

EVMS Training Snippet Library: Predictive Analysis



Office of Acquisition and Project Management (APM) MA-60
U. S. Department of Energy
July 2014

Purpose of Predictive Analysis



- **Provide DOE Project Manager with consistent and timely insight to project status**
- **Verification of the project's cost and schedule status**
- **Authentication of the project's EAC and ECD**



- **Risks**

- Misapplied criteria for awarding fee
- Over-emphasized by higher levels management
- Manipulated EVMS data

- **Solution**

- Examine other metrics as well; even (especially) when CPI is nearly perfect at 1.0

Percent Complete/Spent



$$\frac{\text{BCWP}_{\text{CUM}}}{\text{BAC}} \times 100 = \text{Percent Complete}$$

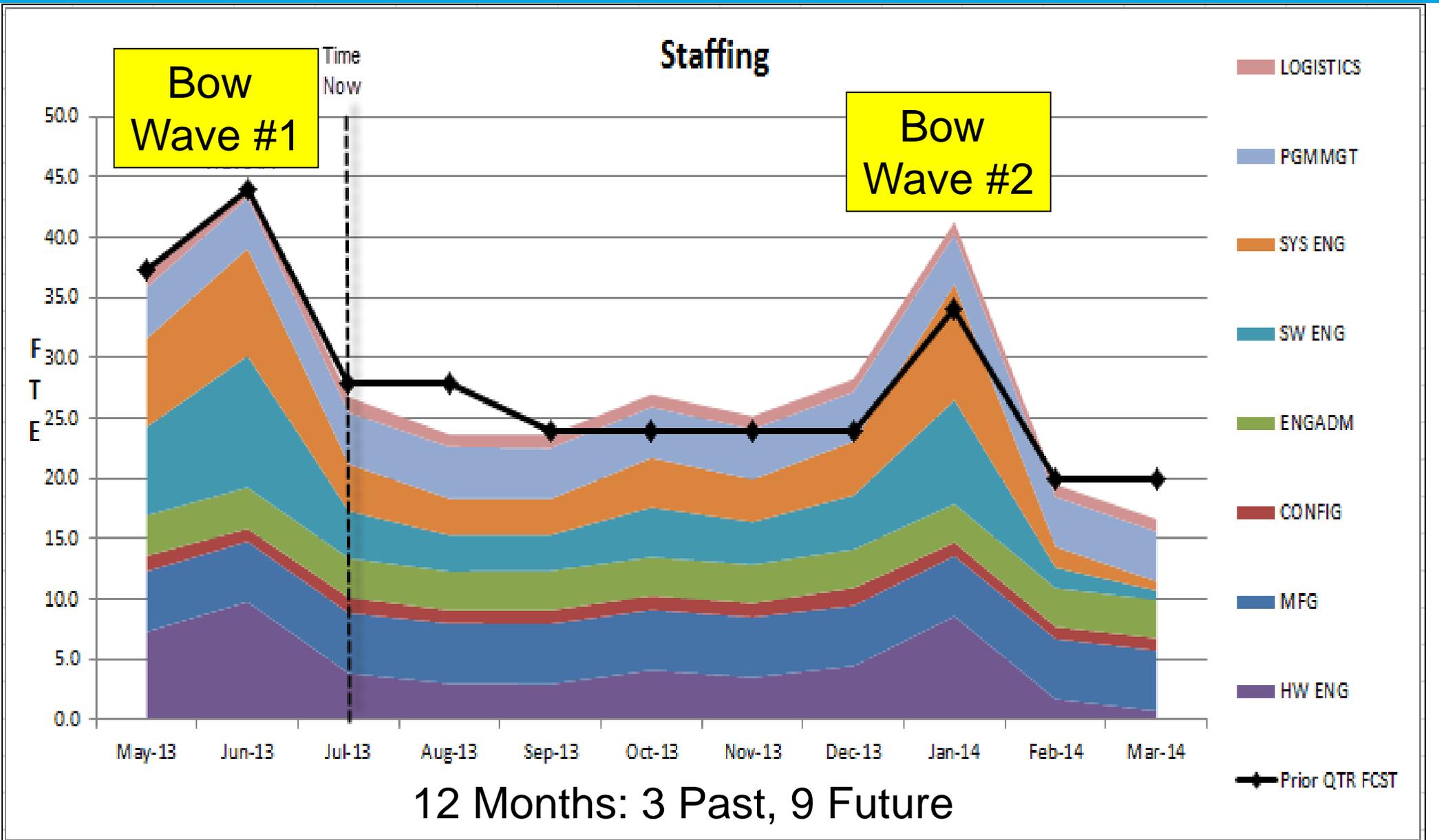
$$\frac{\text{ACWP}_{\text{CUM}}}{\text{EAC}} \times 100 = \text{Percent Spent}$$

- **Timing is everything**
- **Resources without commitments invite trouble**
- **Having the right skills available at the right time is key**





