Control Account Manager (CAM)/
Earned Value Management System (EVMS)
Training 1

Introduction to EVM
Organization, Planning, Scheduling,
Budgeting, and Accounting Considerations

Steve Langish
Overview

- Covering The Basics
  - Introduction to EVMS Web Page/Contents
  - What Is Earned Value Management (EVM)
  - Why Use EVM
  - The EVM Process & How It Applies To You

- Heavy Detail On The Front
  - Organization
  - Planning, Scheduling, & Budgeting
  - Accounting Considerations

- Light Detail On The End (For This Session)
  - Analysis & Management Reports
  - Revisions

- Summary & What ‘s Up Next

- Time At The End For Questions & Throughout
PPPL’s EVMS Web Page

- http://www-local.pppl.gov/EVMS/
What Is EVM?

- **Definition**
  - Earned Value Management (EVM) is a project management technique for measuring project progress in an objective manner.
  - A systematic approach to the integration & measurement of cost, schedule, & technical (scope) accomplishments on a project.

- **Application**
  - Work is planned, budgeted, & scheduled in time-phased increments to achieve this.
  - Takes into consideration risk, uncertainties, & assumptions.
  - Involves project managers, control account managers, contractors, customers, etc.

- **Objective**
  - Encourage the use of effective internal cost & schedule management controls.
  - Allow timely data for determining product-oriented status.

**Gives Control Account Managers Control of Their Schedule/Budget/Work!**
Why Use EVM?

- Who Wants To Babysit Every Line In A Schedule Of This Size?
  - Management By Exception - Provides Early Warning Of Performance Problems
  - Trip Wires Via Thresholds
  - Using All Views Instead Of Driving With Only The Rearview Mirror (Where Have We Been, Where Are We Now, Where Are We Going)

- Allows For Improved Technical Understanding Of The Project At All Levels
- Enhances Communications Between All Parties Involved
- Keeps Project Team Focused On Achieving Progress
- Helps To Prevent Scope Creep
- Creation Of A More Realistic Project
  - Assumptions
  - Risk Identification
  - Future Use On Similar Projects

- It Is The Natural Product Of Good Project Management Practices So Why Not Put All That Hard Work To Use?
Why Use EVM?

- For PPPL *(because we need a tool like this)*
  - Actually provides value and insights into progress and problems
- For Compliance *(because we have to)*
  - DOE Order 413.3B Mandates Compliance With ANSI/EIA 748-B-2007 For Projects With A Budget Of $20M Or More, Regardless Of Funding Source
  - PPPL’s Project Management System Description (PMSD) is consistent with the requirements above (> $20 M) and outlines how our laboratory implements EVM.
- For Princeton University *(a flower in the cap)*
  - EVMS certification is an important marketing accomplishment and says to the world that Princeton has demonstrated it’s knows how to execute and manage projects.
Old School Project Management

- Tells You Only How Much You Have Spent Compared To The Budget
- It Doesn’t Tell You If
  - Ahead Or Behind Schedule
  - Over Or Under Spent
  - Spent Money On The Right Thing
  - Getting Value For Money
  - Problems Are Over Or Just Started
- This Is Project Management With The Lights Off
New School Project Management

- Turn The Lights On With Earned Value
- Tells You How Much Has Been Accomplished
- Accomplished Work Is From Planned Tasks Progressed
- The Budgeted Cost Of That Work Quantifies The Amount Of Accomplishment
- This Gives Many Metrics To Evaluate Project Status & Make More Informed Decisions
Calculations Graphically

- **Cost Variance (CV) Good Or Bad?**
  \[ CV = EV - Actual \]

- **Schedule Variance (SV) Good Or Bad?**
  \[ SV = EV - Budget \text{ (Planned)} \]
EVM Definitions

