBS and OBS.  
Defines lines of responsibility and accountability for specific project tasks.  
It is at this point that the control accounts and work packages are developed.

**Responsibility Assignment Structure (RAM)**  
Aligns the WHAT with the WHO



# Pre-Planning Schedules



## Integrated Schedules

Vertical and Horizontal traceability of milestones and activities between all levels of the schedule.

# Pre-Planning Variable Budgets

---

- n Used on “fast tracked” projects where scope is ill defined at the onset, and evolves as design progresses
- n Typically applies in cost reimbursable contracts as opposed to fixed or target cost contracts
- n A production **unit rate** is budgeted and the actual unit rate compared to it
- n The CPI is the same as the productivity index
- n Fixed budget metrics should still be used for additional analysis
  - i Percent complete will regress as higher quantities are forecast

# Pre-Planning

## Undistributed Budget

---

- n **Budget associated with specific work scope or contract changes that have not been assigned to a Control Account or summary-level planning package.**
- n **Under Formal Change Control**
- n **UB is part of the PMB.**
- n **UB is part of the Control Account EV calculations.**

# Pre-Planning Contractor Contingency

---

- n Budget reserved for unplanned, but potentially required changes to scope or cost.
- n Under formal Change Control
- n Contingency is NOT part of the PMB.
- n Contingency is NOT part of the EV calculations.

# Pre-Planning

## Setting Earned Value Methods

---

- n Earned Value (EV) = Objective measuring the physical accomplishment of an activity.
- n There are numerous Performance Measurement methods to measure progress and calculate the Earned Value (BCWP).

# Pre-Planning

## Performance Measurement Methods

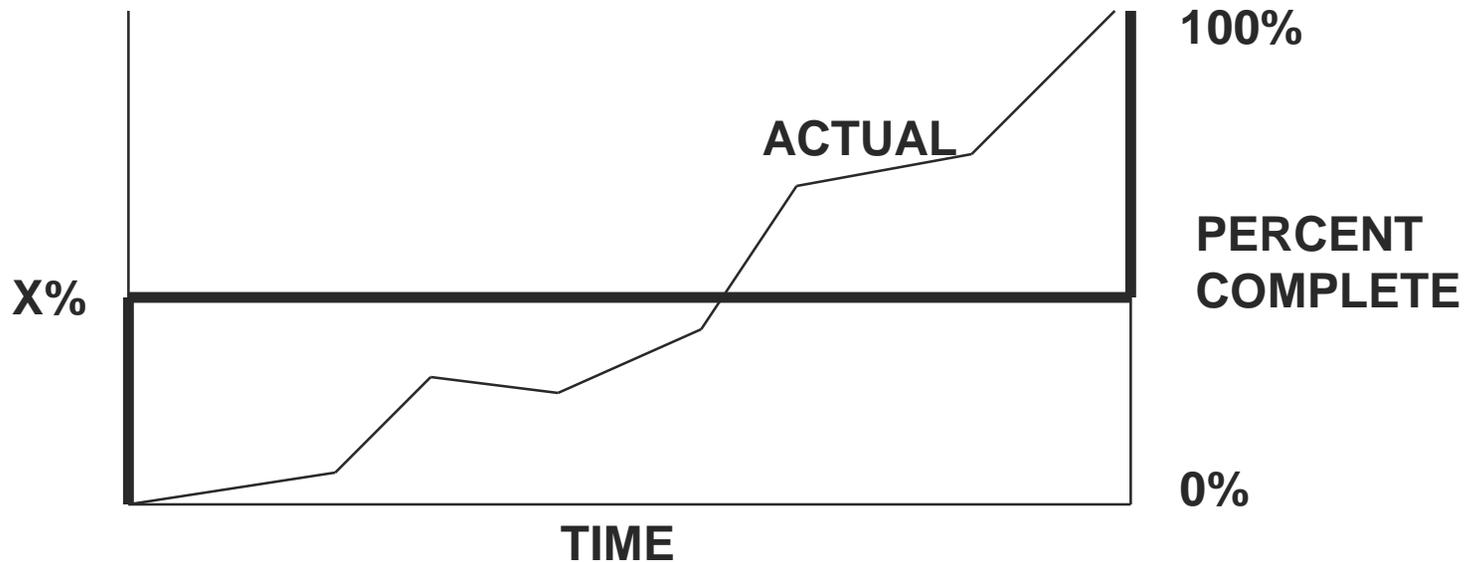
---

- n Discrete Effort
  - i Start/Finish (Fixed Formula) - 0/100, 50/50, 25/75
  - i Units Complete – physical quantity count
  - i Incremental Milestone - % complete based on milestone completion
  - i Percent Complete – based on detailed steps or hours necessary to complete the task
- n Apportioned Effort
- n Level of Effort (LOE)

# Discrete Effort Start / Finish Method (Fixed Formula)

START

FINISH



# Discrete Effort Units Completed Method

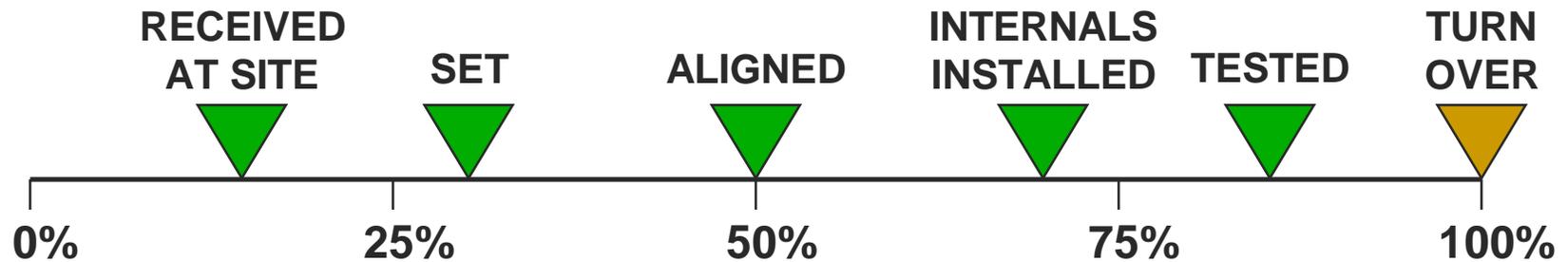
	COMPLETE	1	2	3	4
		5	6	7	8
		9	10	11	12
	TO BE DONE	13	14	15	16
		17	18	19	20