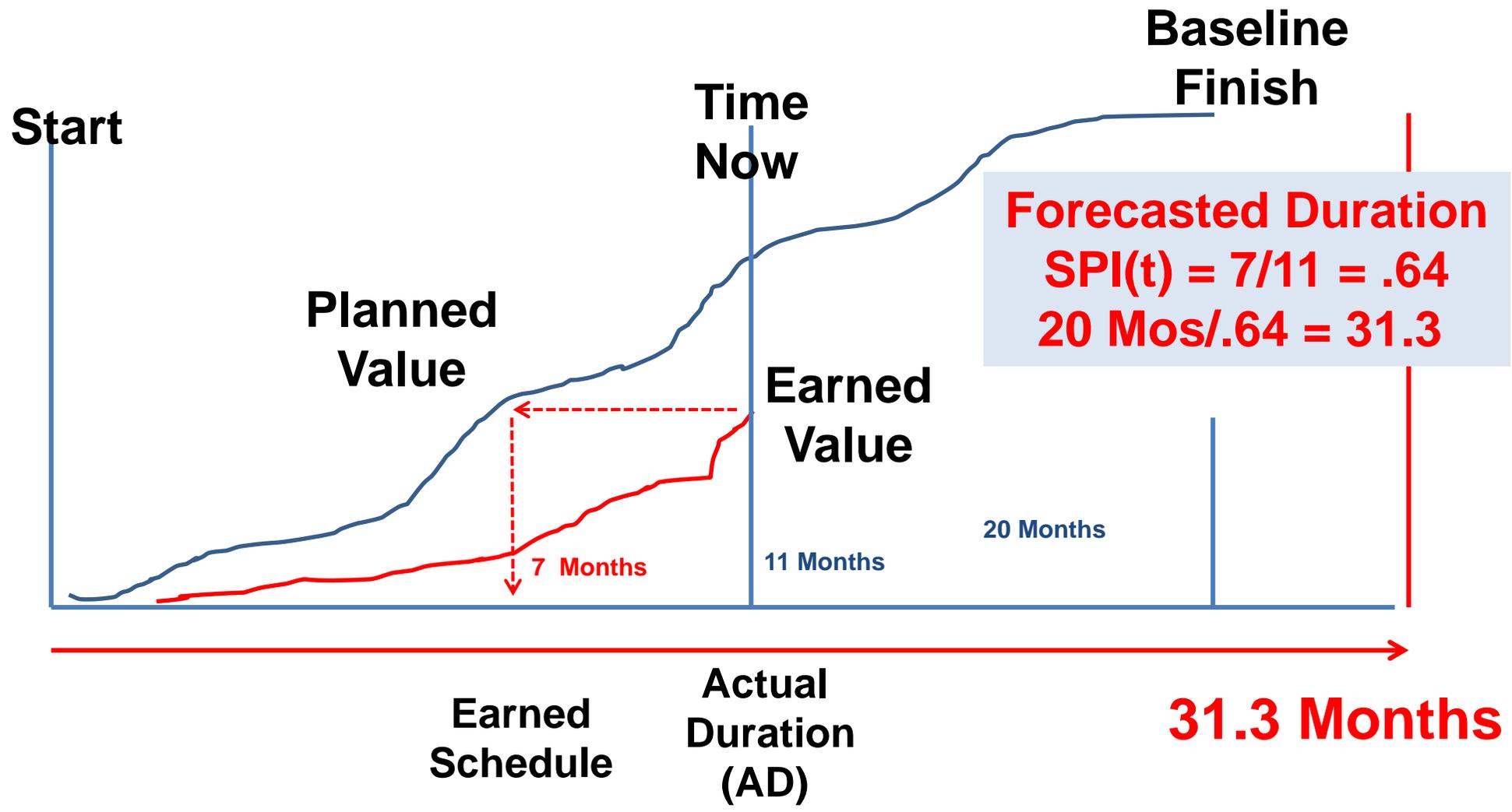
Staffing Profile Curve



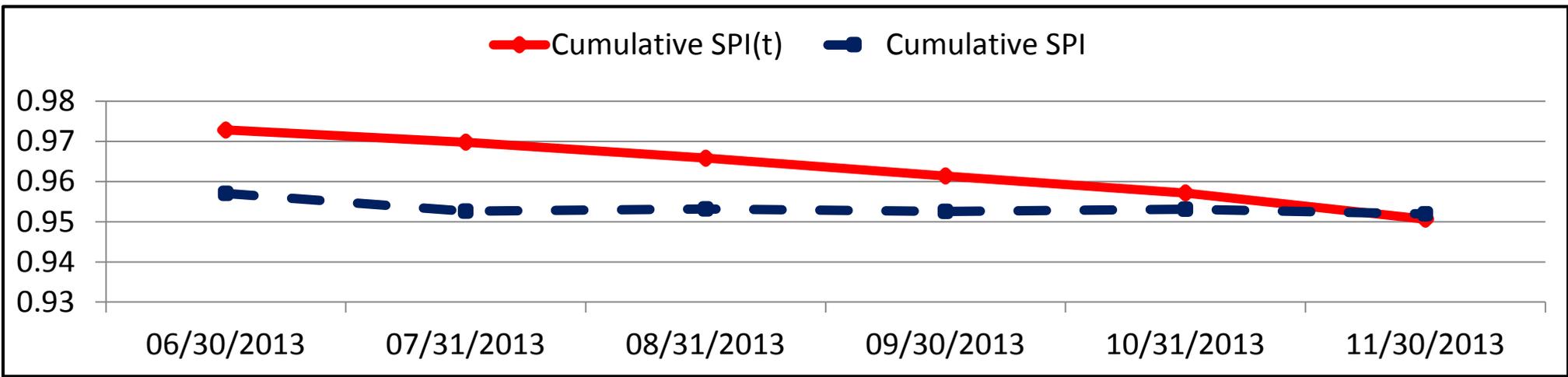
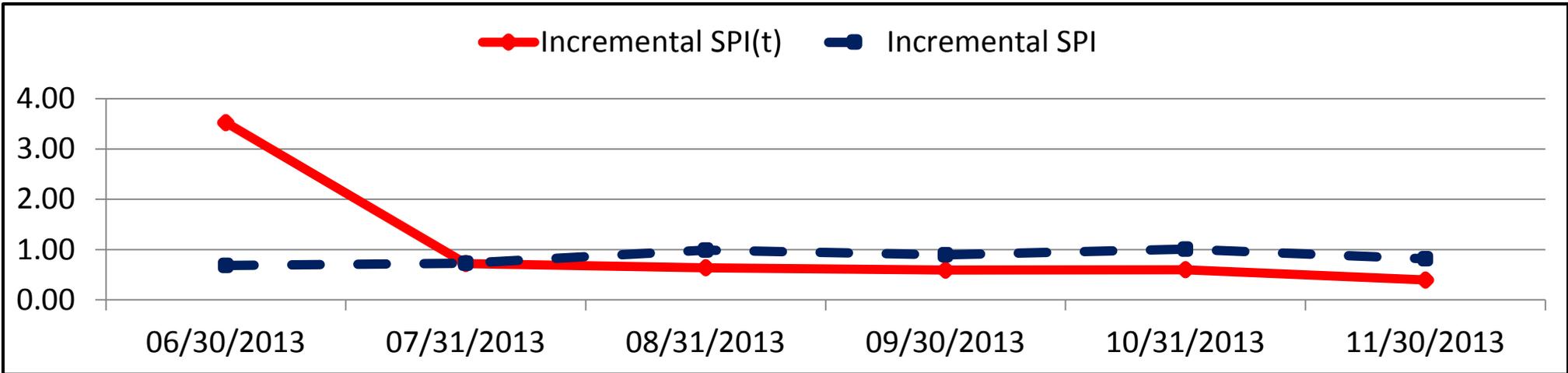