- **BCWS** (Budgeted Cost of Work Scheduled) (also referred to as Planned Value (PV))
  - Value Of Work PLANNED To Be Accomplished During A Given Period Of Time. How Much Work Should Be Done?
- **BCWP** (Budgeted Cost of Work Performed) (also referred to as Earned Value (EV))
  - Value Of Work Accomplished Or EARNED VALUE. How Much Work Is Done?
- **ACWP** (Actual Cost Of Work Performed) (also referred to as Actual Costs (AC))
  - Cost Of Work Accomplished Or ACTUAL COST. How Much Did It Cost?
- **TPC** (Total Project Cost)
  - Sum Of All Project Costs (Including Estimated & Contingency). How Much Could It All Cost?
- **BAC** (Budget At Completion)
  - Sum Of All Budgets Thru Any Given Level (Without Contingency). What Was The Total Job Supposed To Cost?
- **ETC** (Estimate To Completion)
  - Estimated Value Of The Authorized Work Remaining To Be Completed. How Much Will The Remaining Work Cost?
- **EAC** (Estimate At Completion)
  - Estimate Of Total Cost Of All Authorized Work Thru Project Completion. What Do We Now Expect The Total Job To Cost?
- **SV & CV** (Schedule Variance & Cost Variance)
  - Measure Of Cost & Schedule Performance On A Project. How Far Ahead or Behind Cost or Schedule Am I?
- **SPI & CPI** (Schedule Performance Index & Cost Performance Index)
  - Schedule & Cost Efficiency Representing The Ratio Of Work Performed To Work Scheduled Or Costed. How Efficiently Am I Accomplishing Work?
Budgeted Cost of Work Scheduled (BCWS) a.k.a. Planned Value (PV)

<table>
<thead>
<tr>
<th>ID</th>
<th>Task Name</th>
<th>Start</th>
<th>Finish</th>
<th>Duration</th>
<th>2011</th>
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<td>2/1/2011</td>
<td>4/25/2011</td>
<td>60d</td>
<td>200</td>
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<td>3</td>
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<td>2/1/2011</td>
<td>5/31/2011</td>
<td>86d</td>
<td>70</td>
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</table>

BCWS = 950

BAC = 1200
Budgeted Cost of Work Performed (BCWP) a.k.a. Earned Value (EV)

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<th>Duration</th>
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<td>61d</td>
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<tr>
<td>2</td>
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<td>80%</td>
<td>2/1/2011</td>
<td>4/25/2011</td>
<td>60d</td>
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<tr>
<td>3</td>
<td>Work Package #3</td>
<td>73%</td>
<td>2/1/2011</td>
<td>5/31/2011</td>
<td>86d</td>
</tr>
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</table>

Schedule Variance (SV) = BCWP (EV) – BCWS (PV)
SV = 990 – 950 = 40

BCWP = 990
BCWS = 950
Actual Cost of Work Performed (ACWP) aka Actual Costs (AC)

Actual Costs from Job Cost Reports

Assume: AC = 800

Cost Variance (CV) = BCWP (EV) – ACWP (AC) = CV = 990 – 800 = 190
Cost and Schedule Variances/Indices

<table>
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<th>ID</th>
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<th>% Complete</th>
<th>Start</th>
<th>Finish</th>
<th>Duration</th>
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<td>Work Package #1</td>
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<td>1/3/2011</td>
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<td>61d</td>
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<tr>
<td>2</td>
<td>Work Package #2</td>
<td>80%</td>
<td>2/1/2011</td>
<td>4/25/2011</td>
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<td>3</td>
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<td>73%</td>
<td>2/1/2011</td>
<td>5/31/2011</td>
<td>86d</td>
<td></td>
</tr>
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</table>

**Calculations:**

- **SV** = BCWP – BCWS
  - SV = 990 – 950 = +40

- **CV** = BCWP – ACWP
  - CV = 990 – 800 = +190

- **SPI** = \( \frac{BCWP}{BCWS} \)
  - SPI = 990 = 1.04

- **CPI** = \( \frac{BCWP}{ACWP} \)
  - CPI = 990 = 1.24
Where To Start?

- Define the work
- Assign responsibilities
- Define indirect procedures
- Establish proper management controls

Planning, Scheduling, & Budgeting

- Schedule all work
- Authorize all work
- Time-phase the work
- Develop cost accounts

Organization

Assignments made to responsible organizations

Revisions

Maintenance of budget, work, and schedule relationships

Do not modify past budget or actuals (w/o permission)

Analysis & Management Reports

- Understand contract status
- Use data for decision-making

All documents properly maintained

Accounting Considerations

- Costs Elements
- Cost summarization

ANSI/EIA 748
Organization

- Applicable Procedure(s)
  - Project Management System Description (PMSD)
  - PMSD Appendix E
    - Procedure 1 Project Execution Plan
    - Procedure 2 Project Work Breakdown Structure (WBS)
    - Procedure 3 Project Organizational Breakdown Structure (OBS) and Responsibility Assignment Matrix (RAM)

