



Managed by Fermi Research Alliance, LLC for the U.S. Department of Energy Office of Science

Project Monitor & Control: Estimate at Completion and Change Control

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OPSS Project Controls and Cobra Administrator

Meeting Title : EVMS Training – Monitor & Control: Estimate at Completion and Change Control

3 October 2017

Obtain an Fermi Services Account

To request a Fermi account:

- Go to - https://fermi.service-now.com/new_acct_request.do
- Select your affiliation under “Collaborations” using the Pull-down menu
- Fill out the rest of the information.

After submitting the form, it should come to the Project PM/Director for approval

- Once approved it should be easy to get the Fermi account.
- The training courses and the Fermi Workday system set up take a little time

Provide your affiliation

Select your Fermilab Experiment, Project, Division or Section al

A screenshot of a web form's pull-down menu. The menu is titled "Please select" and is currently open, showing a list of Fermilab collaborations. The "NUMI-X" option is highlighted in blue. The list includes: ADMX, COMPASS Accelerator Modeling (COMPASS), GENIE, IARC, IIFC, JDEM Future Astrophysics Telescope, Lattice QCD, LCLS-II, LHC Accelerator Research Project (LARP), LQCD Lattice QCD (LQCD), LSST (Large Synoptic Survey Telescope), Muon Accelerator Program (MAP), Neutrino Experiment with a Xenon TPC (NEXT), NUMI-X, NuSTEC, OPTT, OSG Open Science Grid (OSG), PIP-II, Pythia, and REPTON.

Fermi Systems Access

Once you obtain your Fermi Services account PM/Director can (as appropriate):

- Inform Risk Manager to authorize you to access the Fermilab web-based risk register.
- Authorize access to DocDB or FermiPoint where all Project documents reside including
 - P6 PDFs
 - Status reports
 - Other CAM reports
- Inform OPSS for Access to:
 - P6 can be granted if desired.
 - Cost to Project ~\$400 per year
 - Read only for project files
 - Read/Write for “Sandbox”
 - Baseline Change Request (BCR) Tool – Needed for next session
 - CAM eToolbox – Needed for next session

CAMs Address Deviations from Plan



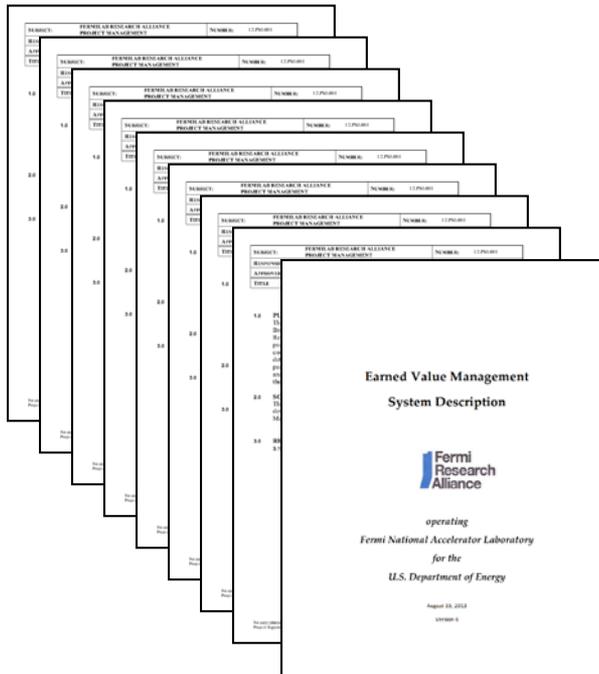
“**How** do you let your PM know there will be an increase (or decrease) in cost or schedule?”

“**When** do you let your PM know there will be an increase (or decrease) in cost or schedule?”

Why do you notify PM?

How Would You Answer?

FNAL EVMS process is found in procedures



EVMS Procedures Answer:

- Who
- Why
- When
- How

CAMs need to:

- Know
- Use
- Reference



FNAL EVMS Procedures (4/9)

- Project WBS, OBS, RAM
- Control Accounts, Work Packages, Planning Packages
- Work Authorization
- Project Scheduling
- Cost Estimating
- Monthly Status Reporting
- Change Control
- EVMS Surveillance & Maintenance
- EVMS Description

Getting to Procedures & Guidelines – Policies & Procedures



Organization > Office of Project Support Services > EVMS Documentation



Office of Project Support Services OPSS Website

EVMS Documentation

- Home
- Org Chart
- Projects and Reviews
- EVMS
- Meetings
 - Cost and Schedule Group
 - PM Community
- PM Resources
 - PM Tools
 - Training Materials
 - PM Document Templates
 - PM Document Examples
- Other
 - Software Development
 - PMII Review

EVMS Certified System Documents		OPSS Guidance
#	Description	Desktop Instructions
Policy	FRA Earned Value Management Description	EVM Processes Using Flow Diagrams and Visuals
	Initial EVMS Certification Letter (2010)	
	Latest EVMS Certification Letter (2016)	
12.PM-001	Project WBS, OBS, RAM	
12.PM-002	Control Accounts, Work Packages, Planning Packages	12.PM-002.DT-02 - Sale of Special Process Spares
12.PM-003	Work Authorization	
12.PM-004	Project Scheduling	12.PM-004.DT-01 - Guidelines for Developing a Schedule 12.PM-004.DT-03 - Guidelines for Milestones 12.PM-004.DT-04 - Guidelines for PMT 12.PM-004.DT-05 - Guidelines for Schedule Review Checklist
12.PM-005	Cost Estimating	12.PM-005.DT-01 - Risk Analysis
12.PM-006	Monthly Status Reporting	12.PM-006.DT-06 - Guidelines for Preparing a Variance Analysis Report 12.PM-006.DT-07 - Guidelines for Understanding and Using a Schedule 12.PM-006.DT-08 - Cobra Reports
12.PM-007	Change Control	12.PM-007.DT-03 - Guidelines for Rate Changes 12.PM-007.DT-04 - Contingency MR & UB 12.PM-007.DT-05 - Guidelines for Baseline Change Request
12.PM-008	EVMS Surveillance and Maintenance	
	Archived Documents	

<https://web.fnal.gov/organization/OPSS/Pages/EVMS-Documentation.aspx>



FNAL Procedure 12.PM-005 Cost Estimating

3.2 Control Account Manager (CAM) is responsible for

- developing cost estimates and establishing time-phased control account budgets
- managing the opening and closing of chargeable task codes as appropriate to support currently active work scope
- identifying and documenting risk and contingency estimates, though contingency ownership and management is defined by the change control process
- managing the execution of the work
- providing periodic status update information
- keeping the Project Manager apprised of any changes to the estimated cost at completion
- preparing basis of estimate documentation using direct costs

FNAL Procedure 12.PM-005 Cost Estimating

4.0 PROCEDURE

Cost estimates are prepared in a clear, consistent, comprehensive format that facilitates reviewing the details and assumptions throughout the cost estimate review process. Activities to be estimated are identified in sufficient detail to support the cost estimate methodology used. Cost estimates have backup documentation in a centrally located file that explains the assumptions and calculations on which the estimate is based.

The objectives of the cost estimating process are to:

1. Support the establishment of the Performance Measurement Baseline;
2. Serve as a basis for change control;
3. Support the establishment of the Estimate at Completion (EAC); and
4. Support the establishment of the Estimate to Complete (ETC).

EAC = Estimate At Completion

ETC = Estimate To Complete

FNAL Procedure 12.PM-005 Cost Estimating

4.1 Cost Estimating

Cost estimates are prepared using appropriate estimating methodologies with the issuance of guidance and instructions from the Project Manager. Estimates should be consistent with DOE G 413.3-21, Cost Estimating Guide. This guide classifies estimates into one of five categories, based on the Association for the Advancement of Cost Engineering (AACE) Recommended Practice No. 18R-97. Generally, most cost estimates are classified as Class 5 (Order of Magnitude), Class 3 (Preliminary) or Class 1 (Definitive). These classifications, further described in Appendix C, help ensure that the quality of the cost estimate is considered when applying contingency for estimate uncertainty and other risks.

A thorough understanding of the project work scope is necessary to effectively estimate project costs. The level of detail and accuracy of the budget becomes more definitive as the project's scope is refined. Cost ranges are required at CD-0 and CD-1, while a point estimate is required for project baselining at CD-2. Periodic estimates of remaining work are conducted during the execution phase to calculate EAC/ETC. Comprehensive bottom-up cost estimates are performed annually as part of the update to a capital project data sheet or at major phases of project evolution (e.g. at CD-2, at completion of design, etc.).