**NOTE: Total Quantity is from the EAC or Forecast. It is not the baseline value.**

$$\% \text{ COMPLETE} = 11/20 = 55\%$$

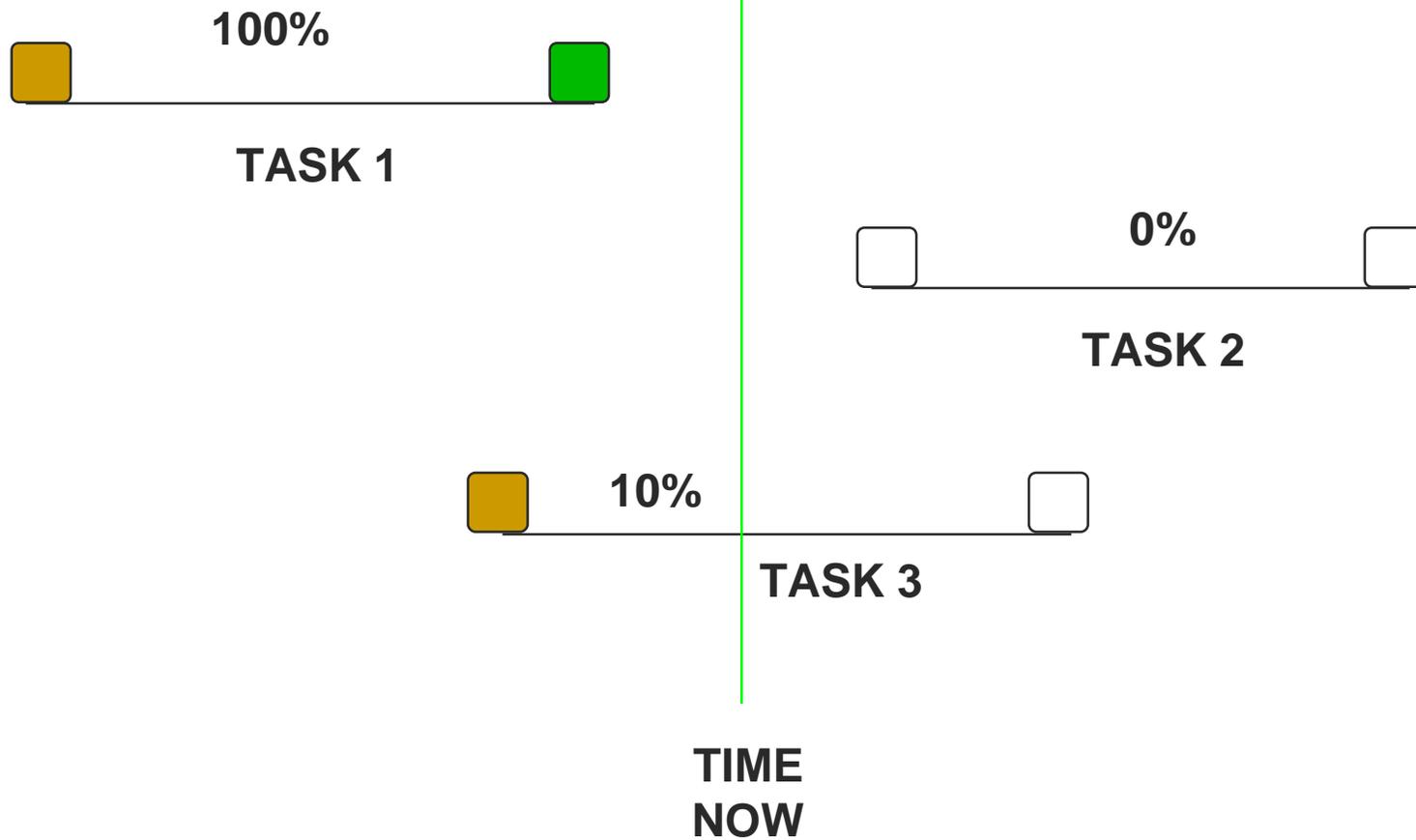
# Discrete Effort Incremental Milestone Method

*(Vessel Installation Example)*



Received at Site	15%
Set	30%
Aligned	50%
Internals Installed	70%
Tested	85%
Turned Over	100%

# Discrete Effort Earned Value vs. Percent Complete



# Performance Measurement Methods

## Apportioned Method

---

% Complete for Apportioned Work Package is based on a defined relationship with a related discrete Work Package(s) from which progress is *objectively* measured.

Usually support efforts (i.e. Construction support Efforts) is tied to the composite performance of the direct effort.

# Performance Measurement Methods

## Level of Effort (LOE)

---

The Level of Effort (LOE) method is based on the passage of time.

**BCWP is always equal to the BCWS.**

This method is usually used for accounts that are more time related than task oriented. Example of an LOE account is Program and Project Management support.

**IMPORTANT:**      **EARN • ACWP**  
                         **BCWP • ACWP**

# Work Breakdown Structure Reporting Levels

---

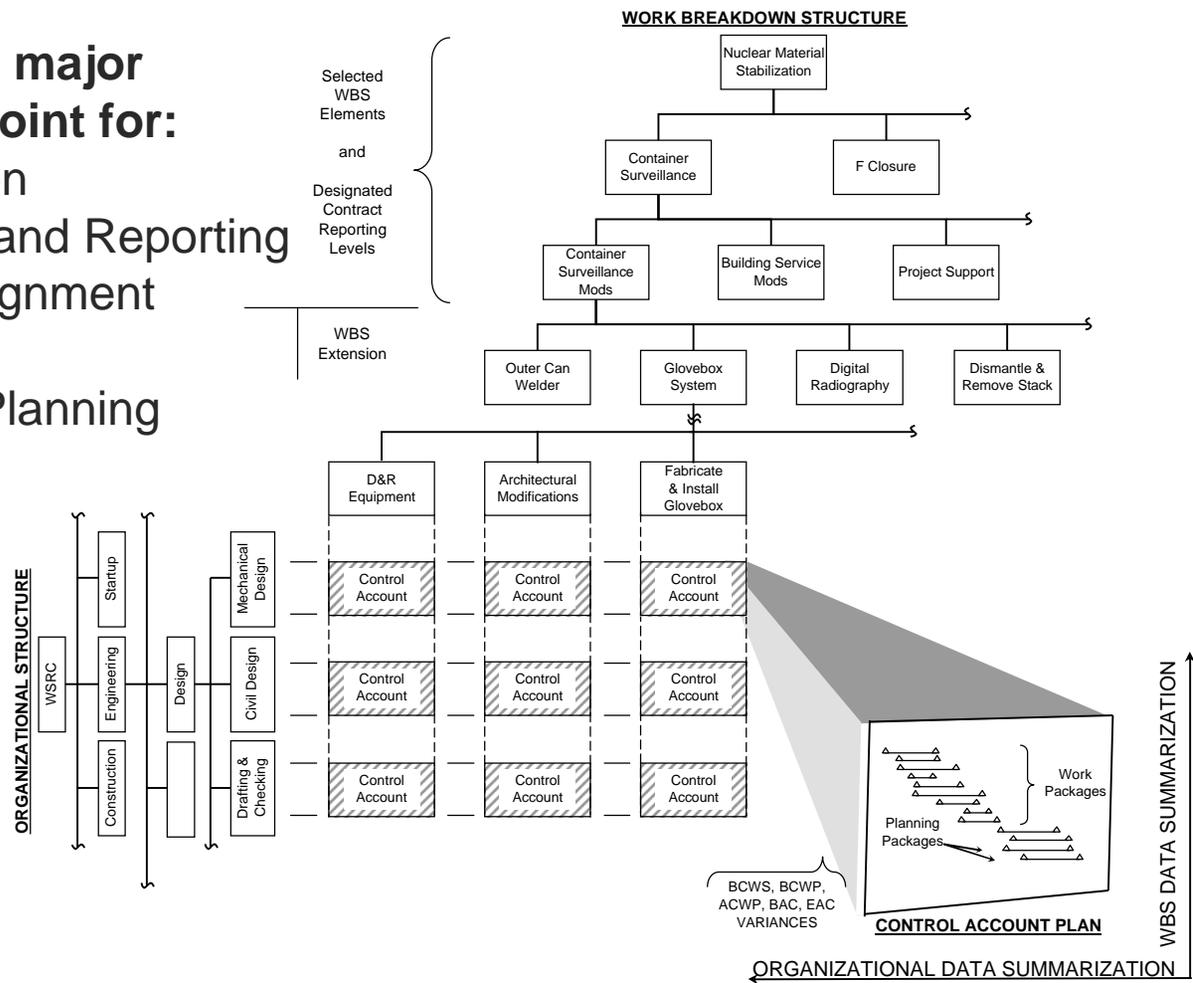
Now let's discuss how the budgeting process (baseline development) and the cost/schedule integration is identified in an earned value environment.

As discussed earlier, the Work Breakdown Structure is the framework used to facilitate the requirement for integrating these major components. The Work Breakdown Structure is further broken down by Control Accounts, Work Packages, and Planning Packages.