- Scope & Definition Of Work
  - Work Breakdown Structure (WBS) & Dictionary
  - Organizational Breakdown Structure (OBS)
  - Project Execution Plan (PEP)

- Assign Responsibilities
  - Responsibility Assignment Matrix (RAM)
  - Control Accounts (CAs)
  - Project Plans

- Establish Proper Management Controls
  - EVMS Guidelines & Procedures
  - Established Completion Metrics & Definitions
  - Risk Management & Contingency
  - Document Assumptions
Organization - OBS *(Who)*

- Organization Breakdown Structure (OBS)
  - Process Focused
  - Indicates Organization Relationships
  - Framework For Assigning Responsibilities

![Organizational Chart Diagram]
Organization - WBS *(What)*

- Organizes & Defines A Project
- Groups Discrete Work Elements

- Framework For Planning & Controlling Cost & Schedule
- A product-oriented, hierarchical outline of all work elements required to accomplish the entire work scope of the project.

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**Diagram**

```
ABC project

Project Charter
  - Reqt. Spec.
  - Bus. Case

Transition documentation
  - Promotion material
  - Training courseware

Central facility
  - Server
  - LAN
  - Comms box

Shop systems
  - Shop LANs
  - Shop terminals
```
Organization - RAM *(Who does What)*

- Responsibility Assignment Matrix (RAM)
  - Merges WBS & OBS
  - Displays Lowest Level
  - Gives Specific Responsibility
Organization - Control Accounts

- This Is Where All The Magic Happens
- Intersection Of WBS & OBS
  - WBS Element Lowest Level & Activities Grouped Under
  - Control Account Manager (CAM) Responsible
- Key Control Point
  - Schedule, Time-Phased Budget
  - Earned Value Determination
  - Actual Cost Accumulation
  - Earned Value Metrics
  - Variance Analysis (Cost & Schedule)
  - Corrective Actions
  - Change Control
Organization - Establish Proper Management Controls

- Framework Established By Following Guidelines Listed (PPPL, DOE, ANSI)
- Establishing Reporting Thresholds
  - Found In The PEP
  - Reporting Occurs At A Cumulative Level Of The WBS With Ability To Drill Down To Control Account Level (Levels Three & Four)
  - Detailed Variance Analysis Will Be Provided When Any One Of The Following Occurs:
    - WBS Level Cumulative schedule variance $\pm 10\%$ AND $>$ $50K$ (NSTX-U Project PEP threshold)
    - WBS Level Cumulative cost variance $\pm 10\%$ AND $>$ $50K$ (NSTX-U Project PEP threshold)
    - Control Account level variance analysis will be requested by the Project Manager for the NSTX-U Project
Planning, Scheduling, & Budgeting

- Applicable Procedure(s)
  - PMSD Appendix E
    - Procedure 5 Control Accounts, Work Packages & Planning Packages
    - Procedure 6 Project Schedule
    - Procedure 7 Cost Estimating

- Planning & Schedule Development
  - Schedule (Sequence, Interdependencies, Durations)
  - Identify Products, Milestones, Technical Performance Goals To Measure Progress
  - Further Determine & Document Assumptions, Risk, & Unknowns

- Time Phasing Of Work
  - Budget At Control Account (CA) Level
  - Identify Budget At Significant Cost Elements (Resource Loading)
  - Budget In Terms Of Hours Or Other Units That Equates To Dollars In The End
  - Identify & Control LOE Activity

- Review & Baseline Project
- Authorize Work & Begin Project Execution
Planning, Scheduling, & Budgeting - Planning & Scheduling

- Planning & Scheduling Answers These Questions
  - What Will Be Performed?
  - How Will It Be Performed?
  - Where Will It Be Performed?
  - Who Will Perform The Work?
  - In What Sequence Will The Work Occur?