FNAL Procedure 12.PM-006 Monthly Status Reporting

SUBJECT:	FERMI RESEARCH ALLIANCE PROCEDURES PROJECT MANAGEMENT	NUMBER:	12.PM-006
RESPONSIBILITY:	Office of Project Support Services	REVISION:	5
APPROVED BY:	Head, Office of Project Support Services	EFFECTIVE:	8/18/13
TITLE	Monthly Status Reporting		

1.0 PURPOSE

This procedure defines the methods used to measure schedule progress on a monthly basis and report the actual performance compared to planned performance for a given period. This information is used to provide various reports required by management, the project, and the customer to manage projects, including those required to use the *FRA Earned Value Management System*.

2.0 SCOPE

This procedure describes the implementation of Earned Value Management for monthly status reporting and analysis. The monthly reporting process describes the project's method of reporting variances in cost and schedule. Internal and external reports will include comparison of the actual costs and work accomplished to the planned value of the work, derived from baseline plans generated during the planning and budgeting phase. Forecasts of future costs and schedule dates will be made, and corrective actions initiated when problems are identified.

Some projects may include labor effort at \$0 cost, if directed to do so by the customer. In order to do earned value management on this effort, analysis and reporting will be performed on hours for those resources. In the accounting system, actual hours for those resources will be accumulated at the chargeable task code level and brought into the cost processor. In the processes described in this procedure, the term "costs" will generally refer to both dollar costs and hours.

FNAL Procedure 12.PM-006 Monthly Status Reporting

3.0 RESPONSIBILITIES

3.1 Project Manager (PM) is responsible for

- Reviewing monthly performance data and variance reports and providing acceptance or required corrective action
- Reviewing and approving monthly status report draft
- Monitoring corrective action on a monthly basis
- Requesting the CAMs to develop a detailed, bottoms-up estimate for the remaining work to establish a new Estimate to Complete (ETC) for each Control Account (CA) and to establish a new Estimate at Completion (EAC) on at least an annual basis.
- Preparing and submitting a project Monthly Status Report (MSR) to the Customer and FRA Management
- Coordination and presentation of information at the monthly Project Management Group (PMG) meetings

3.2 Project Controls (PC) is responsible for

- Retrieving information from financial management system
- Requesting monthly status updates from CAMs
- Integrating the Resource Loaded Schedule (RLS) status information with actual costs and preparing earned value reports
- Preparing performance reports and distributing to CAMs
- Assisting PM to prepare and publish monthly status report
- Analyzing ETC submitted by the CAMs
- Preparing and submitting a draft of project monthly status report to Project Manager for review and inclusion in monthly status report (MSR)

FNAL Procedure 12.PM-006 Monthly Status Reporting

3.3 Project Financial Analyst is responsible for

- Verifying and reconciling actual cost file that is downloaded from the accounting system and imported into the project cost processor as part of the monthly reporting process.
- Working with CAMs to prepare and submit monthly accruals to accounting

3.4 Control Account Manager (CAM) is responsible for

- Providing progress information to PC staff for input to the RLS for the monthly report
- Working with Project Financial Analyst to prepare and submit monthly accruals to accounting
- Providing narrative input for monthly status report
- Analyzing cost and schedule variances
- Preparing variance reports and required corrective action plans
- Monitoring and reporting corrective action on a monthly basis
- Evaluate and update ETC when required

Fermilab Earned Value Management System Description

5.2.6 Project Performance Analysis

Project performance analysis is an ongoing process that includes routine and ad hoc analyses of problem causes, corrective actions, risk analysis, and cost savings opportunities. The process is formalized via the monthly report, which includes a review of cost and schedule performance information, identification of significant problem areas, and the status of corrective actions.

Control Account Managers periodically develop a comprehensive EAC at the Control Account level using all available information to arrive at the best possible estimate. All of the following may be employed to develop the EAC.

- Evaluating the efficiency achieved by performing organizations for completed work and comparing it to remaining budgets.
- Establishing a schedule forecast that reflects the expected time-frame for completing the remaining work.
- Considering all remaining risk areas on the project versus cost avoidance possibilities.
- Ensuring the most current direct and indirect rate structure is used to price out the projected resources.
- Applying this analysis to future efforts to derive the most accurate estimate.

An EAC based on predictive performance measures increases the probability that the project is executed within the overall budget objectives. Monthly EAC reviews are essential for management

Fermilab EVMS Description – Continued 5.2.6

decisions including the planning of project future funding requirements. On a monthly basis, CAMs review the status of expended effort and the achievability of the remaining forecasted work using all available information to arrive at the best possible EAC.

Comparisons of the EAC to the BAC must be made frequently enough for management to ensure project performance and resource availability is not adversely impacted. Routine EAC analysis and review at the Control Account level by the CAM ensures that the EAC continuously reflects a valid projection of project costs. Developing estimates at completion involve multiple methods. No single method consistently provides the “best answer.” **EACs should never entirely be a calculated number.** Formula driven Estimates at Completion are used only as a means of verification or validation that an EAC is reasonable. The uncompleted baseline schedule activities the resources required to complete each activity must be assessed in generating the EAC.

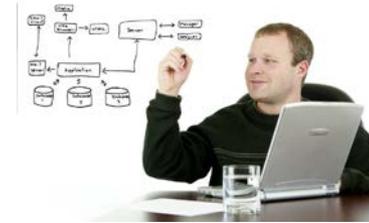
5.2.7 Monthly Project Status Calculations and Forecasts

As part of the monthly project status report, project management updates the EAC and analyzes it at the cost account level to account for all changes from the baseline that have been identified. The EAC update reflects a current analysis of project risks and includes all proposed change requests.

Deviations from Plan are Answered by EVMS Procedures

Who

- CAM
- PM



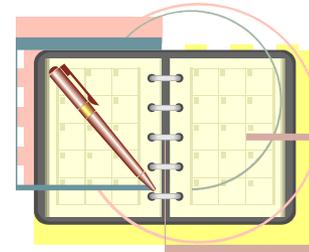
Why

- Required – OK but
- Manage
- Inform



When

- Annually
- When Requested
- Monthly Process
- When Known



FNAL Deviation Communication Tool

What Formal Tool(s) does FNAL use to Communicate Cost and Schedule Deviations?

Variance Analysis Report									
CA: 475.04.03 Transport Solenoids					Project: Solenoids				
CAM: LOPES, MAURICIO DE LIMA					Period Ending: May 31, 2015				
Report in \$K									
Period	Budget	Earned	Actuals	SV (\$)	SV (%)	CV (\$)	CV (%)	SPI	CPI
Current:	278	87	402	(191)	-69%	(316)	-364%	0.31	0.22
Cumulative:	7,922	7,361	8,187	(560)	-7%	(826)	-11%	0.93	0.90
	BAC	EAC		VAC (\$)	VAC (%)				
At Complete:	25,153	25,887		(733)	-3%				
Variance thresholds: Yellow ±\$50K & ±5% Current; ±\$100K & ±5% Cumulative. Red ±\$100K & ±10% Current; ±\$200K & ±10% Cumulative									
Explanation of Variance/Description of Problem:									
Current:	The schedule variance is the result of the delay in the test of the TS Coil module prototype due to the compressor failure at CHL. The cost variance accounts for the efforts in the last two weeks of April to give the final push to install all the modifications of the test cryostat (this is equivalent of 1200 h of labor). Another portion of the cost variance is related to labor being incorrectly charged to Mu2e task and it will be transferred to a Non-Mu2e task (around \$100k). Around 300 hours of labor has been used to correct the drawings of the TS Coil Modules. These corrections are necessary to place the production contract and were based on feedback from the vendors and the results of the prototype evaluation.								
Cumulative:	The schedule variance is being dominated by the delays in the test of the TS Prototype. The cumulative cost variance is due to an underestimate of the labor required to modify the test stand to perform the TS prototype test								
Impact:									
The TS prototype testing delay has already delayed the T4 CD-4 approval milestone, and is currently causing "day for day" impact to the project's critical path.									
Corrective Action:									
We are monitoring closely the progress of the repairs of the CHL refrigerator. Labor transfers to non-Mu2e task codes are in process, and temporary entries reducing the Estimate At Completion have already been included in the EAC on this VAR.									
Monthly Summary:									
The installation of the modifications of the test cryostat were declared complete in April 29. We initiate the cool-down of the prototype and we have already some interesting and encouraging results. Unfortunately the cool-down was interrupted 4 days later due to a failure on the CHL refrigerator. The bids for the coil modules were received in May 8 and the evaluation is underway.									
Prepared by:	Mau Lopes		CAM	Date:	June 17, 2015				
Reviewed by:	David Leeb		PCS	Date:	June 17, 2015				
Approved by:	Ron Ray		PM	Date:	June 17, 2015				

FNAL Deviation Communication Tool (Cont.)