# WBS Levels: Control Accounts

A Control Account is a major management control point for:

- Cost Summarization
- Variance Analysis and Reporting
- Responsibility Assignment
- Scope Description
- Corrective Action Planning



## WBS Levels: Work Packages

- n The detail that builds up to the Control Account Level is contained in Work Packages (WP) and Planning Packages (PP).
- n The sum of all WP and PP within a CA must sum to the total CA amount.
- n Work Packages (WP) contain a discrete segment of work below the Control Account level that is defined by
  - n a description or brief work statement
  - n starting and ending dates
  - n completion milestone
  - n work-in-process measure
  - n time-phased budget expressed in direct labor (hours and/or dollars), material, other direct costs and subcontract dollars

It is important that the duration of a Work Package be a relatively short span of time (normally, but not limited to, 6 months or less).

# WBS Levels: Planning Packages

---

Planning Packages reflect a future segment of work within a Control Account that is not yet broken down into detailed work packages. A planning package has a firm budget, estimated start and complete dates, and Statement of Work.

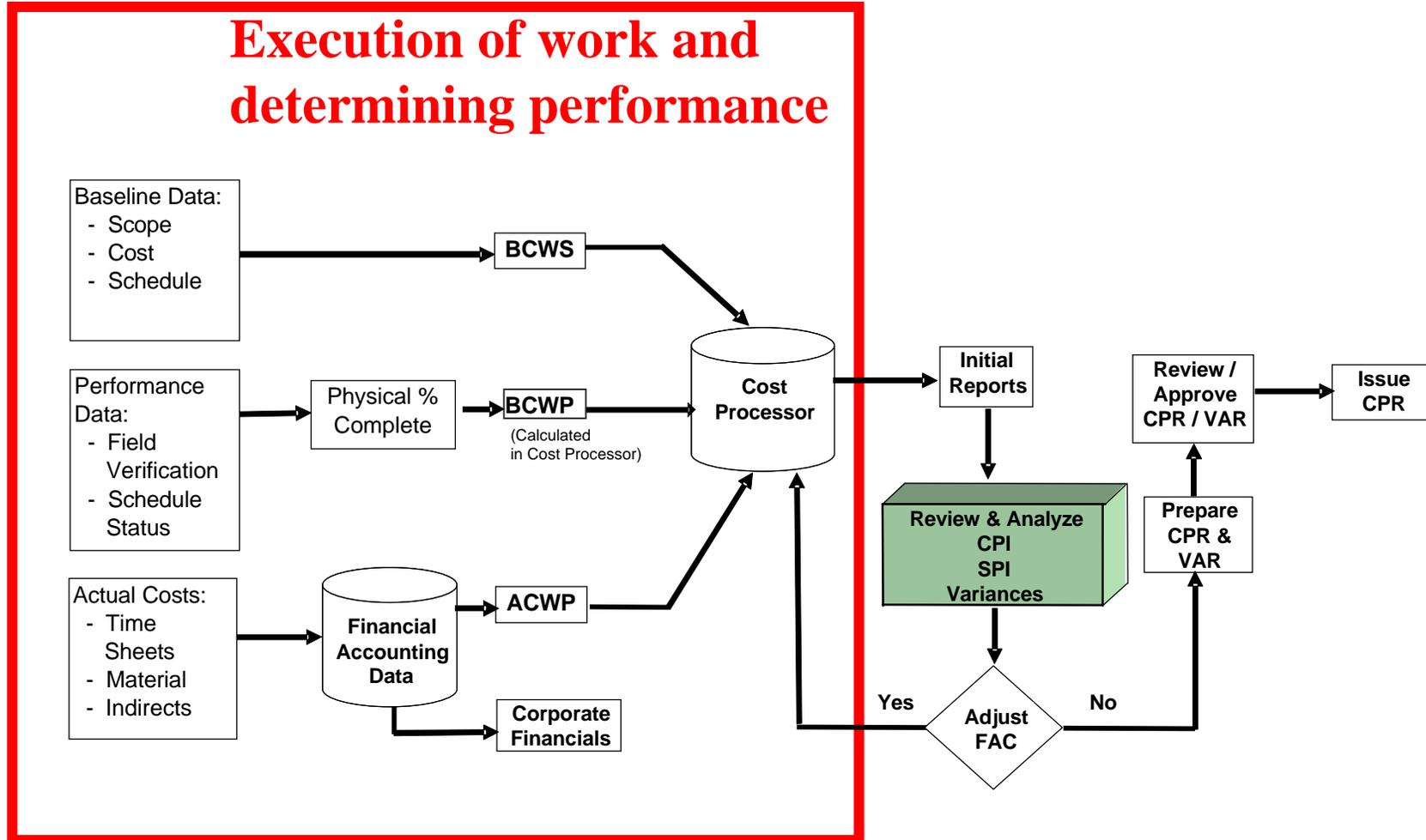
As work becomes more clearly defined and Planning Packages are converted into more detailed Work Packages, the sum of the Work Packages can not exceed the initial cost or schedule duration used for the Planning Package.

# Execution of work using Earned Value Methods

The implementation of the EVMS is the second stage and includes the following items:

- n Defining the Budgeted Cost of Work Scheduled (BCWS)
- n Determining the earned value and Budgeted Cost of Work Performed (BCWP)
- n Actual costs (ACWP)
- n Preparing metrics and performance management indices
- n Early warnings and trending
- n Estimates at Completion
- n Monitoring the integrated cost and schedule baseline
- n Change control

# Execution of Work Using EVMS



# Performance Measure Metrics

<u>Variance Calculations</u>	<u>Percentage Relationships</u>	<u>Performance Indices &amp; Factors</u>
Schedule Variance (SV)	Schedule Variance % (SV%)	Schedule Performance Index (SPI)
Cost Variance (CV)	Cost Variance % (CV%)	Cost Performance Index (CPI)
Variance At Completion (VAC)	Percent Complete	To-Complete Performance Index (TCPI)
	Percent Scheduled	
	Percent Spent	

# Performance Metric Calculations

## EVMS Quick Reference

### Cost Related Calculations:

<b>Cost Variance:</b>	$CV = BCWP - ACWP$
<b>Cost Variance %:</b>	$CV\% = \frac{CV}{BCWP} \times 100$
<b>Cost Performance Index:</b>	$CPI = \frac{BCWP}{ACWP}$

### Schedule Related Calculations:

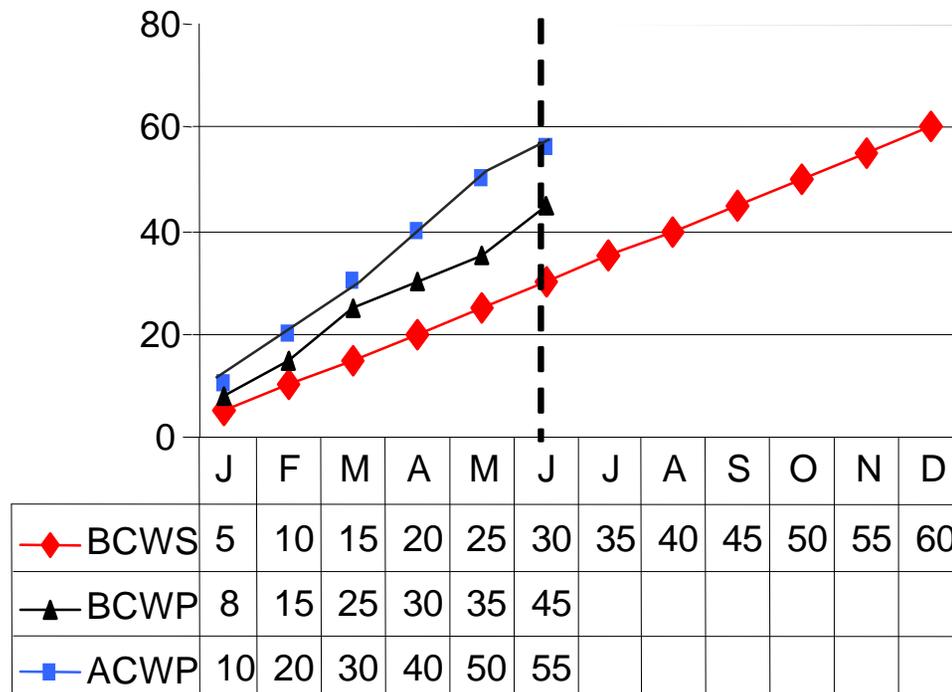
<b>Schedule Variance:</b>	$SV = BCWP - BCWS$
<b>Schedule Variance %:</b>	$SV\% = \frac{SV}{BCWS} \times 100$
<b>Schedule Performance Index:</b>	$SPI = \frac{BCWP}{BCWS}$