- **$SPI(t) = \text{Earned Schedule} / \text{Actual Duration}$**
- **$\text{Forecasted Duration} = \text{Baseline Duration} / SPI(t)$**
- **$SPI(t)$ v. SPI**
 - Pros:
 - Remains predictive throughout life of project
 - Time versus dollars
 - Cons:
 - Skewed when non-critical future tasks are completed early or when LOE effort is included in the calculation

Earned Schedule



PARSII Earned Schedule Report

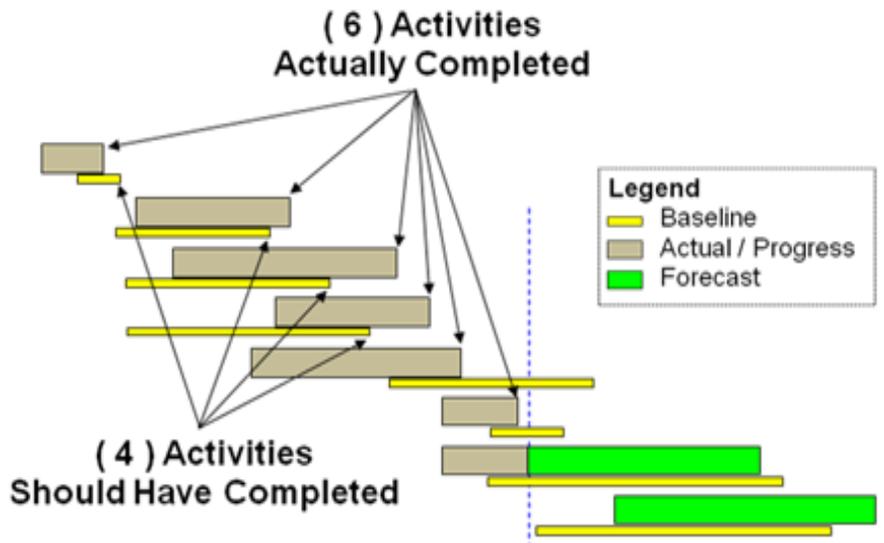


Baseline Execution Index (BEI)



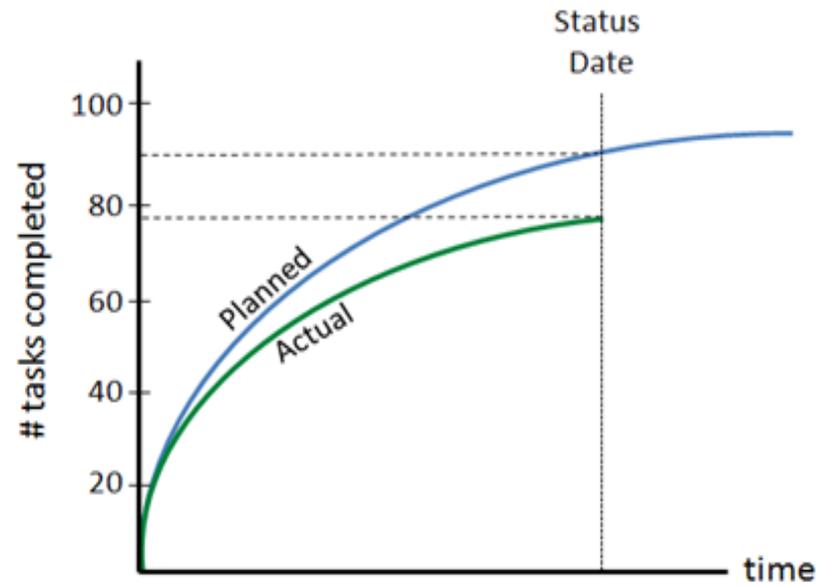
$$BEI = \frac{\text{Completed Tasks}}{\text{Baseline Count}}$$