What Formal Tool(s) does FNAL use to Communicate Forecast Cost Deviations (under/over)?

Variance Analysis Report									
CA: 475.09.04 Data Processing CAM: Rivera, Ryan					Project: Mu2e Trigger & DAQ Period Ending: March 31, 2015				
Report in \$K									
Period	Budget	Earned	Actuals	SV (\$)	SV (%)	CV (\$)	CV (%)	SPI	CPI
Current:	(116)	1	5	117	-100%	(4)	-834%	0.00	0.11
Cumulative:	193	194	103	2	1%	6	3%	1.01	1.03
At Complete:	BAC 889	EAC 883		VAC (\$) 6	VAC (%) 1%				
Variance thresholds: Yellow ±\$50K & ±5% Current; ±\$100K & ±5% Cumulative. Red ±\$100K & ±10% Current; ±\$200K & ±10% Cumulative									
Explanation of Variance/Description of Problem:									
Current:	BCR015 Establish CD-2 Baseline was implemented this period. To establish the performance baseline, adjustments were made in the current period to set BCWS and BCWP equal to ACWP, and the remaining work was replanned. The current period variances are a result of those adjustments.								
Cumulative:									
Impact:									
None									
Corrective Action:									
Last month: We will reschedule these activities to run sequentially instead of in parallel with higher priority tasks. Significant university effort will be added, starting April 2015. We currently have significant float flexibility. -COMPLETED via BCR015.									
Monthly Summary:									
Prepared by:	Ryan Rivera	CAM	Date:	April 21, 2015					
Reviewed by:	Fran Leavell	PCS	Date:	April 21, 2015					
Approved by:	Ron Ray	PM	Date:						

Cobra Reports – VAR: Forecast Communication Tool

Variance Analysis Report									
CA: 475.03.04.01 Mu2e Detector Service Building & Hall Fixed Price					Project: Conventional Construction				
CAM: Hamernik, Thomas J					Period Ending: July 31, 2015				
Report in \$K									
Period	Budget	Earned	Actuals	SV (\$)	SV (%)	CV (\$)	CV (%)	SPI	CPI
Current:	842	1,220	1,298	379	45%	(77)	-6%	1.45	0.94
Cumulative:	2,049	2,480	2,557	430	21%	(77)	-3%	1.21	0.97
At Complete:	BAC	EAC		VAC (\$)	VAC (%)				
	12,641	12,642		(1)	0%				

1

2

3

At Complete

1. BAC (Budget At Completion)
2. EAC (Estimate At Completion)
3. VAC (Variance At Completion)



Variance Analysis Thresholds (Default)

Variance Analysis Thresholds for Control Accounts with Standard Resources		
Green Thresholds – Cost and Schedule Performance falling outside of yellow or red thresholds		
Yellow Thresholds		
Cost Variance Schedule Variance	Type	Threshold limit
Dollars	Current Period	$\geq \pm 5\%$ to $< \pm 10\%$ and $\geq \$50K$
	Cumulative	$\geq \pm 5\%$ to $< \pm 10\%$ and $\geq \$100K$
Red Thresholds		
Cost Variance Schedule Variance	Type	Threshold limit
Dollars	Current Period	$\geq \pm 10\%$ and $\geq \$100K$
	Cumulative	$\geq \pm 10\%$ and $\geq \$200K$

Note: This applies to SV% (Schedule Variance in %) or CV% (Cost Variance in %) and the SV or CV in \$.

Changed by Exception

- FRA Management
- Project Requirements
- FRA Management
- Project Requirements
 - Risk
 - Budget
- Reflected in PMP

VAR – Narration (Four Key Elements)

Explanation of Variance/Description of Problem:

Current Period:

Schedule Variance is within threshold
Cost Variance is within threshold

Cumulative:

Schedule Variance is within threshold
Unfavorable Cost Variance is due to Task 47504.4011144, marked complete in April without the creation of an accrual. Because the missing accrual was prior to the initial baseline date of 4/30/14, the S=P=A balancing transaction removed the budget from the control account. When the material was received in July, an accrual was entered in the accounting system, and the variance became apparent.

Impact:

The paid invoice for Task 47504.4011144 is reflected in the EAC and is the primary contributor to the forecast overrun at completion.

Corrective Action:

When the baseline is established, followed CD-2 approval, setting the baseline equal to actual cost will restore the correct budget amount.

Monthly Summary (to include technical causes of VARs, Impacts) and Corrective Action(s):

Prepared by:

Date:

Approved by:
Marc Buehler

Date:
10/10/2014

- **Explanation of Variance**
- **Impact**
- **Corrective Action**
- **Summary**



VAR – Narration (First Two Elements)

Explanation of Variance/Description of Problem:

Current Period:

Schedule Variance is within threshold

Cost Variance is within threshold

Cumulative:

Schedule Variance is within threshold

Unfavorable Cost Variance is due to Task 47504.4011144 , marked complete in April without the creation of an accrual. Because the missing accrual was prior to the initial baseline date of 4/30/14, the S=P=A balancing transaction removed the budget from the control account. When the material was received in July, an accrual was entered in the accounting system, and the variance became apparent.

Impact:

The paid invoice for Task 47504.4011144 is reflected in the EAC and is the primary contributor to the forecast overrun at completion.

Explanation of Variance

- Current
- Cumulative
 - Cost
 - Schedule
 - ✓ What
 - ✓ Why
- **At Completion**

Impact

- Schedule
- **Cost**
- CA
- Think Successors
- Project

VAR – Narration (Last Elements)

Explanation of Variance/Description of Problem:

Current Period:

Schedule Variance is within threshold
Cost Variance is within threshold

Cumulative:

Schedule Variance is within threshold
Unfavorable Cost Variance is due to Task 47504.4011144, marked complete in April without the creation of an accrual. Because the missing accrual was prior to the initial baseline date of 4/30/14, the S=P=A balancing transaction removed the budget from the control account. When the material was received in July, an accrual was entered in the accounting system, and the variance became apparent.

Impact:

The paid invoice for Task 47504.4011144 is reflected in the EAC and is the primary contributor to the forecast overrun at completion.

Corrective Action:

When the baseline is established, followed CD-2 approval, setting the baseline equal to actual cost will restore the correct budget amount.

Monthly Summary (to include technical causes of VARs, Impacts) and Corrective Action(s):

Prepared by:

Date:

Approved by:

Marc Buehler

Date:

10/10/2014

Corrective Action

- Plan to Return to PMB
- Time-frame to Correction
- Track Actions to Completion
- **VAC – Usually None**

Summary

- Accomplishments
- Technical Challenges
- **Look Ahead**
 - **Over and Under Runs**

Ensure your VAR is Approved (Project Manager)

Scenario #1

What if you know a Contract/M&S has cost more (or less) than Planned?

Actions

- Communicate via VAR
 - Explanation of Variance (VAC)
 - Impact: CA increase EAC
 - No Corrective Action (Unless warrants BCR on Future work)
- Project Change in ETC if Appropriate

<u>Explanation of Variance/Description of Problem:</u>			
Current Period: Schedule Variance is within threshold Cost Variance is within threshold			
Cumulative: Schedule Variance is within threshold Unfavorable Cost Variance is due to Task 47504.4011144 , marked complete in April without the creation of an accrual. Because the missing accrual was prior to the initial baseline date of 4/30/14, the S=P=A balancing transaction removed the budget from the control account. When the material was received in July, an accrual was entered in the accounting system, and the variance became apparent.			
<u>Impact:</u> The paid invoice for Task 47504.4011144 is reflected in the EAC and is the primary contributor to the forecast overrun at completion.			
<u>Corrective Action:</u> When the baseline is established, followed CD-2 approval, setting the baseline equal to actual cost will restore the correct budget amount.			
<u>Monthly Summary (to include technical causes of VARs, Impacts) and Corrective Action(s):</u>			
Prepared by:	Date:	Approved by: Marc Buehler	Date: 10/10/2014

Scenario #2

What if you know a **Future Contract/M&S will** cost more (or less) than Planned?