## Other Calculations:

<b>% Complete:</b>	$\% \text{ Complete} = \frac{BCWR(cum)}{PMB} \times 100$
<b>% Scheduled</b>	$\% \text{ Scheduled} = \frac{BCWS(cum)}{BAC(pmb)} \times 100$
<b>% Spent:</b>	$\% \text{ Spent} = \frac{ACWR(cum)}{BAC} \times 100$ Note: May substitute EAC in the denominator to determine the % of EAC spent (total funds required).
<b>Variance at Completion</b>	$VAR = BAC - EAC$
<b>To Complete Performance Index:</b>	$TCPI = \frac{BAC - BCWR(cum)}{BAC - ACWR(cum)}$ NOTE: May substitute EAC for BAC in denominator to determine efficiency needed to complete within the EAC.

# Schedule Performance Metrics

Calculate the following:  
SV, SV%, SPI



$$SV = BCWP - BCWS$$

$$45 - 30 = 15$$

$$SV\% = SV / BCWS * 100$$

$$= 15 / 30 = 50\%$$

$$SPI = BCWP / BCWS$$

$$45 / 30 = 1.50$$

# EV Schedule Variances

---

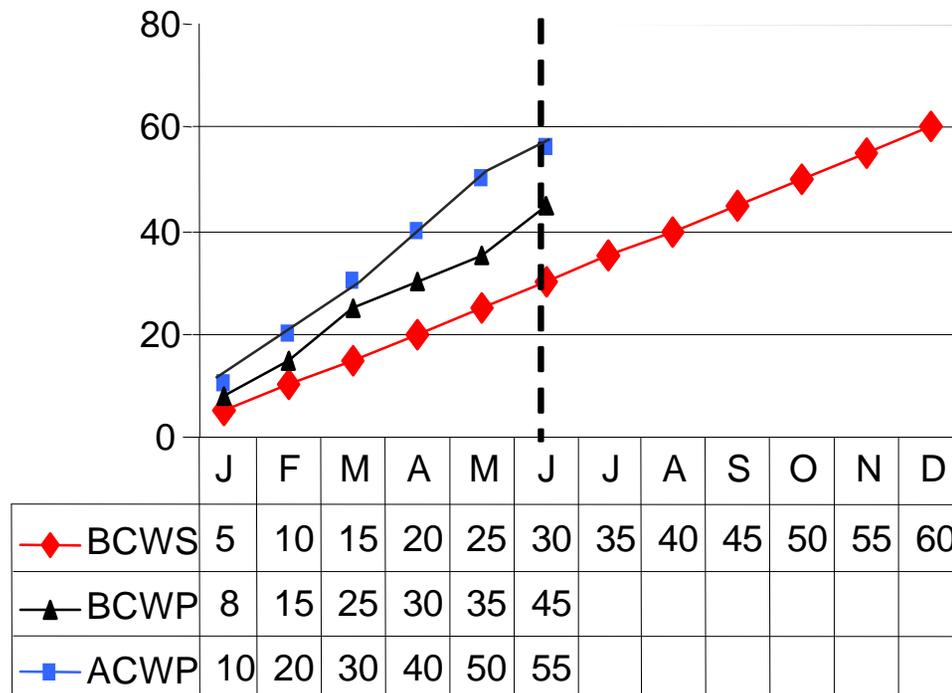
*An [EV] schedule variance is stated in terms of dollars of work and must be analyzed in conjunction with other schedule information such as provided by networks, Gantt charts, etc.*

*By itself, the [EV] **schedule variance reveals no "critical path" information** and may be misleading because unfavorable accomplishments in some areas can be offset by favorable accomplishments in other.*

(Arthur D. Little Company, 1986)

# Cost Metrics

Calculate the following  
CV, CV%, CPI



$$CV = BCWP - ACWP$$

$$45 - 55$$

$$= -10$$

$$CV\% = (CV / BCWP) * 100$$

$$= (-10/45) * 100$$

$$= 22\%$$

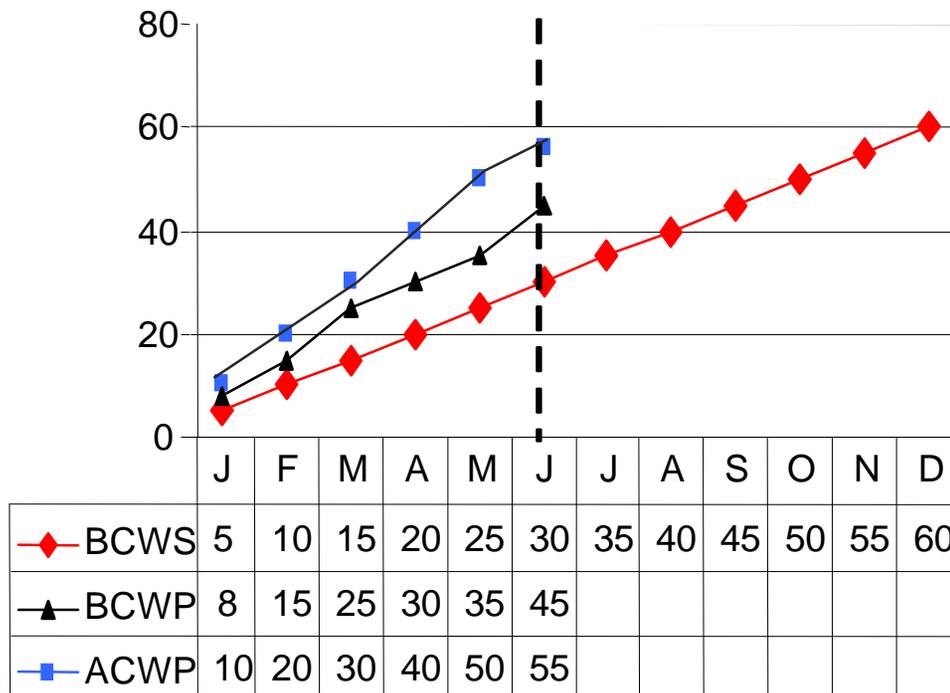
$$CPI = BCWP / ACWP$$

$$45/55$$

$$= 0.82$$

# Percentage Relationships

Calculate the following: % Scheduled,  
% Complete, % Spent



$$\begin{aligned} \% \text{ Scheduled} &= \frac{BCWS(cum)}{BAC(pmb)} \times 100 \\ &= (30 / 60) \times 100 \\ &= 50\% \end{aligned}$$

$$\begin{aligned} \% \text{ Complete} &= \frac{BCWP(cum)}{PMB} \times 100 \\ &= (45 / 60) \times 100 \\ &= 75\% \end{aligned}$$

$$\begin{aligned} \% \text{ Spent} &= \frac{ACWP(cum)}{BAC} \times 100 \\ &= (55 / 60) \times 100 \\ &= 92\% \end{aligned}$$