- All Of These Come Together To Determine The Answer To The Final Question
  - When Will The Work Be Performed

- A Schedule Must
  - Represent Work In A Work Package Or Planning Package
  - Include Logical Ties For All Activities
  - Include All Key Milestones & Deliverables
  - Reflect The Agreed To Project Baseline
  - Integrate With The Cost Baseline
Planning, Scheduling, & Budgeting - Control Accounts, Work Packages, Activities

WBS

OBS

Control Account

Schedule

Work Packages or Activities

Planning Packages

Activity

Activity
WAF’s are the vehicle for estimating cost, schedule and risk

PPPL Standard estimating methodology provides format and process for capturing work scope, task, estimates, contingency, risks and uncertainties

Expanded WAF to include subjective contingency estimate (as % of task estimate)
Planning, Scheduling, & Budgeting - WAF to Plan

- Job Managers Prepared Work Authorization Forms (WAF’s) - realistic, not optimistic estimates
  - Disciplined and uniform approach for all work
  - Excel based spreadsheet includes;
    - Tab A – Work scope description
    - Tab B – Detail estimate; Tasks, resource estimates (labor hours by skill and material cost), schedule and task durations, basis of estimates, and task-by-task contingency estimate
    - Tab C – Risk – Likelihood, cost and schedule impact
      - Tab D – Materials, hardware detail and other backup estimate basis
- Internal Engineering Department Review for all Job Estimates
- Prepared resource Loaded Schedule (Primavera)
- Quantified Contingency by bottoms-up task-by-task subjective estimate, weighted risk plus schedule contingency
The resource loaded schedule is the master database for all cost, schedule, and resource requirements.

Contingency estimate %
Also used to help determine schedule contingency

Base cost = resource estimate (in hours) x loaded rates (does not include contingency)

Resource estimate from WAF (hours for labor $ for materials)

Total float (in work days. Approx 21 per month)
Planning, Scheduling, & Budgeting - Scheduling

- Assumptions, Risk, & Unknowns Are Evaluated & Documented During This Process
  - Assign Owners
  - Potential Impacts & Probability Of Occurrence
- Occurs Over Many Iterations
  - Examine The Schedule For Feasibility & Logic
  - Independent Quality Assessment
- Determine Critical Path (CP)
  - The Sequence Of Activities That Represents The Longest Schedule Duration
  - A Duration Increase In These Activities Creates A Day For Day Increase In The Project’s End Date
  - No Schedule Flexibility (Float)
- Determine Near Critical Path (Near CP)
  - The Sequence Of Activities That Have The Second Longest Path through The Project
  - Monitor For Possible Impact To Critical Path
- Both CP & Near CP Are Equally Important To Manage & Understand
Planning, Scheduling, & Budgeting - Critical path, float (slack)

- Critical Path: Is the longest duration path through a network diagram and determines the shortest time to complete the project.

- How does the Critical Path help a CAM:
  - Helps prove how long the project will take.
  - Helps the PM/CAM determine where best to focus his/her project management efforts.
  - Helps determine if an issue needs immediate attention.
  - Provides a vehicle to compress the schedule during project planning and whenever there are changes.
  - Provides a vehicle to determine which activities have float and can therefore be delayed without delaying the project.

- Definitions:
  - Total float (slack): the amount of time an activity can be delayed without delaying the project end date or intermediary milestone.
  - Free float (slack): the amount of time and activity can be delayed without delaying the early start date of its successor.
Planning, Scheduling, & Budgeting - Precedence Diagramming Method/Critical Path Method

- Precedence Diagramming Method (PDM)
  - Sometimes referred to as “Activity-On-Node”

Compute float:
LF - EF = 14 – 9 = 5
OR
LS – ES = 8 – 3 = 5
Planning, Scheduling, & Budgeting - Precedence Diagramming Method/Leads & Lags

- Precedence Diagramming Method (PDM) – method used in Critical Path Methodology (CPM)
  - Sometimes referred to as “Activity-On-Node”
  - Types of relationships (3 most typically used)
    - Finish to Start (FS) – Finish Task 1 before Starting Task 2 (Conventional (default) relationship)
    - Finish to Finish (FF) – Finish Task 1 and Task 2 at same time
    - Start to Start (SS) – Task 1 and Task 2 start at same time

- Leads/Lags

```
<table>
<thead>
<tr>
<th>Task A</th>
<th>Task B</th>
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</thead>
<tbody>
<tr>
<td>Pour Concrete</td>
<td>Walk on concrete</td>
</tr>
</tbody>
</table>
```