Actions

- Attempt to Mitigate
- Project change in ETC
- Communicate via VAR
 - Cost Variance Explanation (VAC)
 - Impact: CA increase EAC
 - Corrective Action: Attempt Mitigation or BCR

Explanation of Variance/Description of Problem:			
Current Period: Schedule Variance is within threshold Cost Variance is within threshold			
Cumulative: Schedule Variance is within threshold Unfavorable Cost Variance is due to Task 47504.4011144 , marked complete in April without the creation of an accrual. Because the missing accrual was prior to the initial baseline date of 4/30/14, the S=P=A balancing transaction removed the budget from the control account. When the material was received in July, an accrual was entered in the accounting system, and the variance became apparent.			
Impact: The paid invoice for Task 47504.4011144 is reflected in the EAC and is the primary contributor to the forecast overrun at completion.			
Corrective Action: When the baseline is established, followed CD-2 approval, setting the baseline equal to actual cost will restore the correct budget amount.			
Monthly Summary (to include technical causes of VARs, Impacts) and Corrective Action(s):			
Prepared by:	Date:	Approved by: Marc Buehler	Date: 10/10/2014

Scenario #3

What if you know Rates (Labor/M&S) have Changed from Planned?

Actions: ETC

- Project change in ETC
- Communicate via VAR
 - Cost Variance Explanation (VAC)
 - No Corrective Action

Actions: BCR

- Communicate via Change Control
- VAR with new BAC

Decision of ETC vs BCP is PM's

<u>Explanation of Variance/Description of Problem:</u>			
Current Period: Schedule Variance is within threshold Cost Variance is within threshold			
Cumulative: Schedule Variance is within threshold Unfavorable Cost Variance is due to Task 47504.4011144, marked complete in April without the creation of an accrual. Because the missing accrual was prior to the initial baseline date of 4/30/14, the S=P=A balancing transaction removed the budget from the control account. When the material was received in July, an accrual was entered in the accounting system, and the variance became apparent.			
<u>Impact:</u> The paid invoice for Task 47504.4011144 is reflected in the EAC and is the primary contributor to the forecast overrun at completion.			
<u>Corrective Action:</u> When the baseline is established, followed CD-2 approval, setting the baseline equal to actual cost will restore the correct budget amount.			
<u>Monthly Summary (to include technical causes of VARs, Impacts) and Corrective Action(s):</u>			
Prepared by:	Date:	Approved by: Marc Buehler	Date: 10/10/2014

Scenario #4

What if you know a Field Change has been Initiated (Added Scope) or **BCR will be** implemented, **but** has **not been yet?**

Actions: ETC

- Project change in ETC
- Communicate via VAR
 - Cost Variance Explanation (VAC)
 - Corrective Action – Future BCR
- Prepare Change Control Documentation
- Identify in Summary (Look ahead)

Decision BCP approval is PM's - Communicate

<u>Explanation of Variance/Description of Problem:</u>			
Current Period: Schedule Variance is within threshold Cost Variance is within threshold			
Cumulative: Schedule Variance is within threshold Unfavorable Cost Variance is due to Task 47504.4011144 , marked complete in April without the creation of an accrual. Because the missing accrual was prior to the initial baseline date of 4/30/14, the S=P=A balancing transaction removed the budget from the control account. When the material was received in July, an accrual was entered in the accounting system, and the variance became apparent.			
<u>Impact:</u> The paid invoice for Task 47504.4011144 is reflected in the EAC and is the primary contributor to the forecast overrun at completion.			
<u>Corrective Action:</u> When the baseline is established, followed CD-2 approval, setting the baseline equal to actual cost will restore the correct budget amount.			
<u>Monthly Summary (to include technical causes of VARs, Impacts) and Corrective Action(s):</u>			
Prepared by:	Date:	Approved by: Marc Buehler	Date: 10/10/2014

Scenario #4 (Cont.)

What if you know a Field Change has been Initiated (Added Scope) or **BCR will be** implemented, **but** has **not** been **yet**?

Communicated to PM but PM will not allow BCR

Actions: ETC

- Project change in ETC
- Communicate via VAR
- Identify in Summary (Look ahead)

Decision BCP approval is PM's - Communicate

<u>Explanation of Variance/Description of Problem:</u>			
Current Period: Schedule Variance is within threshold Cost Variance is within threshold			
Cumulative: Schedule Variance is within threshold Unfavorable Cost Variance is due to Task 47504.4011144 , mark ad complete in April without the creation of an accrual. Because the missing accrual was prior to the initial baseline date of 4/30/14, the S=P=A balancing transaction removed the budget from the control account. When the material was received in July, an accrual was entered in the accounting system, and the variance became apparent.			
<u>Impact:</u> The paid invoice for Task 47504.4011144 is reflected in the EAC and is the primary contributor to the forecast overrun at completion.			
<u>Corrective Action:</u> When the baseline is established, followed CD-2 approval, setting the baseline equal to actual cost will restore the correct budget amount.			
<u>Monthly Summary (to include technical causes of VARs, Impacts) and Corrective Action(s):</u>			
Prepared by:	Date:	Approved by: Marc Buehler	Date: 10/10/2014

How to Calculate ETC

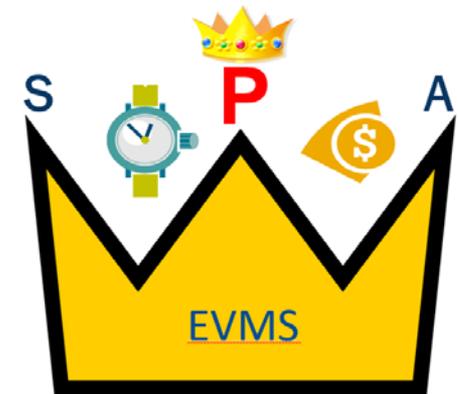
Information Needed to Start

- **BAC = Budget at Completion**
- **BCWS_{CTD} = Cumulative BCWS**
- **BCWP_{CTD} = Cumulative BCWP**
- **ACWP_{CTD} = Cumulative ACWP**

Calculations

- **EAC = ACWP_{CTD} + ETC**
- **ETC = EAC - ACWP_{CTD}**
- **ETC = BAC - BCWP_{CTD}**
- **VAC = BAC - EAC**

Cumulative to Date			BAC	ETC	EAC	VAC
BCWS	BCWP	ACWP				
1,000	500	700	10,000	9,500	10,200	-200
1,000	1,000	700	10,000	9,000	9,700	300
1,000	1,000	1,000	10,000	9,000	10,000	0
1,000	1,500	1,000	10,000	8,500	9,500	500



$$SV = P - S$$

$$CV = P - A$$

$$SPI = P / S$$

$$CPI = P / A$$

How to Calculate ETC

Information Needed to Start

- **BAC = Budget at Completion**
- **BCWS_{CTD} = Cumulative BCWS**
- **BCWP_{CTD} = Cumulative BCWP**
- **ACWP_{CTD} = Cumulative ACWP**

Calculations

- **$EAC = ACWP_{CTD} + ETC$**
- **$ETC = EAC - ACWP_{CTD}$**
- **$ETC = BAC - BCWP_{CTD}$**
- **$VAC = BAC - EAC$**
- **SPI, CPI & CV**

Cumulative to Date									
BCWS	BCWP	ACWP	BAC	ETC	EAC	VAC	SPI	CPI	CV
1,000	500	700	10,000	9,500	10,200	-200	0.50	0.71	-200
1,000	1,000	700	10,000	9,000	9,700	300	1.00	1.43	300
1,000	1,000	1,000	10,000	9,000	10,000	0	1.00	1.00	0
1,000	1,500	1,000	10,000	8,500	9,500	500	1.50	1.50	500

How to Calculate ETC (Cont.)

$$EAC = ACWP_{CTD} + ETC$$

$$ETC = EAC - ACWP_{CTD}$$

$$ETC = BAC - BCWP_{CTD}$$

$$VAC = BAC - EAC$$

What is Missing?