# EVMS Analysis and Reporting

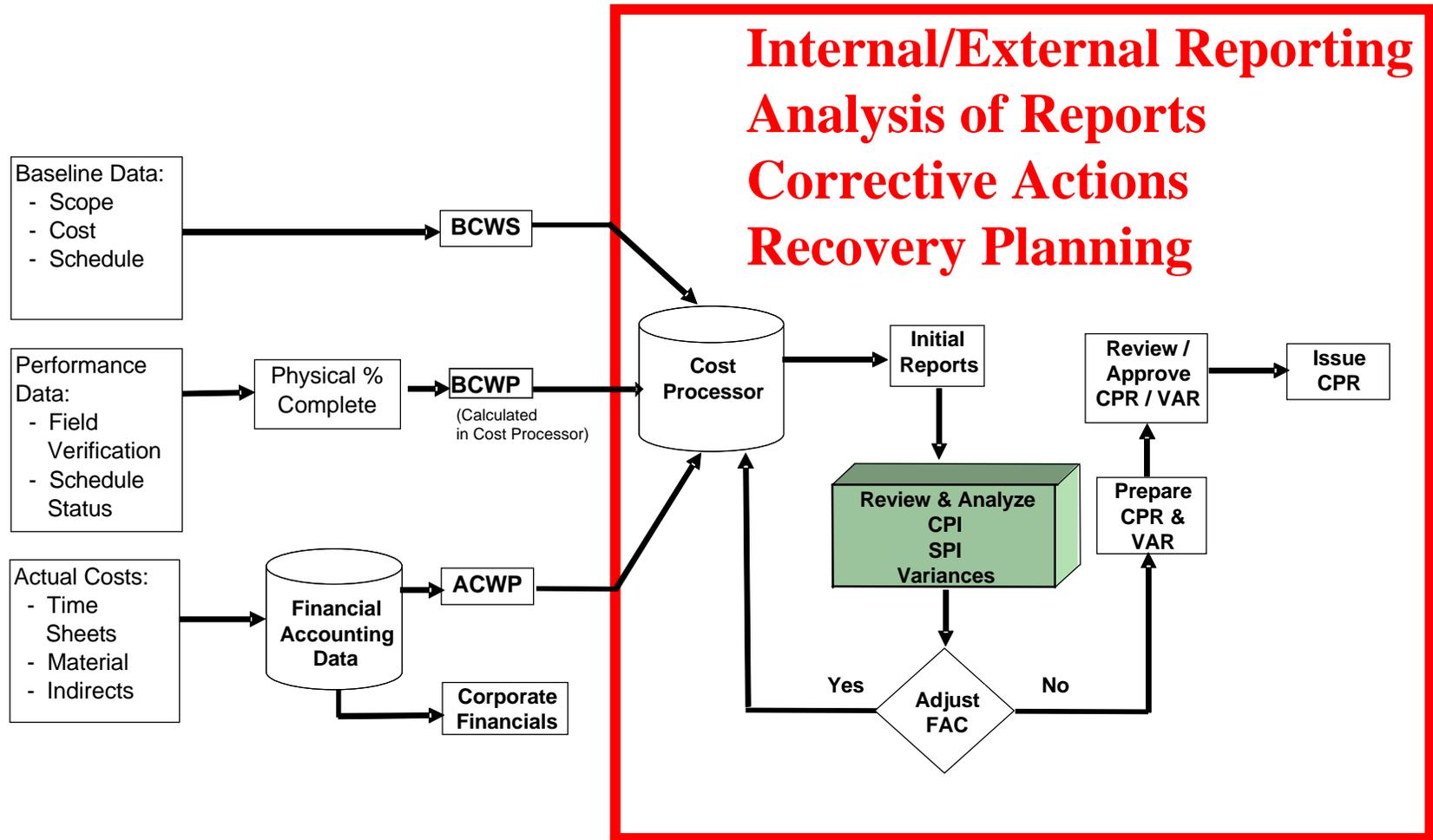
---

Even if the first two phases are completed appropriately, improper analysis of the outputs could cause inappropriate or inadequate actions to be taken against the project and could either create problems that otherwise would not exist or fail to fix the real problem that does exist.

This third stage would include:

- n Reporting requirements - both internal and external
- n Proper Analysis of Reports
- n Corrective Action
- n Recovery Planning

# Analysis and Reporting



---

## Performance Reporting and Analysis

- n Estimate at Completion (EAC)
- n To Complete Performance Index (TCPI)
- n Change Control
- n Identifying Deviations

# Estimate At Completion (EAC)

---

EAC: The forecast for completing the total project considering performance to date plus future estimate to completion (ETC).

$$\mathbf{EAC = ACWP + ETC}$$

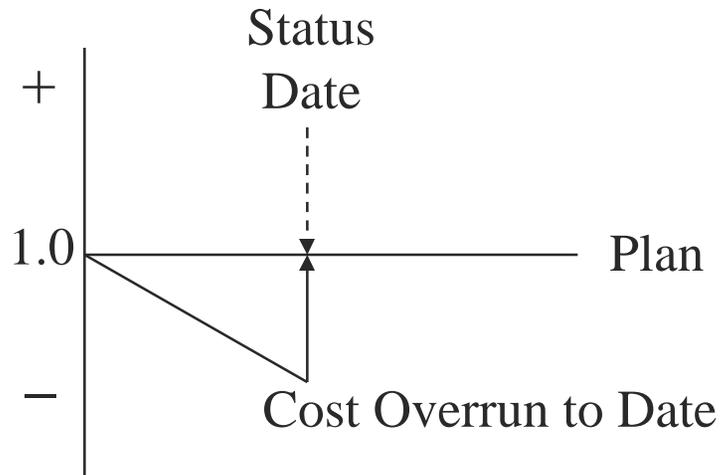
# EAC Statistical Forecasting

- n Not a replacement for Formal EAC
- n “Reasonableness Test”
- n 3 determining variables
  - i Total of Actual Costs to date
  - i Value of Work Remaining (WR) for uncompleted tasks (BAC less the earned value already accomplished)
  - i Division of WR by some performance efficiency factor

# EAC Statistical Forecasting

## Mathematical or “Overrun to Date”

$$EAC = ActualCosts + \frac{(BAC - EV)}{1.0(pf)}$$



Not widely accepted in Gov't sectors. Used more in private sectors.

Assumes all future work (beginning immediately) will be done at the full budgeted rate (CPI of 1.0)

# EAC Statistical Forecasting

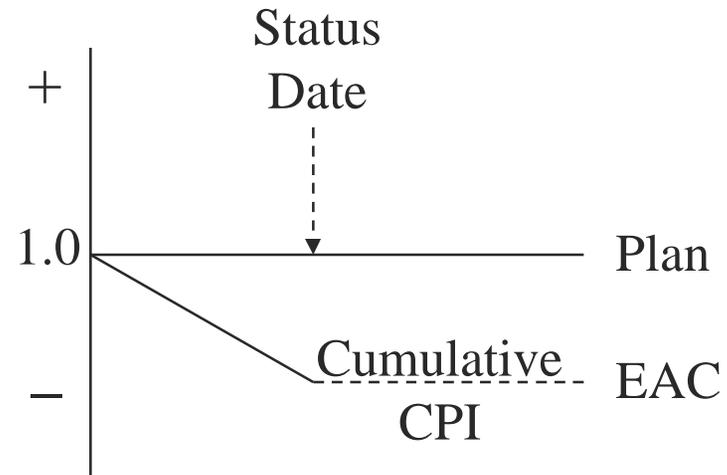
Most commonly used method

Most likely (or minimum) cost indicator needed to complete the work

Viewed as “most accurate”

## Cumulative CPI

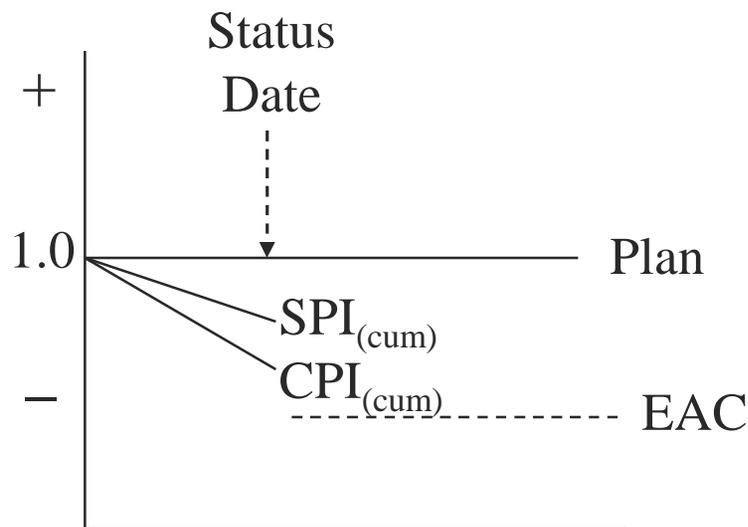
$$EAC = ActualCosts + \frac{(BAC - EV)}{CumulativeCPI}$$