FS + 5 days
Planning, Scheduling, & Budgeting - Resources

- Now That We Have A Planned Schedule - Time Phase Work
- Resources Allocated At Activity Level Within The Control Account
  - Discrete Effort
    - Specific End Product Or Result
  - Apportioned Effort
    - Effort Related To Discrete Tasks With Dependent Relationship On Measured Performance
  - Level Of Effort
    - No Final Product Or End Result, Continuing Support
- Measurement Of EVM Technique (Methodology) Needs To Be Kept In Mind When Allocating Resources
Planning, Scheduling, & Budgeting - EV Methods

- Earned Value falls into 3 categories:
  - Discrete
  - Non-discrete (aka management tasks - LOE)
  - Apportioned

- Examples of discrete EV methods:
  - 0/100 (performance is earned after all work is complete – typically used for short tasks within one accounting period)
  - 50/50 (50% earned at start; 50% earned at finish – typically used for short tasks – less than 3 months)
  - Physical % complete (incremental earning based on PMs assessment of %)
    - Units complete
    - Milestones (30% design, 60% design, etc.)

- Physical % complete is the most popular but must have a defined or documented rationale for each task or type of tasks!

- Remember, the method you choose must be objective and consistent throughout the project tasks

- Examples of non-discrete EV methods:
  - Level of Effort (LOE) (Support type with no product, BCWP = BCWS always!)

- Apportioned
  - Parent/child relationship
Planning, Scheduling, & Budgeting - What makes a good schedule?

- Include the entire scope of work
- All tasks are logically linked and reflect how the work will be accomplished
- Limited use of constraint dates and lags
- Schedule should include meaningful, well defined milestones to assist project in tracking overall progress
- All tasks should include all required coding (WBS, milestone, CAM, etc.)
- Task durations must be reasonable for the scope of work. General rule – Discrete work should be no longer than 1 to 2 months.
- Schedule should address risk with project and include mitigation effort that is to be included in the plan.
Planning, Scheduling, & Budgeting - Contingency & Baseline

- Now That We Have A Resource Loaded Schedule Let’s Establish Contingency Reserve
  - Established To Cover Overruns In Cost & Schedule That May Occur As A Result Of Known (Risk) Or Unknown (Uncertainty) Events
  - Expected Value Of Identified Risks (Probability x Impact)
  - Developed Bottoms Up But Managed At A Program Level, Owned By The Customer

- Time To Baseline!
  - Schedule Baseline
    - Durations, Dates, & Sequence Of Project Activities By Which Major Project Milestones Must Be Accomplished
  - Technical Project Baseline
    - Identification Of All Project Scope
    - Includes Physical, Functional, & Operational Requirements & Configurations
    - Covered In WBS Dictionary
  - Performance Measurement Baseline (PMB)
    - Total Time-Phased Budget Plan Against Which Project Performance Is Measured
    - Does Not Include Contingency Since It Has No Specific Work Scope

- All Provide The Basis For Measuring & Reporting Performance
Planning, Scheduling, & Budgeting - Performance Measurement Baseline

[Diagram showing the relationship between Total Project Cost, DOE Contingency, BAC, and Performance Measurement Baseline.]

- Total Project Cost
- DOE Contingency
- BAC
- Performance Measurement Baseline

[Legend for abbreviations used in the diagram: CA forCost Adjustments, SLP for Spending Limitations]
Planning, Scheduling, & Budgeting - Plan and Authorize Work

- Let’s Get Started! WAIT...What Authorizes You To Start Work?
- Work Authorization Documents (WADs to authorize) and Forms (WAFs to plan/authorize)
  - Formal Process For Approving The Scope, Budget, & Schedule For Discrete Project Elements Down To The CA Level
  - Each CA Has A WAD Signed By Control Account Manager & Project Manager
  - Answer If Asked, “Can You Accomplish The Work Scheduled For The Budget Authorized?” ➔ YES
- What Kind Of Information Will Be In Yours?
  - Control Account Title, Number, Period Of Performance, Authorized Budget
  - WBS Dictionary
  - Detailed Schedule
  - Budgeted Cost By Month
- These Are For The Life Cycle Of The Project
- All Changes Will Be Documented & Controlled Through A Formal Process
Planning, Scheduling, & Budgeting - WAD to Authorize