Cumulative to Date									
BCWS	BCWP	ACWP	BAC	ETC	EAC	VAC	SPI	CPI	CV
1,000	500	700	10,000	9,500	10,200	-200	0.50	0.71	-200
1,000	1,000	700	10,000	9,000	9,700	300	1.00	1.43	300
1,000	1,000	1,000	10,000	9,000	10,000	0	1.00	1.00	0
1,000	1,500	1,000	10,000	8,500	9,500	500	1.50	1.50	500

How to Calculate ETC (Cont.)

$$EAC = ACWP_{CTD} + ETC$$

$$ETC = EAC - ACWP_{CTD}$$

$$ETC = BAC - BCWP_{CTD}$$

$$VAC = BAC - EAC$$

Understand:

- **Assumes Plan is Perfect**
Does not Account for Good/Bad Performance
- **No Future Adjustments**
- **No Cost of Schedule Slip**

Cumulative to Date									
BCWS	BCWP	ACWP	BAC	ETC	EAC	VAC	SPI	CPI	CV
1,000	500	700	10,000	9,500	10,200	-200	0.50	0.71	-200
1,000	1,000	700	10,000	9,000	9,700	300	1.00	1.43	300
1,000	1,000	1,000	10,000	9,000	10,000	0	1.00	1.00	0
1,000	1,500	1,000	10,000	8,500	9,500	500	1.50	1.50	500

How to Calculate ETC (Cont.)

$$EAC = ACWP_{CTD} + ETC$$

$$ETC = EAC - ACWP_{CTD}$$

$$ETC = BAC - BCWP_{CTD} + \text{Known Future Deviations}$$

$$VAC = BAC - EAC$$

Cumulative to Date										
BCWS	BCWP	ACWP	BAC	ETC	EAC	VAC	SPI	CPI	CV	Known Future Deviation
1,000	500	700	10,000	9,500	10,200	-200	0.50	0.71	-200	
1,000	1,000	700	10,000	8,600	9,300	700	1.00	1.43	300	-400
1,000	1,000	1,000	10,000	9,000	10,000	0	1.00	1.00	0	
1,000	1,500	1,000	10,000	10,500	11,500	-1500	1.50	1.50	500	2000
1,000	1,500	1,000	10,000	8,500	9,500	500	1.50	1.50	500	



EVMS is:

- **Management Tool**
- **Communication Tool**

How to Calculate ETC using P6

P6 update included forecast dates and resource remaining units

Activity ID | Activity Name | Activity % Complete | BL Start | BL Finish | Start | Finish | Variance - BL Finish | Total Float

Project: 475.02-20140930			5/1/14	9/25/20	4/30/14 A	10/20/20	-17	518
Control Account: 475.02.01 Accelerator Project Management			10/1/14	9/21/20	10/1/14	10/20/20	-21	498

General | Status | Resources | Codes | Predecessors | Successors | Notebook | Steps | Relationships | Expenses | Summary | Feedback | WPs & Docs

Activity: 2253.501 Procure Dump Parts/Material - M&S

Activity Type: Task Dependent

WBS: 476-B-2.02.02.05.03 Implementation

Duration Type: Fixed Duration & Units

% Complete Type: Physical

Activity ID	Activity Name	Activity % Complete	BL Start	BL Finish	Start	Finish	Variance - BL Finish	Total Float
47502.07.03.002000	Final LCW system design (remaining)	0%	8/1/14	11/21/14	8/1/14 A	12/15/14	-14	250
47502.07.03.001117	Final Vacuum Design	16.4%	7/7/14	12/26/14	8/1/14 A	1/27/15	-19	224
47502.07.03.002010	Final compressed air system design	0%	8/1/14	11/21/14	10/1/14	1/29/15	-42	222

Chargeable Task Code: 475.02.02.05.03	Activity % Complete	Performance % Complete	Schedule % Complete	Physical % Complete	Units % Complete	Labor Cost % Complete
Chargeable Task Code: 475.02.02.05.03	100%	100%	100%	100%	100%	0%
Chargeable Task Code: 475.02.02.05.03	100%	100%	100%	0%	100%	0%
Control Account: 475.02.02.05.03	0%	0%	100%	0%	0%	0%
Control Account: 475.02.02.05.03	16.4%	16.4%	12.23%	16.4%	15.3%	0%

General | Status | Resources | Relationships | Codes | Notebook | Steps | Feedback | WPs & Docs | Expenses | Summary

Activity: 47502.07.03.001117 Final Vacuum Design

Role	Resource ID	Resource Name	Start	Finish	Planned Units	Remaining Units
	FNAD_ELEC_ASMBY_TECH	Electrical Assembly Technician	8/1/14 A	1/27/15	80.00h	64.00h
	FNAD_ENGNRING_PHYST	Engineering Physicist	8/1/14 A	1/27/15	40.00h	32.00h
	FNAD_MECH_DESIGN_EN	Mechanical Design Engineer	8/1/14 A	1/27/15	200.00h	166.00h
Hurd D	FNAD_MECH_DRAFTER	Mechanical Drafter	8/1/14 A	1/27/15	380.00h	331.00h

How to Calculate ETC using P6 (cont.)

P6 Forecast dates and remaining units integrated into Cobra

Code	Description	Ctrl Acct	WP	Description	CAM	Budget	Hours Budget	BAC	Hours B
		475.02.07	47502.07.03.001117	Final Vacuum Design		\$38,792.71	355.83	\$76,464.75	
		475.02.07	47502.07.03.001210	Develop Vacuum Installation Schedule		\$0.00	0.00	\$3,087.26	
		475.02.07	47502.07.03.001000	Refinement Design of the ICM System P&ID		\$42,533.00	350.00	\$42,533.00	

General | Resource Assignments | Milestones/Steps | Notes

Class Filter: All Classes

Cost Set Filter:

Resource Assignment:

Resource	Description	Class	Class Description	Result	Units	TOTAL	31OCT2014	30NOV2014	31DEC2014	31JAN2015
FNAD_ENGNRING_PHYST	Engineering Physicist	CB	Current Budget (BCWS)	Percent		100.00	29.49	23.08	25.64	21.79
FNAD_MECH_DESIGN_EN	Mechanical Design Engineer	CB	Current Budget (BCWS)	HOURS	HOURS	64.00	18.87	14.77	16.41	13.95
FNAD_MECH_DRAFTER	Mechanical Drafter	CB	Current Budget (BCWS)	FTEM	HEADS	0.45	0.12	0.12	0.12	0.10
FNAD_ELEC_ASMBY_TECH	Electrical Assembly Technician	CL	Contingency - Labor	FTEY	HEADS	0.04	0.01	0.01	0.01	0.01
FNAD_ENGNRING_PHYST	Engineering Physicist	CL	Contingency - Labor	DIRECT	\$	1,736.32	511.99	400.69	445.21	378.43
FNAD_MECH_DESIGN_EN	Mechanical Design Engineer	CL	Contingency - Labor	ESCA	\$	46.88	13.82	10.82	12.02	10.22
FNAD_MECH_DRAFTER	Mechanical Drafter	CL	Contingency - Labor	FRINGE	\$	1,053.16	310.55	243.04	270.04	229.53
FNAD_ELEC_ASMBY_TECH	Electrical Assembly Technician	Earned	Performed (BCWP)	OVERHEAD	\$	2,866.71	845.31	661.55	735.05	624.80
FNAD_ENGNRING_PHYST	Engineering Physicist	Earned	Performed (BCWP)	Total Currency		5,703.07	1,681.67	1,316.09	1,462.32	1,242.98
FNAD_MECH_DESIGN_EN	Mechanical Design Engineer	Earned	Performed (BCWP)							
FNAD_MECH_DRAFTER	Mechanical Drafter	Earned	Performed (BCWP)							
FNAD_ELEC_ASMBY_TECH	Electrical Assembly Technician	FCB	Forecast non-PO							
FNAD_ENGNRING_PHYST	Engineering Physicist	FCB	Forecast non-PO							
FNAD_MECH_DESIGN_EN	Mechanical Design Engineer	FCB	Forecast non-PO							
FNAD_MECH_DRAFTER	Mechanical Drafter	FCB	Forecast non-PO							

General | Resource Assignments | Milestones/Steps | Notes

Status: In-progress

Description: Final Vacuum Design

Work Package Manager:

Dates

Baseline: Start: 07/07/2014 Finish: 12/26/2014

Actual: 08/01/2014

Forecast: 08/01/2014 01/27/2015

Early: 08/01/2014 01/27/2015

Late: 08/01/2014 12/14/2015

Pending: 10/01/2009 10/01/2009

Earned Value Technique

EVT: % Complete

% Completed: 16.40

Reporting Tools – Understand ETC

Estimate To Completion i.e. cost of future work

Time-Phased ACWP (Actuals), BCWS (Budget) & ETC in Hours

Results			HOURS																
Sum of Value Control Account	Resource.CATE	Cost Set	Date																
			9/30/2014	10/31/2014	11/30/2014	12/31/2014	1/31/2015	2/28/2015	3/31/2015	4/30/2015	5/31/2015	6/30/2015	7/31/2015	8/31/2015	9/30/2015				
475.09.01 TDAQ Project Management	EE Electrical Engineer	Actuals	4.0																
		Budget																	
	IT Information Technology	Actuals	45.8														36.0	85.0	39.0
		Budget																	
	PM Project Management	Budget	60.2	66.0	51.6	57.4	57.4	57.4	57.4	63.1	63.1	57.4	63.1	63.1	60.2	60.2			
		ETC		66.0	51.6	57.4	57.4	57.4	63.1	63.1	57.4	63.1	63.1	63.1	60.2	60.2			
475.09.02 TDAQ System Design and Test	EE Electrical Engineer	Budget														6.4	22.4	60.8	
		ETC														11.7	10.7	67.2	
	IT Information Technology	Budget														9.6	33.6	72.0	
		ETC														17.6	16.0	81.6	
	SC Scientist	Budget														12.8	44.8	44.8	
		ETC														23.5	21.3	57.6	
475.09.03 Data Acquisition	EE Electrical Engineer	Actuals	243.5																
		Budget	189.0	171.0	94.3	76.7			90.0	110.0	110.0	108.0	198.0	144.0					
		ETC		94.8	128.0	101.7	65.0	93.3	106.7	106.7	111.3	198.0	144.0						
	IT Information Technology	Actuals	51.3																
		Budget	126.0	138.0	108.0	78.0		108.0	132.0	132.0	120.0	132.0	96.0						
	SC Scientist	Budget	63.0	69.0	54.0	39.0		54.0	66.0	66.0	60.0	66.0	48.0						
ETC			63.0	69.0	54.0	39.0	56.0	64.0	64.0	62.0	66.0	48.0							
475.09.04 Data Processing	EE Electrical Engineer	Actuals	4.0																
		Budget	42.0	28.0	17.1	46.9						4.0	44.0	32.0					
		ETC		15.2	29.9	69.7	42.0	28.0										4.0	44.0
	IT Information Technology	Budget	84.0	92.0	72.0	52.0		72.0	88.0	88.0	80.0	88.0	64.0						
		ETC		30.4	25.6	45.6	84.0	92.0	72.0	101.8	53.3	113.8	53.3	57.8	88.0				
	SC Scientist	Budget	63.0	69.0	54.0	39.0		54.0	66.0	66.0	60.0	66.0	48.0						
ETC			22.8	19.2	34.2	63.0	69.0	54.0	76.3	40.0	85.3	40.0	43.3	66.0					
475.09.05 Controls and Networking	EE Electrical Engineer	Actuals	16.0																
		Budget	63.0	51.0	22.3	24.7		32.4	39.6	22.0	24.0	66.0	48.0						
		ETC		24.0	43.3	74.7	51.0	32.9	42.5	13.3	28.4	13.3	51.4	81.0					
	IT Information Technology	Actuals	17.0																
		Budget	42.0	46.0	36.0	26.0		36.0	44.0	44.0	40.0	44.0	32.0						
	SC Scientist	Budget	42.0	46.0	36.0	26.0		46.0	36.0	50.9	26.7	56.9	26.7	50.9	54.0				
ETC			16.0	26.0	42.0	46.0	36.0	44.0	40.0	40.0	44.0	32.0							

Reporting Tools – Understand ETC

Time-Phased ACWP, BCWS & ETC in Dollars

Control Account	Results	30SEP2014	31OCT2014	30NOV2014	31DEC2014	31JAN2015	28FEB2015	31MAR2015	30APR2015	31MAY2015	30JUN2015	31JUL2015	31AUG2015	30SEP2015	Cumulative
475.09.02 TDAQ System Design and Test	Actuals	-0.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.35
	OVERHEAD Actuals	-0.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.35
475.09.03 Data Acquisition	Scheduled	0.00	0.00	0.00	15,454.42	38,636.06	3,863.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	57,954.09
	Actuals	-0.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.53
	Estimate to ci	0.00	0.00	0.00	15,454.42	38,636.06	3,863.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	57,954.09
	DIRECT_AYS Scheduled	0.00	0.00	0.00	12,598.37	31,495.93	3,149.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	47,243.90
	Estimate to ci	0.00	0.00	0.00	12,598.37	31,495.93	3,149.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	47,243.90
	OVERHEAD Scheduled	0.00	0.00	0.00	2,856.05	7,140.13	714.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10,710.19
	Actuals	-0.53	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.53
	Estimate to ci	0.00	0.00	0.00	2,856.05	7,140.13	714.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10,710.19
475.09.04 Data Processing	Scheduled	0.00	0.00	0.00	10,933.40	27,333.49	2,733.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	41,000.24
	Estimate to ci	0.00	0.00	0.00	10,933.40	27,333.49	2,733.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	41,000.24
	DIRECT_AYS Scheduled	0.00	0.00	0.00	8,912.85	22,282.13	2,228.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	33,423.20
	Estimate to ci	0.00	0.00	0.00	8,912.85	22,282.13	2,228.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	33,423.20
	OVERHEAD Scheduled	0.00	0.00	0.00	2,020.54	5,051.36	505.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7,577.04
	Estimate to ci	0.00	0.00	0.00	2,020.54	5,051.36	505.14	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7,577.04
475.09.05 Controls and Networking	Scheduled	0.00	0.00	0.00	3,350.02	8,375.05	837.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12,562.57
	Estimate to ci	0.00	0.00	0.00	3,350.02	8,375.05	837.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	12,562.57
	DIRECT_AYS Scheduled	0.00	0.00	0.00	2,730.92	6,827.30	682.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10,240.95
	Estimate to ci	0.00	0.00	0.00	2,730.92	6,827.30	682.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	10,240.95
	OVERHEAD Scheduled	0.00	0.00	0.00	619.10	1,547.75	154.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2,321.62
	Estimate to ci	0.00	0.00	0.00	619.10	1,547.75	154.77	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2,321.62
Grand Total	Scheduled	0.00	0.00	0.00	29,737.84	74,344.60	7,434.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	111,516.90
	Actuals	-0.88	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.88
	Estimate to ci	0.00	0.00	0.00	29,737.84	74,344.60	7,434.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	111,516.90