Gantt Chart Example



$$BEI = \frac{6 \text{ tasks}}{4 \text{ tasks}} = 1.50$$

Schedule Rate Chart Example



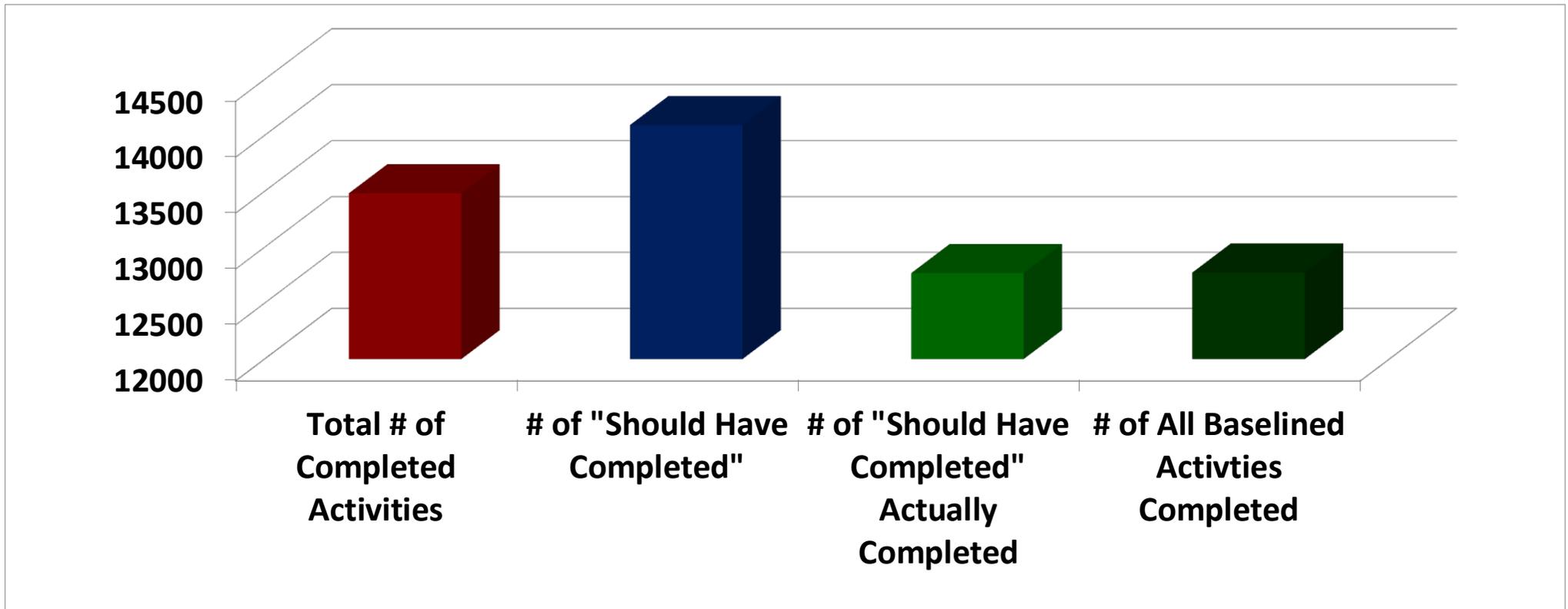
$$BEI = \frac{78 \text{ tasks}}{90 \text{ tasks}} = 0.87$$

PARSII Schedule Baseline Execution Index Report, Summary Tab



Total Count		Total # of Completed Activities	# of "Should Have Completed"	# of "Should Have Completed" Actually Completed	# of All Baselined Activities Completed	BEI		% of Baseline Completed		
Baseline	Current					Should Have Completed	Baselined Completed	Planned	Actual	Actual less Accelerated
14287	17023	13483	14093	12769	12774	0.91	0.91	98.64%	89.37%	89.41%

* Target BEI is >= 0.95. Any value below 0.95 is considered failure on the assessment scale.