Work Authorization Document
NSTX Upgrade Project

<table>
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<th>Control Account #:</th>
<th>1000</th>
<th>Title:</th>
<th>CSL Analytical Support</th>
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Period of Performance: 04 January 2013 to 06 October 2014

Authorized Budget: $385
Control Account Manager: Title

Revision #: 0
Revision Date: 05/16/11

Authorized Work Description:
As a result of the NSTX Upgrade Project, the NSTX xtal models and analyses will need to be updated. This WBS element includes analytical support for global models and analysis not presently identified. The global model will provide the basis for updating the analysis to qualify components and identify areas of the tokamak requiring further analysis. Identified plasma scenarios and power-supply current limit analyses will be used in the global model and current sets that require further analysis will be identified. These analyses also serve to verify the results of more detailed analyses.

Attachments:
1. WBS Dictionary sheet that defines the scope of work for this WBS element.
2. A detailed Control Account schedule showing all work packages and planning packages.
3. A resultant Resource Report by WBS and functional activity
4. Budgeted Cost by month.
5. Original Work Authorization Form (WAF)

Control Account History

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<th>ECP#</th>
<th>Implement Date</th>
<th>Prior Budget</th>
<th>New Budget</th>
<th>Signature</th>
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Approve

Name: R. Strojek
Signature: Date:

NSTX Upgrade Manager: P. Strojek
Control Account Manager: P. Title
Functional Manager: P. Heitzenroeder
Accounting Considerations

- Applicable Procedure(s)
  - Accounting Manual
- Identify Cost Elements
  - Labor
  - Material
  - Contracts
- Subcontract Management
- Approved Accounting System With Ability To Extract Actuals
Reporting Of Hours Example

Princeton Plasma Physics Laboratory Online Timesheet

Time Sheet Information

- Monthly Time Sheet
- Paygroup: 18
- Period Ending: 5/22/2011
- Employee: Stephen W. Langish

Total Worked Time: 6.00%
Total Non-Productive Time: 0.00%
Total Required: 100%

Worked Time Section (Reported in Percentages)

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Non-Productive Time Section (Reported in Days)

Time Off will be calculated from the data below (% days per day off)

- 2100: Vacation
- 2201: Occasional Illness

Codes Requiring Personnel Approval

- 2202: Temporary Disability
- 2400: Death in Family
- 2500: Civic Duty
- 2600: Lab Holiday
- 2601: Optional Holiday
- 2800: Military Leave
- 2901: Leave Without Pay
- 2503: Miscellaneous NFT
- 2209: Sporadic Workers Comp

Enter the actual days off below (This is required data)
Subcontract Management

When substantial effort associated with large and complex projects is obtained through subcontracts, the subcontracts must be written in such a way that information required for earned value management may be readily obtained from the subcontractor. The scope, complexity (risk), criticality, and cost of the subcontracted work may warrant inclusion in the subcontract of an EV flow-down provision. The project manager will establish reporting requirements for all subcontracts.

4.1 SUBCONTRACTS WITH EV FLOW-DOWN
[Guide 9, 10, 16, 22, 23 {2.2d, e, 2.3a, 2.4a, b}]

The earned value flow-down subcontracts are generally high dollar value (required on projects greater than $20 million), high-risk subcontracts. These subcontracts require careful planning prior to solicitation and award. The solicitation (RFP) or Memorandum of Understanding (MOU) must include the proper language and the subcontract the appropriate contract clauses, including full description of the reporting requirements. The reporting requirements include monthly earned value, and performance reporting from the subcontractor to PPPL. Requirements for reporting are described in the Request for Proposal (RFP) and formalized in the contract.

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

- Time and material
- Support subcontracts that are primarily LOE
Analysis & Management Reports

- Applicable Procedure(s)
  - PPPL PMSD Appendix E
    - Procedure 8 Monthly Status Reporting
- Monthly Reporting Requirements On Project Status
  - Contract Performance Reports (CPRs) – Customer
- Identify Significant Differences In Schedule/Cost Performance & Provide Reasons
- Summarize Data & Variances Through The WBS Elements & Compare Results With Baseline
- Implement Recovery Plans, Managerial Actions, & Recommendations Resulting From Reports & Exceeded Thresholds
- Develop Revised Estimates Based On Performance To Date & Future (EAC & ETC)
Analysis & Management Reports - Reporting Process