Reporting Tools – Understand ETC

Time-Phased BCWS (Budget) & ETC

Sum of Value	Column Labels												
Row Labels	10/31/2014	11/30/2014	12/31/2014	1/31/2015	2/28/2015	3/31/2015	4/30/2015	5/31/2015	6/30/2015	7/31/2015	8/31/2015	9/30/2015	Grand Total
HOURS	1,535.9	1,360.0	1,329.3	776.7	1,457.4	1,629.7	1,584.7	1,502.5	1,890.0	1,661.5	896.9	948.9	16,573.5
EE Electrical Engineer	384.0	334.8	394.6	158.0	276.7	298.8	252.0	275.8	519.3	473.6	203.1	211.0	3,781.5
Budget	250.0	133.6	148.4		122.4	149.6	132.0	136.0	308.0	266.4	107.4	99.8	1,853.6
ETC	134.0	201.2	246.2	158.0	154.3	149.2	120.0	139.8	211.3	207.2	95.7	111.2	1,927.9
IT Information Technology	448.4	405.6	351.6	208.0	456.0	514.9	520.4	474.2	536.4	455.4	246.4	280.6	4,898.0
Budget	276.0	216.0	156.0		216.0	264.0	264.0	240.0	264.0	237.6	118.6	111.0	2,363.2
ETC	172.4	189.6	195.6	208.0	240.0	250.9	256.4	234.2	272.4	217.8	127.8	169.6	2,534.8
PM Project Management	132.0	103.3	114.7	114.7	114.7	126.2	126.2	114.7	126.2	126.2	120.5	120.5	1,440.0
Budget	66.0	51.6	57.4	57.4	57.4	63.1	63.1	57.4	63.1	63.1	60.2	60.2	720.0
ETC	66.0	51.6	57.4	57.4	57.4	63.1	63.1	57.4	63.1	63.1	60.2	60.2	720.0
SC Scientist	571.6	516.4	468.4	296.0	610.0	689.8	686.0	637.8	708.0	606.3	326.9	336.8	6,454.0
Budget	368.0	288.0	208.0		288.0	352.0	352.0	320.0	352.0	281.6	89.6	89.6	2,988.8
ETC	203.6	228.4	260.4	296.0	322.0	337.8	334.0	317.8	356.0	324.7	237.3	247.2	3,465.2
FTEM	9.5	10.7	9.4	5.5	10.3	10.5	10.2	10.7	12.2	10.7	6.1	6.4	112.2
EE Electrical Engineer	2.4	2.6	2.8	1.1	2.0	1.9	1.6	2.0	3.4	3.1	1.4	1.4	25.6
Budget	1.5	1.1	1.1		0.9	1.0	0.9	1.0	2.0	1.7	0.7	0.7	12.4
ETC	0.8	1.6	1.7	1.1	1.1	1.0	0.8	1.0	1.4	1.3	0.6	0.8	13.2
IT Information Technology	2.8	3.2	2.5	1.5	3.2	3.3	3.4	3.4	3.5	2.9	1.7	1.9	33.2
Budget	1.7	1.7	1.1		1.5	1.7	1.7	1.7	1.7	1.5	0.8	0.8	15.9
ETC	1.1	1.5	1.4	1.5	1.7	1.6	1.7	1.7	1.8	1.4	0.9	1.1	17.2
PM Project Management	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	9.8
Budget	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	4.9
ETC	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	0.4	4.9
SC Scientist	3.5	4.1	3.3	2.1	4.3	4.5	4.4	4.5	4.6	3.9	2.2	2.3	43.7
Budget	2.3	2.3	1.5		2.0	2.3	2.3	2.3	2.3	1.8	0.6	0.6	20.2
ETC	1.3	1.8	1.8	2.1	2.3	2.2	2.2	2.3	2.3	2.1	1.6	1.7	23.5
F-BDN-AYS	127,511.8	111,227.7	112,684.0	65,666.3	113,276.6	125,775.1	121,114.5	115,661.7	154,269.8	137,463.4	76,030.7	82,188.0	1,342,869.6
EE Electrical Engineer	44,480.7	38,780.8	45,714.5	18,304.3	32,051.9	34,613.4	29,194.2	31,948.9	60,164.8	54,660.9	23,045.7	24,224.3	437,184.5
Budget	28,962.5	15,477.6	17,192.2		14,180.1	17,331.2	15,292.2	15,755.6	35,681.8	30,659.3	11,962.7	11,341.8	213,837.0
ETC	15,518.1	23,303.3	28,522.3	18,304.3	17,871.8	17,282.3	13,902.0	16,193.3	24,483.0	24,001.6	11,083.0	12,882.5	223,347.4
IT Information Technology	61,226.1	55,382.0	48,008.7	28,401.0	62,263.8	70,304.7	71,063.3	64,751.9	73,248.0	61,945.5	33,076.0	38,054.7	667,725.7
Budget	37,686.0	29,493.4	21,300.8		29,493.4	36,047.5	36,047.5	32,770.4	36,047.5	32,203.3	15,628.8	14,897.0	321,615.4
ETC	23,540.1	25,888.6	26,707.9	28,401.0	32,770.4	34,257.2	35,015.8	31,981.5	37,200.5	29,742.2	17,447.2	23,157.8	346,110.3
PM Project Management	21,805.1	17,064.8	18,960.9	18,960.9	18,960.9	20,857.0	20,857.0	18,960.9	20,857.0	20,857.0	19,909.0	19,909.0	237,959.5
Budget	10,902.5	8,532.4	9,480.5	9,480.5	9,480.5	10,428.5	10,428.5	9,480.5	10,428.5	10,428.5	9,954.5	9,954.5	118,979.7
ETC	10,902.5	8,532.4	9,480.5	9,480.5	9,480.5	10,428.5	10,428.5	9,480.5	10,428.5	10,428.5	9,954.5	9,954.5	118,979.7

CAMs Address Deviations from Plan

Now How Would You Answer?



“**How** do you let your PM know there will be an increase (or decrease) in cost or schedule?”

“**When** do you let your PM know there will be an increase (or decrease) in cost or schedule?”

Why do you notify PM?

FNAL Procedure 12.PM-007 Change Control

3.1 Customer is responsible for

- Reviewing, approving, and disapproving BCRs in accordance with the PEP

3.2 Project Manager (PM) is responsible for

- Identifying potential changes
- Reviewing, approving, and disapproving BCRs
- Differentiating BCRs that should be processed from updates to Estimates to Complete/Estimates at Completion (ETC/EAC) that are more accurately characterized as variances.
- Notify Control Account Managers of any changes which could affect their control accounts.

Baseline Change Request

3.3 Change Control Board

- Identifying potential changes
- Ensures cross-functional needs of the project are evaluated
- Evaluates the necessity, merits, and impacts of BCRs
- Ensures technical performance, scope, schedule, and risks are evaluated

FNAL Procedure 12.PM-007 Change Control

3.4 Control Account Manager (CAM) is responsible for

- Identifying potential changes
- Preparing BCRs in conjunction with Project Controls
- Reviewing, approving, and disapproving applicable CRs
- Submitting BCRs to Project Manager

3.5 Project Controls is responsible for

- Helping determine impact of and validating BCRs
- Recording approval/disapproval and implementation of BCRs
- Incorporating approved changes into the PMB
- Ensure that all changes are consistent with the EVMS processes

3.6 Project Financial Analyst is responsible for

- Helping determine impact of and validating BCRs
- Updating Statements of Work and corresponding purchase orders/contracts with non-FRA entities when they are impacted by an approved change.

Fermilab Earned Value Management System Description

6.0 CHANGE CONTROL

Change control ensures that any project changes are identified, evaluated, coordinated, controlled, reviewed, approved, and documented in a manner that best serves the project. This process is discussed in the *Change Control* (EVMS Procedure 12.PM-007).

6.1 CHANGE-CONTROL PROCESS

6.1.1 Objective

Change control has the following objectives:

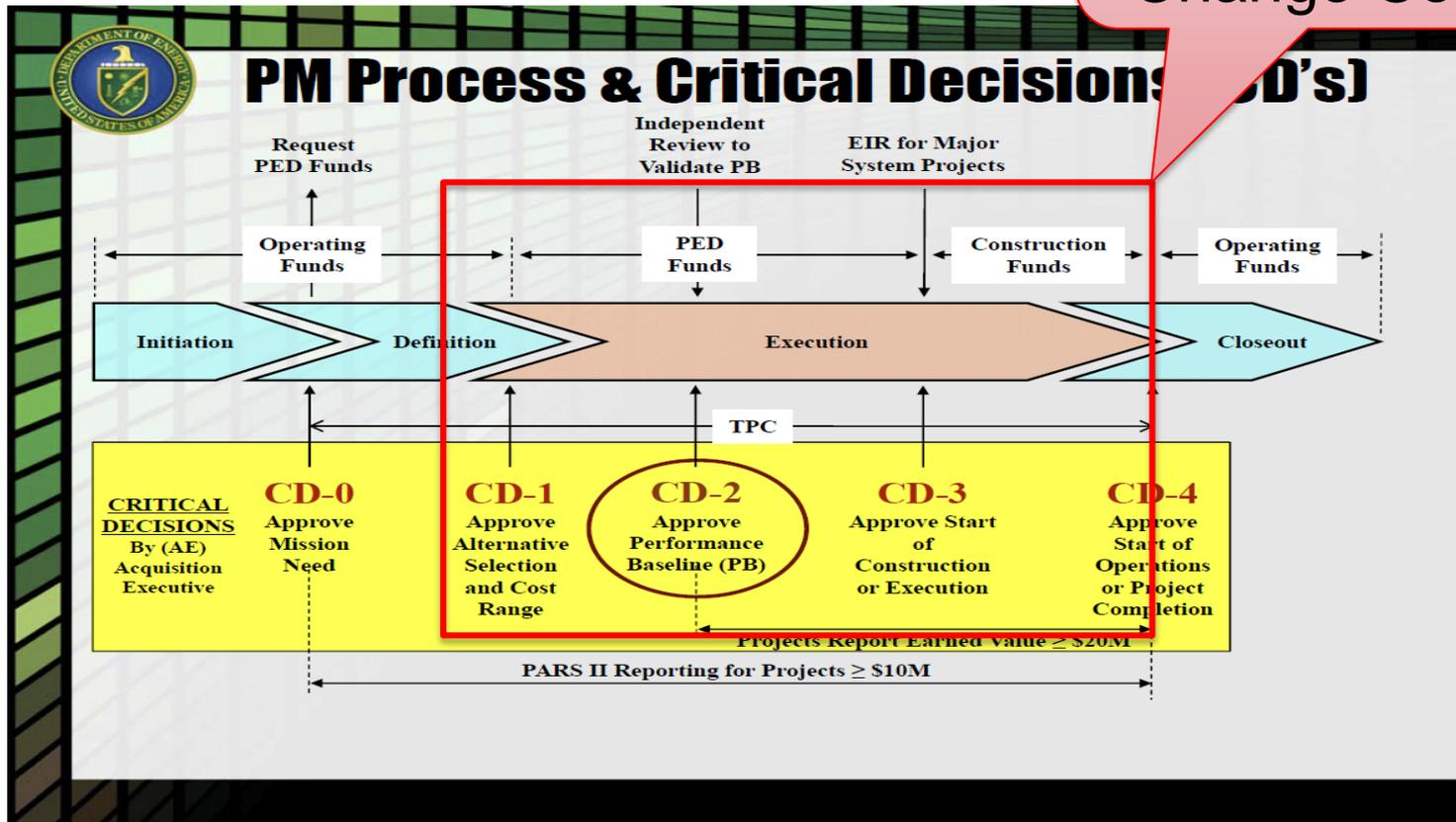
- Delineates the methods used to ensure the integrity of the project's cost, schedule, and work-scope baseline.
- Enables the implementation of timely and auditable changes to the baseline.
- Ensures that no work is performed without prior authorization.