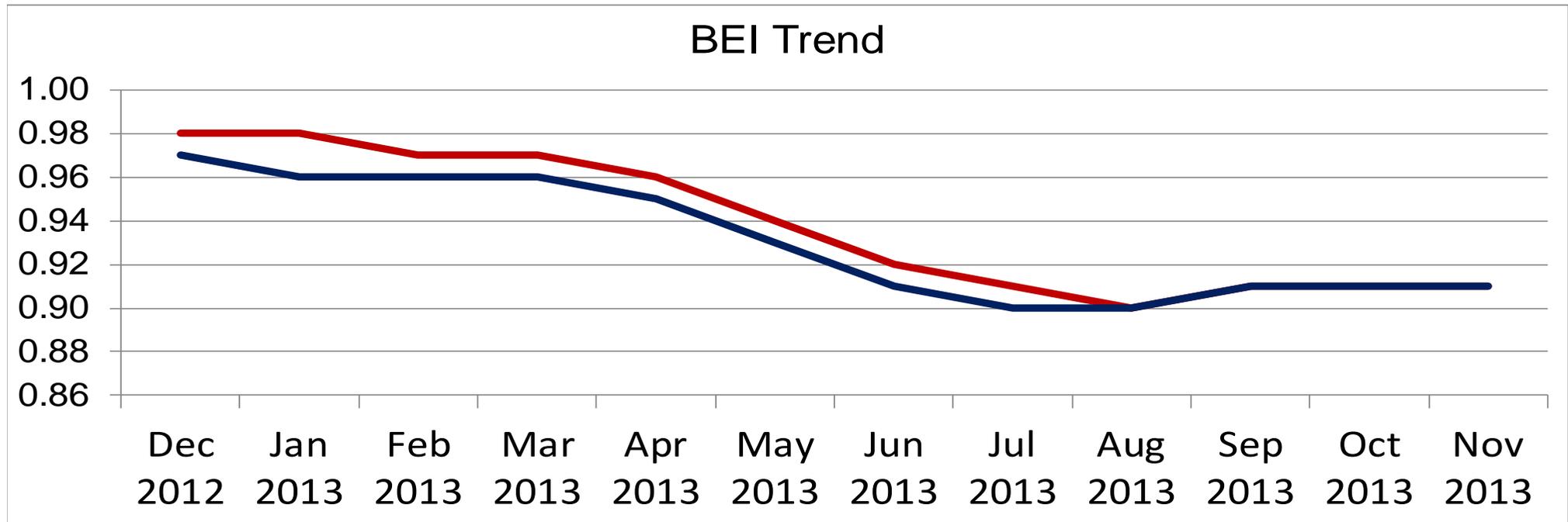


PARSII Schedule Baseline Execution Index Report, Trend Tab



	Dec 2012	Jan 2013	Feb 2013	Mar 2013	Apr 2013	May 2013	Jun 2013	Jul 2013	Aug 2013	Sep 2013	Oct 2013	Nov 2013
BEI (All Baselined)	0.98	0.98	0.97	0.97	0.96	0.94	0.92	0.91	0.90	0.91	0.91	0.91
BEI (BEF < Status)	0.97	0.96	0.96	0.96	0.95	0.93	0.91	0.90	0.90	0.91	0.91	0.91

* Target BEI is ≥ 0.95 . Any value below 0.95 is considered failure on the assessment scale.





- **Advantage of SPI over BEI**
 - SPI is more sensitive than BEI
- **Advantages of BEI over SPI**
 - BEI is a more objective metric than SPI
 - SPI may be skewed due to inclusion of LOE
- **Similar**
 - Derived from historical data
 - Most valuable when used prior to 70-80% completion
 - Value:
 - > 1.0 Favorable
 - = 1.0 On Track
 - < 1.0 Unfavorable



- **Total Project Float is a leading indicator of schedule performance**
- **Looking at the change in float between periods indicates potential schedule concerns**
- **Float is not subject to trends in SPI and CPI but rather trends in schedule performance of predecessors and requirements of successors in the schedule**



- **To Complete Performance Index**
 - Calculates future efficiencies based on past performance to achieve EAC or the BAC
 - $TCPI_{EAC}$ or $TCPI_{BAC}$
 - A useful metric at all WBS levels
- **IEACs**
 - A prediction of the final EAC model
 - Normally calculated at the total project level
 - Best viewed as a range
- **TCPI and IEACs are good indicators of EAC reasonableness**