CAM (a.k.a job manager) via monthly “Mike Williams” status mtg

Effort, Status Sheets, ETC/EAC, & Contribution Highlights

Scheduling Tool (Primavera P3)

Schedule Updated

Project Controls (a.k.a Orlando)

Create Internal Performance Reports (eg barcharts, CPR’s, financial reports, JCR’s etc)

Cost Tool (Cobra 4.7)

Dekker Extraction Utility

Report Package posted (sent to Project, DOE-PSO and PARS-II)

From Accounting

Great Plains

Actuals Imported

Project Controls (a.k.a Orlando)

From Accounting
Analysis & Management Reports - Analysis Process

CAMs Review Report & Supplemental Data

CAMs Research CAs Exceeding Threshold

Explanation & Corrective Actions

Reports Compiled

Input to PARS and Post on internal web

Federal Project Director Approves Report Information

Project Manager Reviews & Approves
Analysis & Management Reports - Metrics & Calculations

- **Cost Variance** (Favorable $\geq 0$, Unfavorable $< 0$)
  - $CV = BCWP - ACWP$

- **Cost Efficiency** (Favorable $> 1.0$, Unfavorable $< 1.0$)
  - Cost Performance Index (CPI) $= BCWP / ACWP$

- **Schedule Variance** (Favorable $\geq 0$, Unfavorable $< 0$)
  - $SV = BCWP - BCWS$

- **Schedule Efficiency** (Favorable $> 1.0$, Unfavorable $< 1.0$)
  - Schedule Performance Index (SPI) $= BCWP / BCWS$

- **Estimate At Completion**
  - $EAC = ACWP + ETC$
  - Three Alternate Versions But We Use This Mainly

- **Variance At Completion** (Favorable $\geq 0$, Unfavorable $< 0$)
  - $VAC = BAC - EAC$
Analysis & Management Reports - Reporting Example

NSTX Upgrade Project Performance since CD-2 Approval

<table>
<thead>
<tr>
<th></th>
<th>Dec-10</th>
<th>Jan-11</th>
<th>Feb-11</th>
<th>Mar-11</th>
<th>Apr-11</th>
<th>May-11</th>
<th>Jun-11</th>
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</thead>
<tbody>
<tr>
<td>BCWS</td>
<td>15419</td>
<td>16311</td>
<td>17196</td>
<td>18197</td>
<td>18999</td>
<td>19819</td>
<td>20528</td>
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<tr>
<td>BCWP</td>
<td>15412</td>
<td>15989</td>
<td>16655</td>
<td>17656</td>
<td>18287</td>
<td>18972</td>
<td>19937</td>
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<tr>
<td>ACWP</td>
<td>14828</td>
<td>15249</td>
<td>15788</td>
<td>16431</td>
<td>17090</td>
<td>17869</td>
<td>18878</td>
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</tbody>
</table>
Analysis & Management Reports - Reporting Example

NSTX UPGRADE PROJECT OVERALL

Project Total CPI

NSTX UPGRADE PROJECT OVERALL

Project Total SPI
Revisions

- Applicable Procedure(s)
  - PPPL PMSD Appendix E
    - Procedure 8 Change Control
- Establish Change Management System With Thresholds
- Incorporate, Control, & Document Authorized & Retroactive Changes (Includes Cost, Schedule, Scope, & Administrative)
- Record Updates & Effects To Budget & Schedule
- Prevent Unauthorized Changes To Baseline
- When Can Changes Occur?
  - Contractual Changes/Modifications
  - The Use Of Contingency/Management Reserve
  - Re-Planning
  - Formal Reprogramming
  - Bottom Line: Any Change To Scope (Technical), Responsibility, Schedule, Or Budget
## Revisions - Thresholds