# EAC Statistical Forecasting

## Cumulative CPI x SPI

$$EAC = ActualCosts + \frac{(BAC - EV)}{CumulativeCPI \times SPI}$$



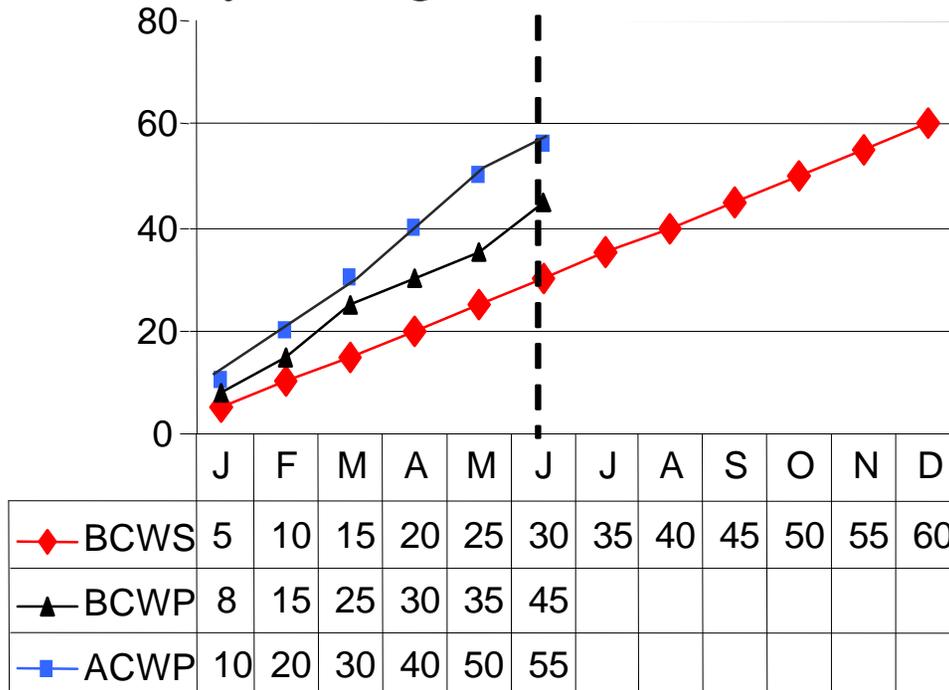
Typically used to forecast high end cost requirements. Usually “worst case” scenarios

Used when project insists on “getting back on schedule”

# To Complete Performance Index (TCPI)

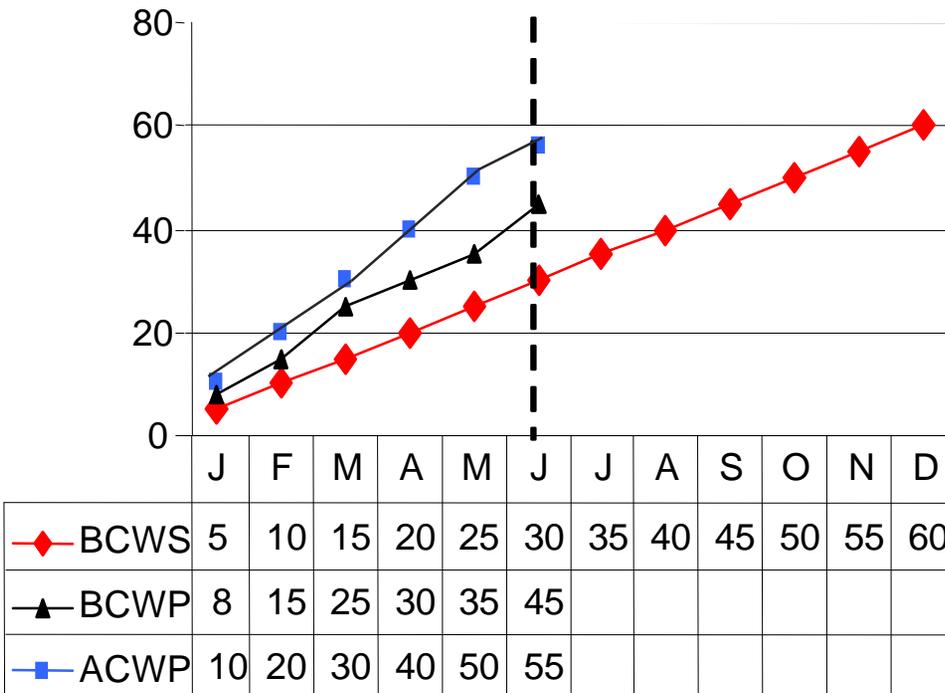
Calculates the performance factor that must be achieved on the remaining work in order to stay within financial goal set by management.

$$TCPI = \frac{\text{Remaining Work}}{\text{Funding Remaining}}$$



$$\begin{aligned}
 TCPI &= \frac{BAC - BCWP_{(cum)}}{BAC - ACWP_{(cum)}} \\
 &= (60 - 45) / (60 - 55) \\
 &= 15 / 5 \\
 &= 3.0
 \end{aligned}$$

# To Complete Performance Index (TCPI)



The EAC may be substituted in the Denominator to determine the efficiency required to complete within the EAC

Assume EAC = 80

$$\begin{aligned}
 TCPI &= \frac{BAC - BCWP(cum)}{EAC - ACWP(cum)} \\
 &= (60 - 45) / (80 - 55) \\
 &= 15 / 25 \\
 &= .60
 \end{aligned}$$

# Change Control (CC)

---

A formal, documented approval process that:

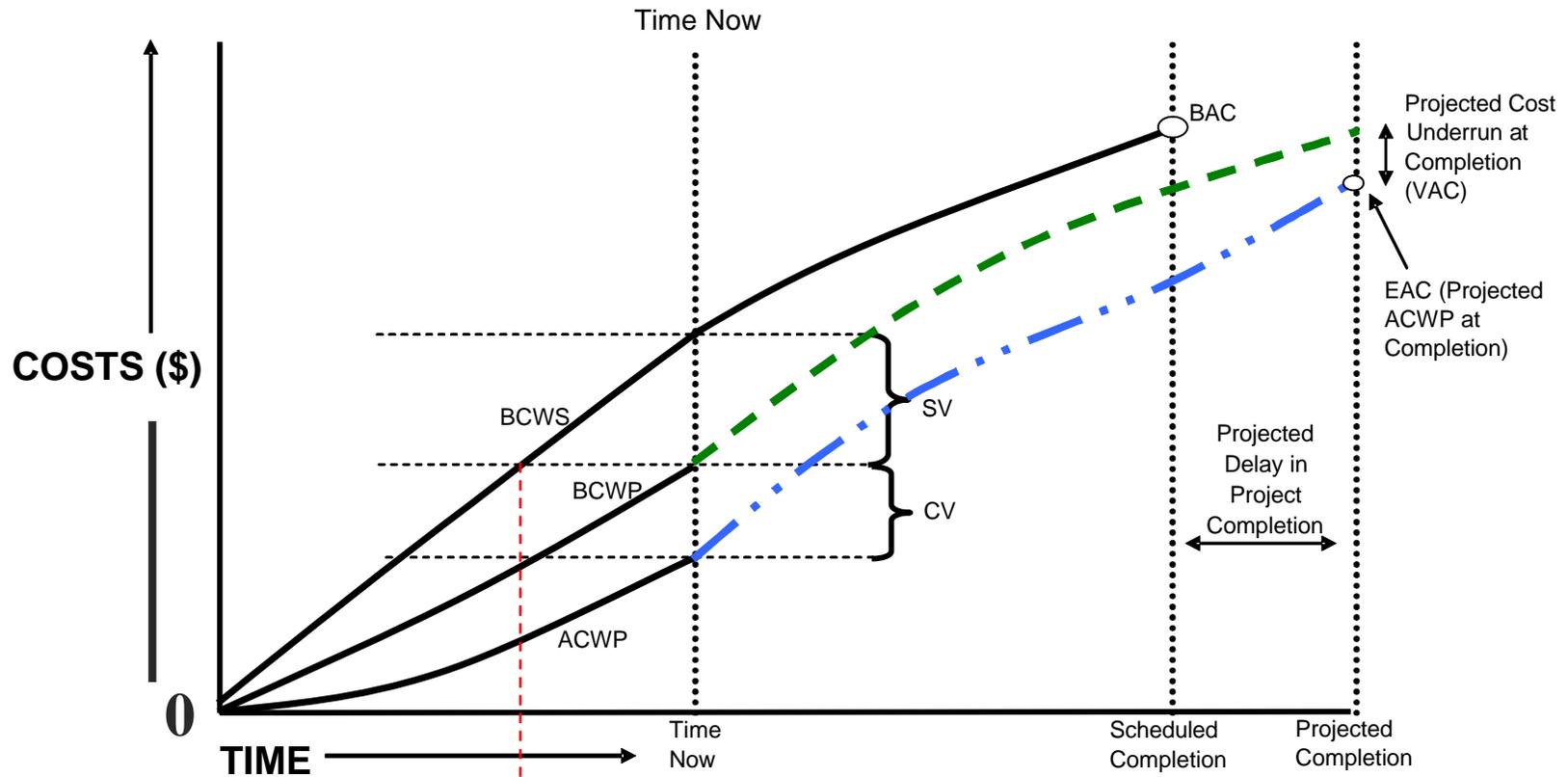
- n Defines conditions under which CC may occur.
- n Ensures scope, schedule, and cost baselines remain integrated
- n Identifies the controlling authority, thresholds and limits of authority.
- n Establishes a process for managing and documenting changes to project scope, cost, and schedule baseline documents and/or the PMB.

# Change Control (CC)

---

- n Accommodates emergency changes.
- n Controls retroactive changes.
- n Maintains a record log of all Baseline Change Proposal (BCP) actions in process, approved or declined.
- n Provides a systematic method for reporting and dispositioning identified potential scope, cost and/or schedule impacts to the project. (i.e. risk management/trending)