Comparing Past to Future

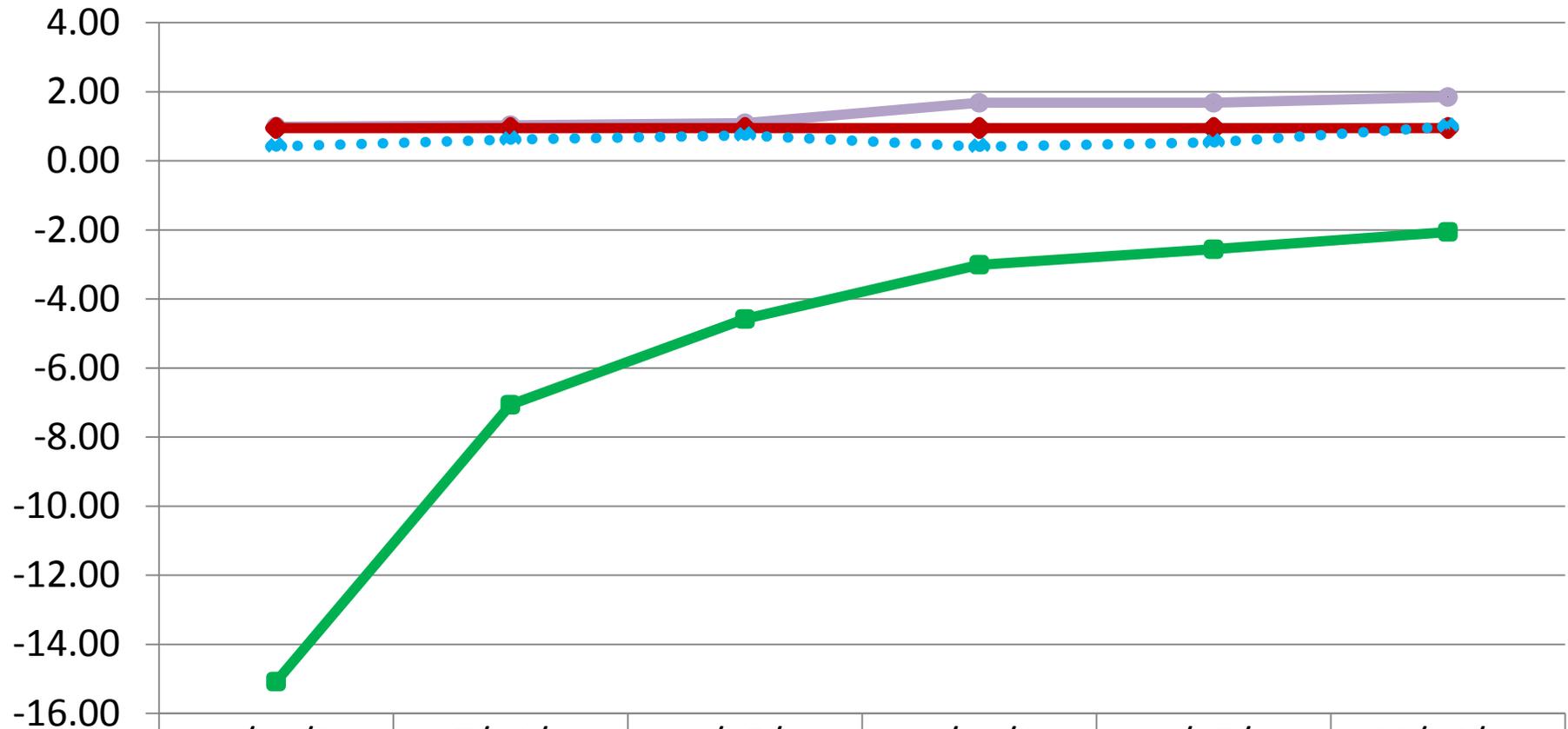


$$CPI = \frac{BCWP}{ACWP} \quad TCPI_{EAC} = \frac{BAC - BCWP}{EAC - ACWP} = \frac{BCWR}{ETC}$$

- **PARS II Reports, Analysis Reports folder**

- **Performance Index Trends (WBS Level)** to drill down to lower levels views
- **CPI v. TCPI (PMB Level)** for project level views (next slide)
 - Rule of thumb: If difference between CPI_{cum} and $TCPI_{EAC}$ around 5% then EAC questionable; if near 10% or more then EAC unrealistic
- **EV Data Validity (WBS Level)** report shows if 5% threshold has been exceeded
- **IEAC Analysis (WBS Level)**

CPI vs. TCPI (PMB Level)



	06/23/13	07/21/13	08/25/13	09/30/13	10/27/13	11/24/13
TCPI to EAC	0.99	1.03	1.09	1.68	1.68	1.85
TCPI to BAC	-15.08	-7.06	-4.58	-3.01	-2.56	-2.06
CPi Cum	0.95	0.95	0.95	0.95	0.95	0.95
CPi Current	0.42	0.62	0.74	0.41	0.54	0.99





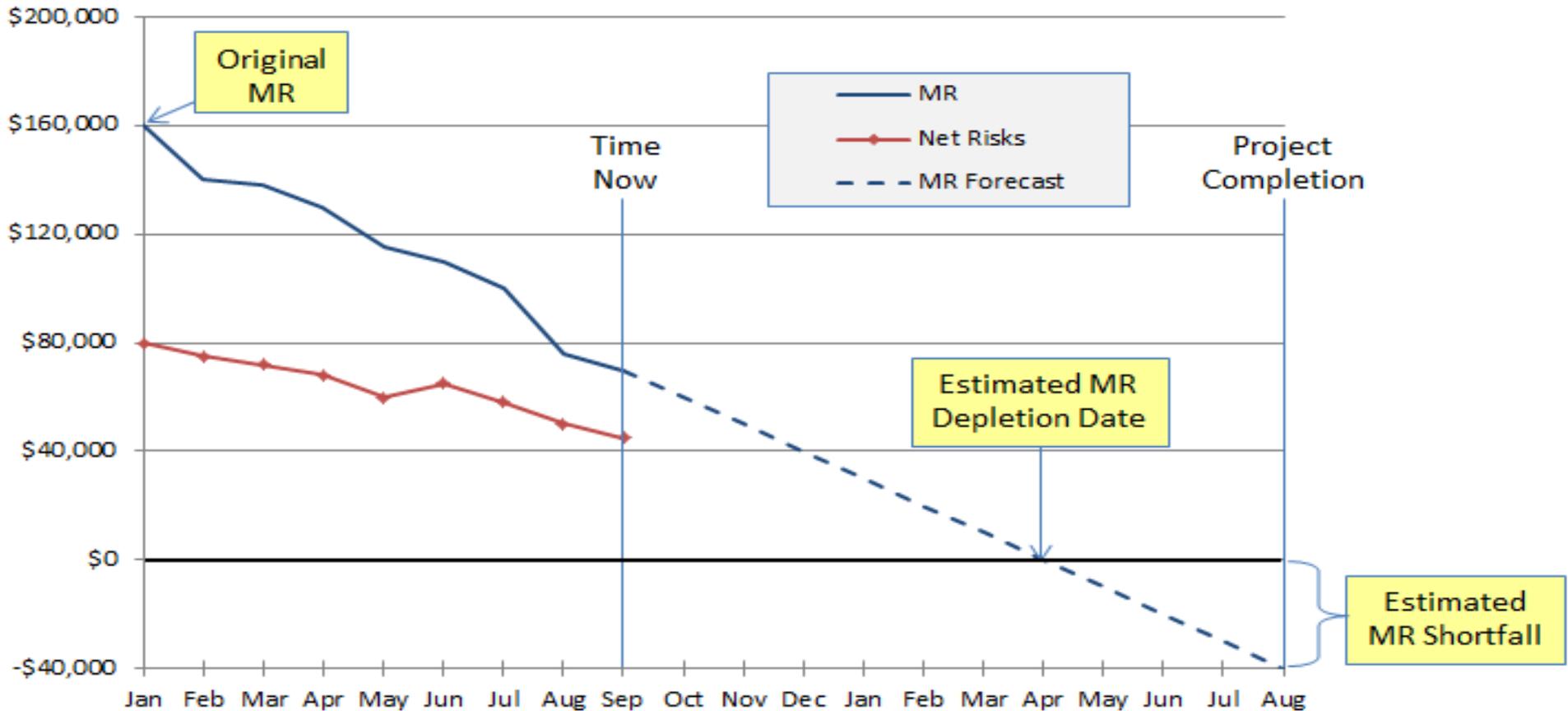
- **Statistical EACs provide insight into EAC trends and the validity of the EAC.**
- **There are many defined in literature, the most common are:**
 - Formula 1: BAC/CPI_{cum}
 - Formula 2: $ACWPCum + (BAC - BCWPCum) / (SPI * CPI)$
 - Formula 3: $ACWPCum + (BAC - BCWPCum) / CPI_3$
 - Recall: $(BAC - BCWP) = BCWR$ or Budgeted Cost of Work Remaining