### Change Approval Thresholds (NSTXU PEP Table 4)

<table>
<thead>
<tr>
<th>Change Level</th>
<th>Approval Level</th>
<th>Technical Scope</th>
<th>Schedule</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Deputy Secretary of Energy</td>
<td>Any change in scope and/or performance that affects mission need requirements as show in Section 2.2.2 or is not in conformance with the current approved OMB-300.</td>
<td>6 month or greater increase (cumulative) in the original project completion date as shown in Section 2.2.4.</td>
<td>Increase in excess of 25% (cumulative) of the original cost baseline as show in Table 1, Section 2.</td>
</tr>
<tr>
<td>1</td>
<td>Director of Science, SC-1</td>
<td>Changes to technical requirements and parameters that affect safety basis and operation function, but do not affect mission need objectives.</td>
<td>Less than a 6 month increase (cumulative) in the original project completion date as shown in Section 2.2.4.</td>
<td>Increase of the original cost baseline as show in Table 1, Section 2.</td>
</tr>
<tr>
<td>2</td>
<td>NSTX Upgrade Project Federal Project Director</td>
<td>Changes with ES&amp;H impacts significant enough to affect the approved NEPA/EA documentation.</td>
<td>Change in DOE level II milestones discussed in Section 2.2.4</td>
<td>Changes requiring the use of contingency funds as referenced in Table 1, Section 2.</td>
</tr>
<tr>
<td>3</td>
<td>NSTX Upgrade Project Manager</td>
<td>Changes not requiring DOE approval.</td>
<td>All other changes to the performance measurement baseline that do not affect level II milestones.</td>
<td>All other changes to the performance measurement baseline costs not requiring DOE approval.</td>
</tr>
</tbody>
</table>
Revisions - Change Process

1. **Initiate Change Request (ECP)**
2. **Evaluate Level & If Proceed**
3. **Create Offline Schedule & Cost Data**
4. **Compile Change Request Package**
5. **Submit For Required Approvals**
6. **Implement Change Request & Update Log**
7. **Sponsor Receives Report**

Schedule, New Estimates, & Technical Info
How P3 & Cobra Play?

- Just Tools To Complete The Job (For Project Management)
  - P3 – Resource Loaded Schedule
  - Cobra– Actuals & PMB
- Communicates Project Status To Upper Management & The Customer
- Imports Actuals From Financial
- Organizes Tasks, Maintains Schedule, & Allocated Budget
- Calculates EVM Metrics & Summarizes For Reporting
- Generates Documents For Monthly Reports
- Acts As Repository For Historical Data
Communication Is Key...

<table>
<thead>
<tr>
<th>Experiment Dept</th>
<th>FIRE</th>
<th>ITER &amp; Tokamaks</th>
<th>NCSX</th>
<th>NSTX</th>
<th>PS&amp;T</th>
<th>QPS</th>
<th>TFTR</th>
<th>TFTR D&amp;D</th>
</tr>
</thead>
</table>

**Project Web Sites**

- Work Breakdown Structure
  - WBS Dictionary
- Work Authorization Forms (WAFs)
- Project Status
  - Earned Value Management System (EVMS)
    - Cost Account Manager (CAM) Notebook
  - Project Performance & Status
    - Cost Performance Reports (CPRs)
    - Variance Reports
    - Statused Barcharts, Labor Reports
    - Latest Performance Trends
  - Engineering Change Proposals (ECPs)
  - Risk Register
    - Latest Risk Register (R18)

Site Address: [http://nstx-upgrade.pppl.gov](http://nstx-upgrade.pppl.gov)
What’s Up Next?

- Next Time (Yes, There’s More Training To Come)
  - In Depth Focus On Analysis, Reporting, & Revision
  - Examples & Exercises Based On Other Project’s Reports
  - EVMS Review & Interview Question Preparation
Summary

- Understand That Earned Value
  - Helps Determine If Your Project Is On Schedule & Within Budget
  - Assesses The Project On The Basis Of Cost & Schedule As Compared To What Has Been Accomplished In The Baseline Plan
  - Three Key Components:
    - Cost, Schedule, & Technical Baselines (Planned Value - BCWS)
    - Actual Charges (Actual Value - ACWP)
    - Reported Accomplishments (Earned Value - BCWP)
  - Is the Result Of Following Good Management Practices
    - Organization
    - Planning, Scheduling, & Budgeting
    - Accounting Considerations
    - Analysis & Management Reporting
    - Revisions & Data Maintenance

- What’s Up Next?
  - In Depth Focus On Analysis, Reporting, & Revision
  - Examples & Exercises Based On Other Project’s Reports
  - EVMS Review & Interview Question Preparation
Additional Resources

- Websites
  - EVM - http://www-local.pppl.gov/EVMS/
  - Overkill On EVM Information - https://acc.dau.mil/evm
Questions?