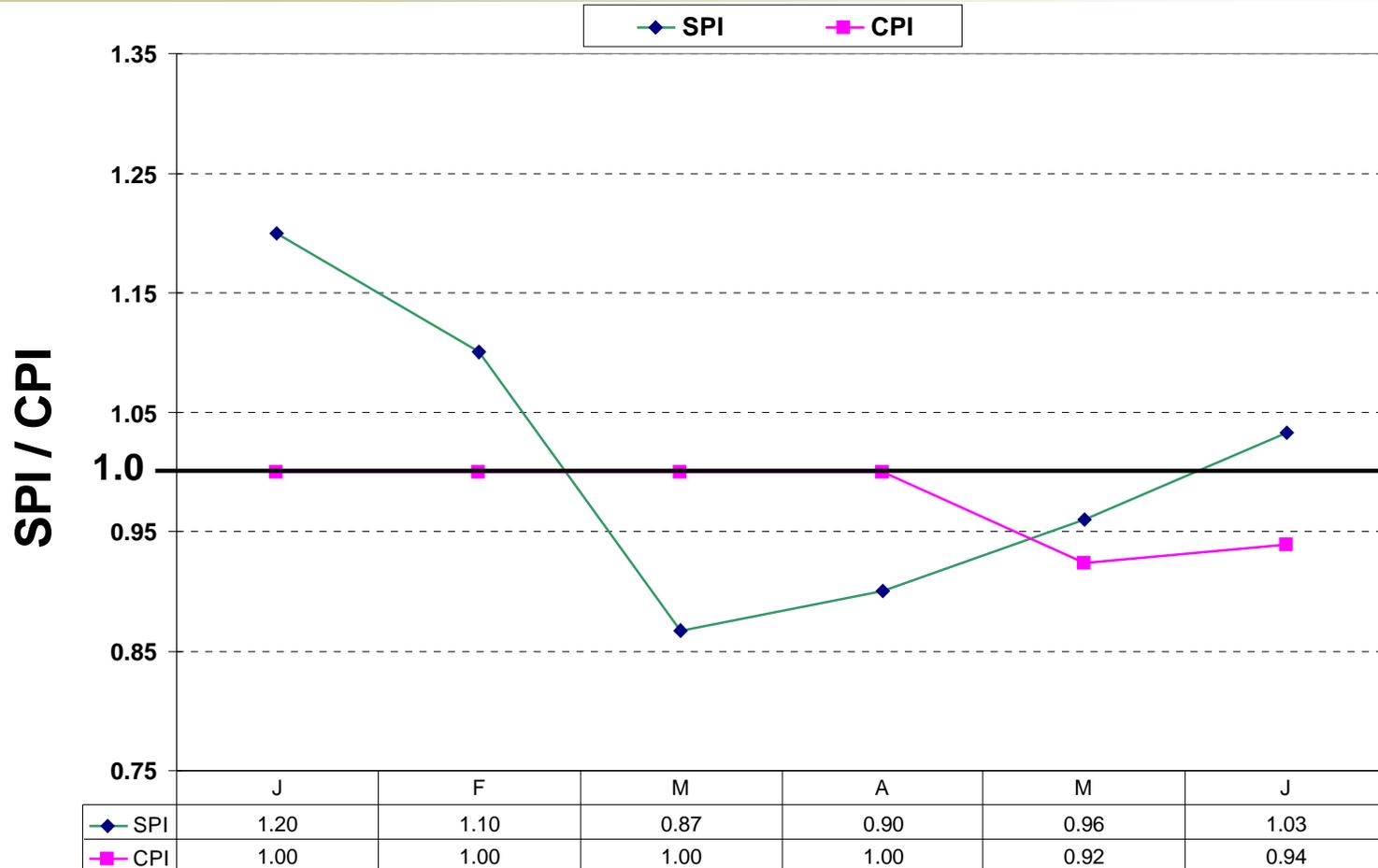
# Identifying Deviations



To date SV in units of time

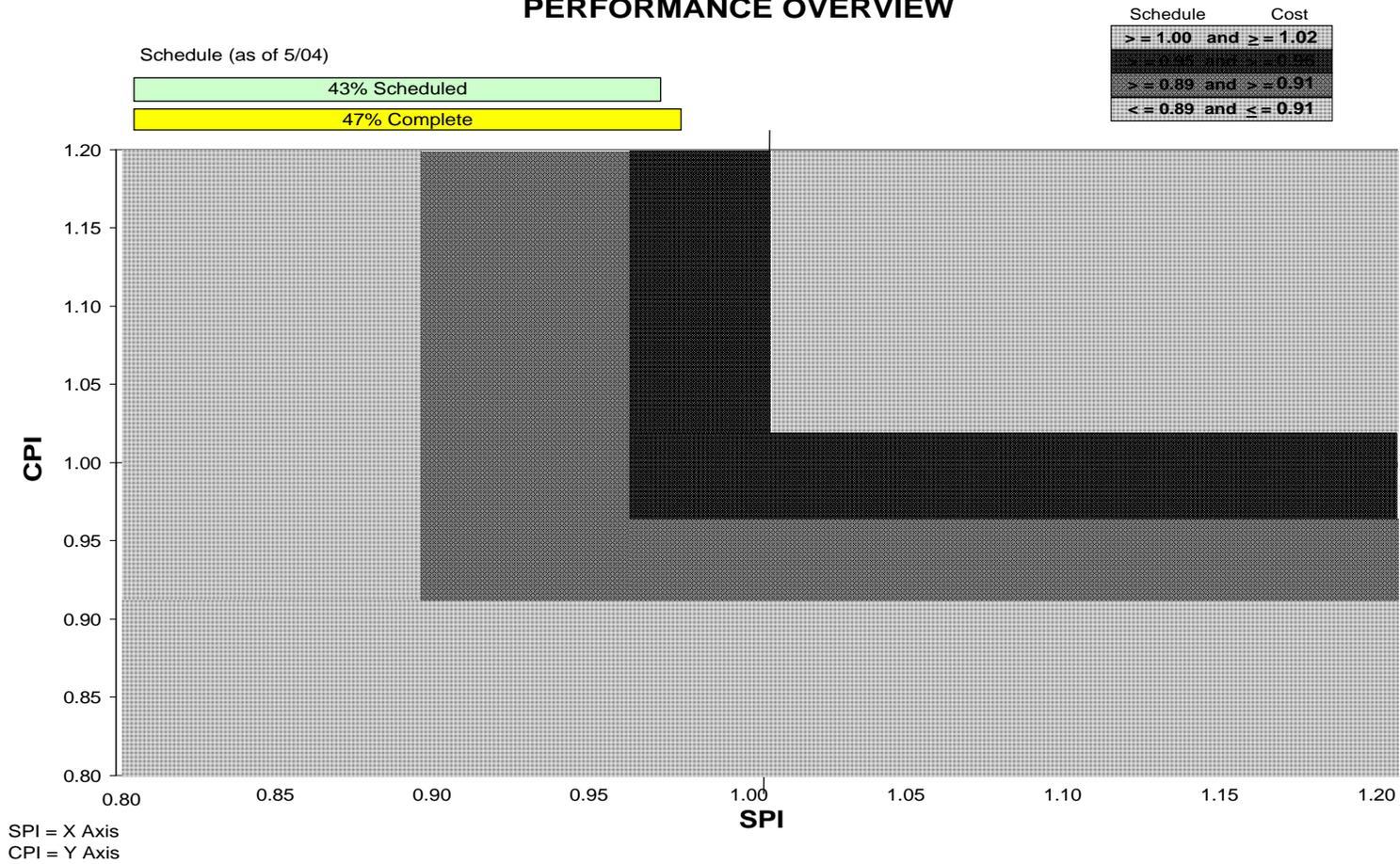
NOTE: This example excludes Contingency. Contingency would be addressed at the TCP level

# Identifying Deviations

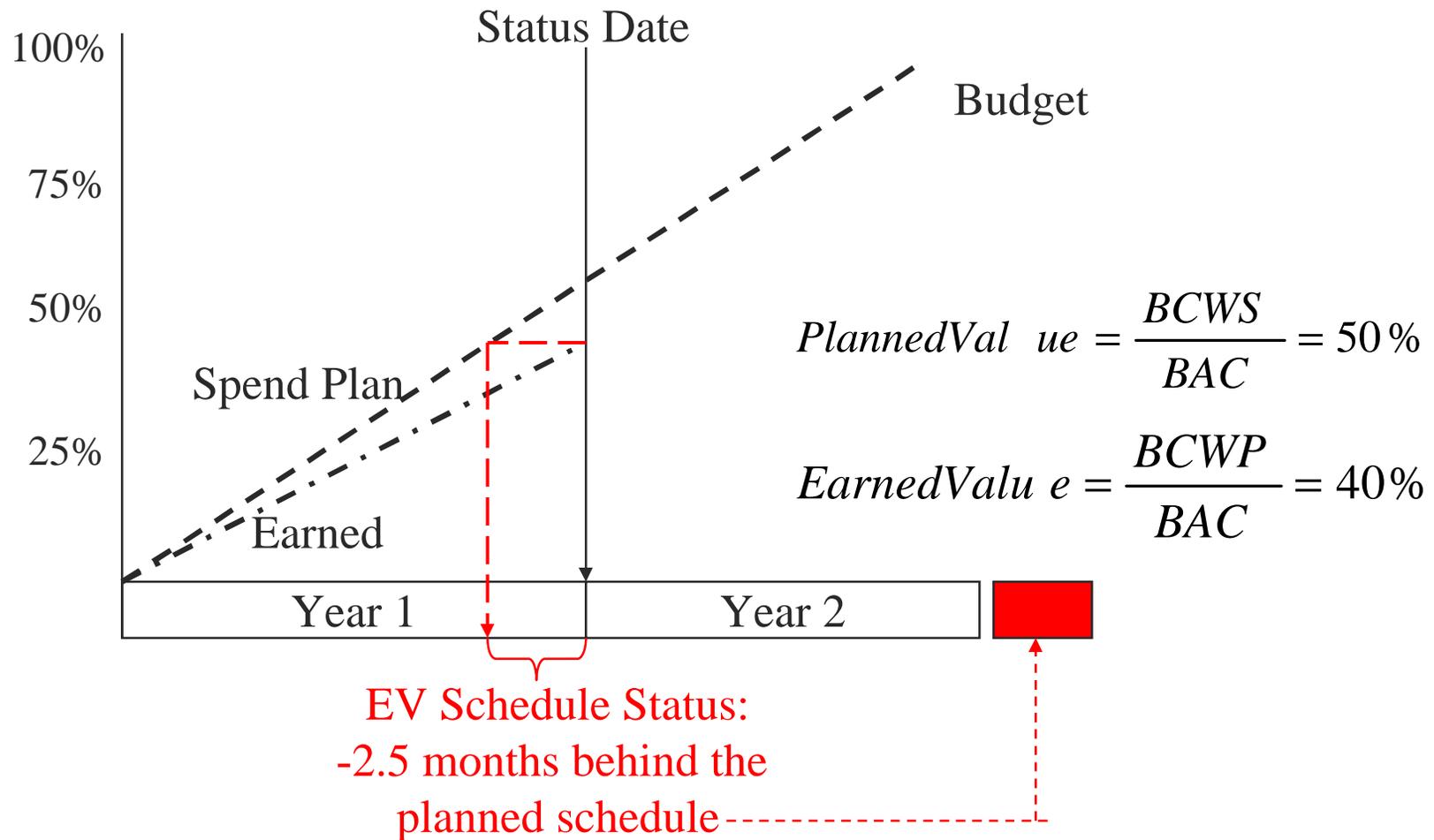


# Identifying Deviations

## PERFORMANCE OVERVIEW



# Monitoring Schedule Performance



## References – Books and Papers

---

- n Skills and Knowledge of Cost Engineering, 5<sup>th</sup> Ed., AACE International
- n Earned Value Project Management, Fleming and Koppelman, 2<sup>nd</sup> Edition, Project Management Institute, 2000
- n Professional Practice Guide #5, Earned Value, AACE International, 1999

# References - Websites

1. AACEI Web Site  
<http://www.aacei.org/>
2. PMI – College of Performance Management (CPI)  
<http://www.pmi.org/>
3. Acquisition Community Center (Defense Acquisition University)  
<https://acc.dau.mil/> (Main web site)  
[https://acc.dau.mil/simplify/ev\\_en.php](https://acc.dau.mil/simplify/ev_en.php) (EVMS web site)
4. NDIA Web Site  
<http://www.ndia.org>
5. INTEGRATING COST, SCHEDULE, AND TECHNICAL PERFORMANCE FOR PROJECT MANAGEMENT (Information on earned value project management for government, industry and academic users web site)  
<http://www.acq.osd.mil/pm/>
6. Energy Facilities Clearinghouse (EFCOG Website)  
<http://www.srs.gov/general/EFCOG/>

---

# Case Study