Management Reserve Trends

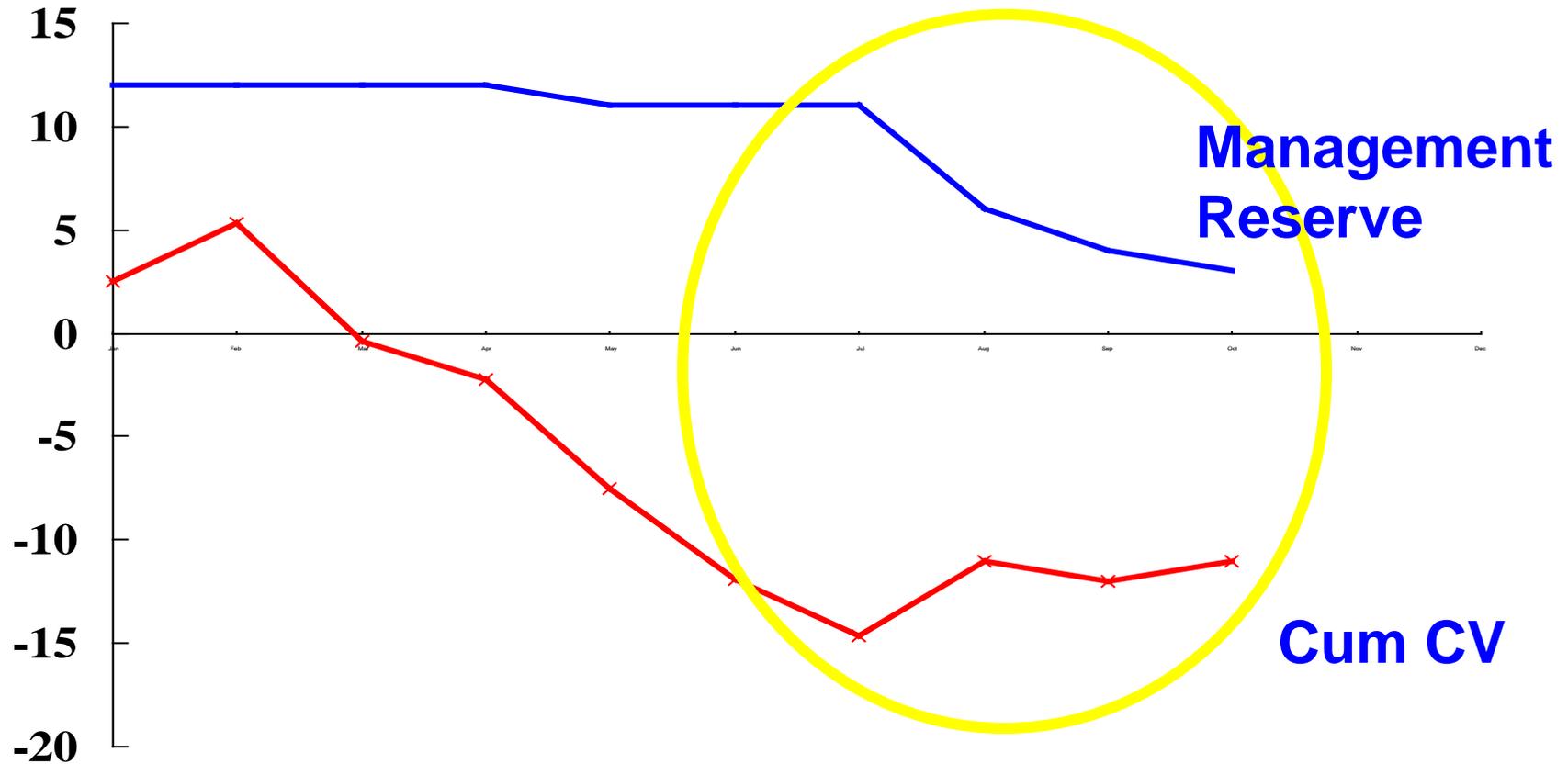
- Management Reserve Remaining

$$(\text{Original MR} - \text{Current MR}) / \text{Original MR} = \% \text{ MR Used}$$





Is MR applied to effectively mask the cum CV?

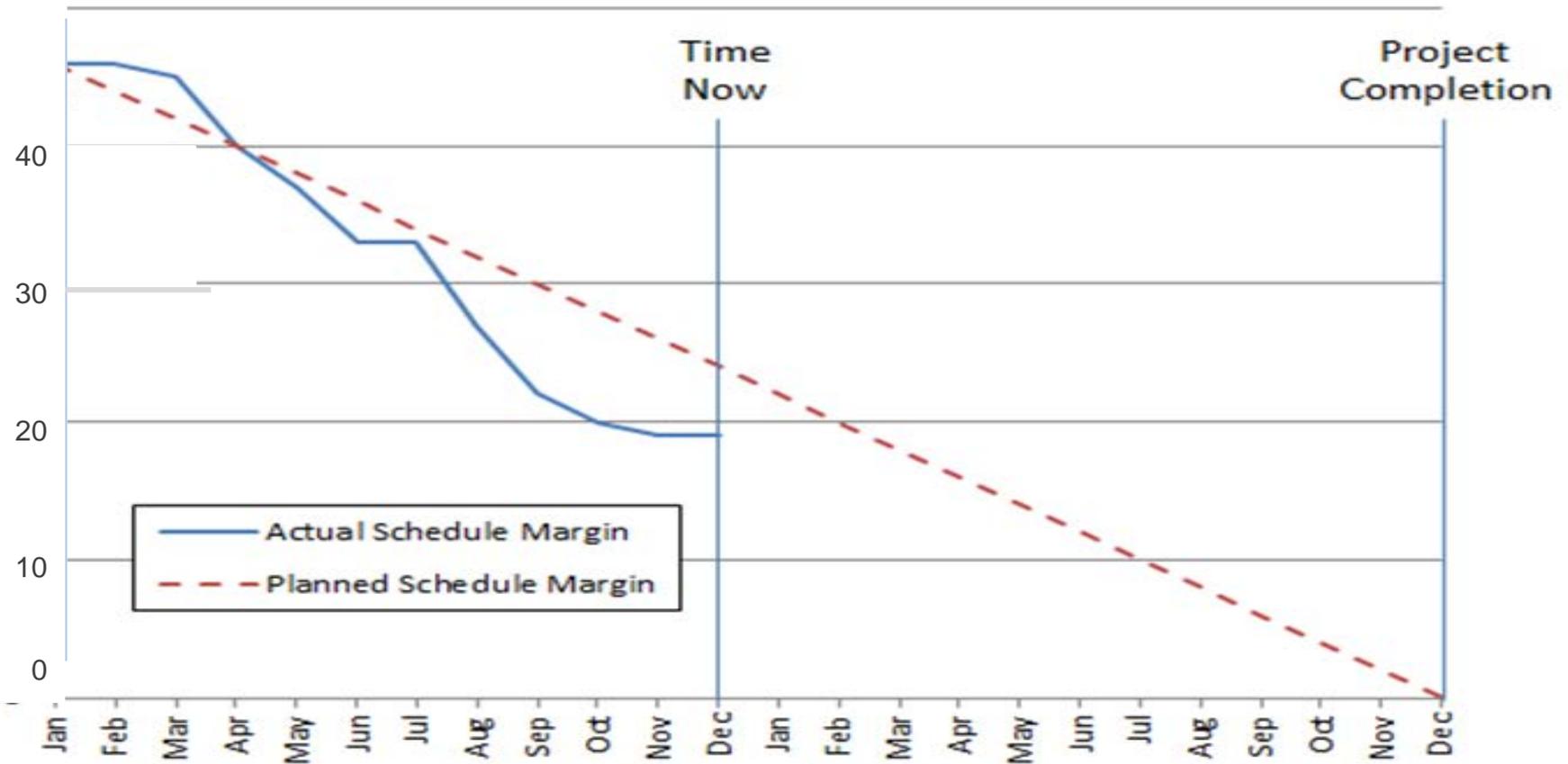




Schedule Margin

- Schedule Margin Remaining**

$(\text{Planned Schedule Margin} - \text{Actual Schedule Margin}) / \text{Planned Schedule Margin} = \% \text{ Schedule Margin Used}$





- **Schedule Health Metrics covered in Snippets 3.2 and 5.3**
 - Missing Logic
 - Leads
 - Lag
 - Relationship Types
 - Hard Constraints
 - Float: High Float and Negative Float
 - High Duration
 - Invalid Dates: Forecast and Actual
 - Missing Resources



- **Always check other indices and trends – don't rely solely on SPI and CPI**
- **Indices to consider:**
 - Percent Complete and Percent Spent
 - Staffing Profiles
 - Earned Schedule
 - Baseline Execution Index
 - Changes in schedule float
 - To Complete Performance Index
 - Independent Estimates at Completion
 - Management Reserve
 - Schedule Margin Reserves



Home » Operational Management » Project Management » Earned Value Management

EARNED VALUE MANAGEMENT

- Aviation Management
- Executive Correspondence
- Energy Reduction at HQ
- Facilities and Infrastructure
- Freedom of Information Act
- Financial Assistance
- Information Systems
- Procurement and Acquisition
- Project Management
 - Earned Value**
 - Lessons Learned
 - Reviews and Validations
 - Documents and Publications
 - RCA and CAP

Earned Value Management (EVM) is a systematic approach to the integration and measurement of cost, schedule, and technical (scope) accomplishments on a project or task. It provides both the government and contractors the ability to examine detailed schedule information, critical program and technical milestones, and cost data.

- [EVMS Surveillance Standard Operating Procedure \(ESSOP\)](#) - 26 Sep 2011 (pdf)
 - [EV Guideline Assessment Templates](#) - (MS Word)
 - [DOE EVMS Cross Reference Checklist](#) - (pdf)
 - [DOE EVMS Risk Assessment Matrix](#) - (MS Word)
- [Formulas and Terminology "Gold Card"](#) - Sep 2011 (pdf)
- [Slides from the OECM Road Show: Earned Value \(EV\) Analysis and Project Assessment & Reporting System \(PARS II\)](#) - May 2012 (pdf)
- [DOE EVM Guidance](#)

EVM TUTORIALS

[Module 1 - Introduction to Earned Value](#) (pdf 446.86 kb) July 17, 2003

This module is the introduction to a series of online tutorials designed to enhance your understanding of Earned Value Management. This module's objective is to introduce you to Earned Value and outline the blueprint for the succeeding modules. This module defines Earned Value management. It looks at the differences between Traditional management and Earned Value management, examines how Earned Value management fits into a program and project environment, and defines the framework necessary for proper Earned Value management implementation.

<http://energy.gov/management/office-management/operational-management/project-management/earned-value-management>

Career Development Program

Real Estate

History