DOE O 413.3B establishes change control requirements for DOE projects. All major projects will implement similar requirements in project procedures for change control. Change control processes begin after CD-1 for design activities (scope/budget/schedule) and between CD-1 and CD-2 for the working baseline. Change control processes continue when the performance measurement baseline is approved, and are in effect through CD-4.

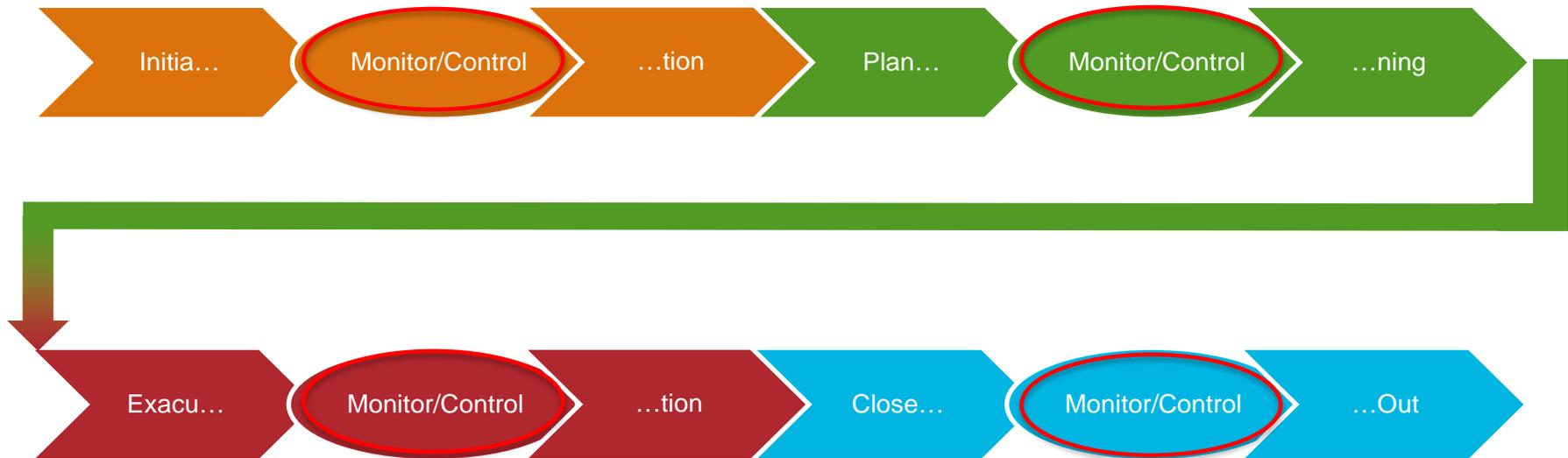
Project Life Cycle – Models Review



Begin then Implement Change Control



Project Life Cycle – Monitor & Control Review



Monitor & Control Cycle

- Measure
- Evaluate
- Correct



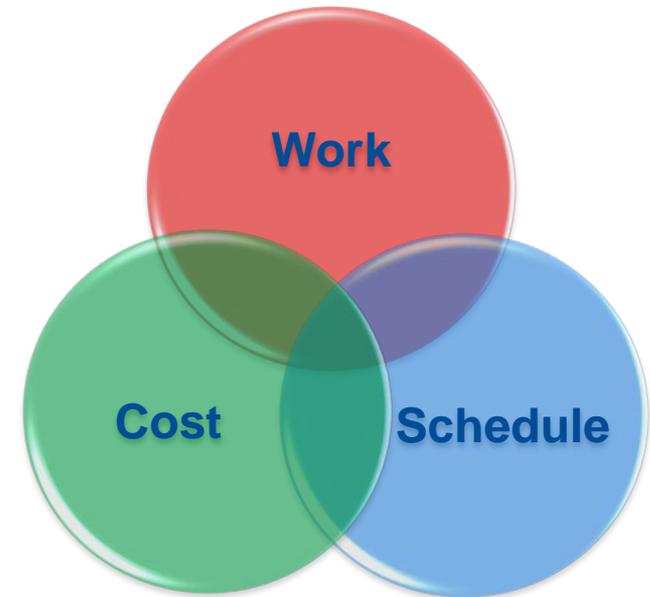
Why We Monitor/Control and Initiate Change Control



Change Management – Primary Goal is Manage/Control

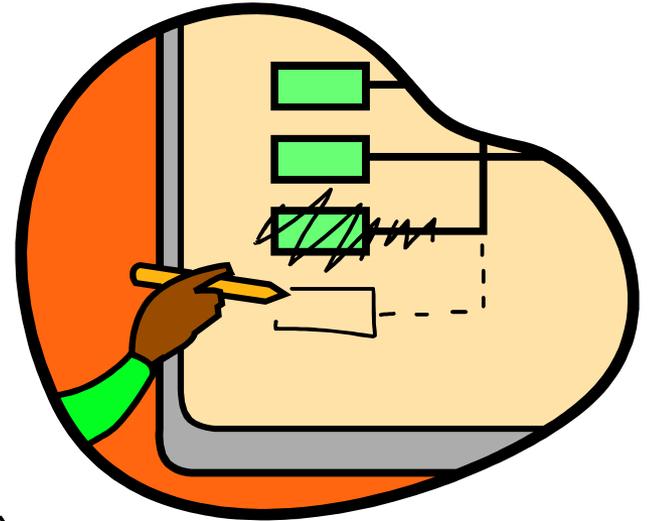
Control Deviations from Original Plan

- **Work**
 - Defined Scope
 - Performed Scope
- **Cost**
 - Budget
 - Actual
- **Schedule**
 - Baseline
 - Actual



Types of Change

- **Scope/Schedule/Cost**
 - Internal Re-planning & Changes
 - Changed Conditions
 - Better Mouse Trap
 - Missed Scope (requires FPD Approval)
 - Realized Risks
 - External/Directed (Added Scope)
 - Authorized Unpriced Work (Field Changes)
- **Administrative**
 - Coding
 - Typographical
 - Description Clarification



Where to Find Change Thresholds

- Appendix C of Change Control Procedure (Guidance)
- PEP – Project Specific

Table 6.0
Mu2e Project
Change Control Levels

	L1 Deputy Director for Science Programs	L2 Associate Director of Science for HEP	L3 Federal Project Director*	L4 Fermilab/Mu2e Project Manager
Scope	Any change in scope and /or performance that affects the ability to satisfy the mission need or is not in conformance with the current approved PEP Section 2.1 and PDS.	Any addition to scope as described in PEP section 2.1 or major changes in technology or approach to Level 2 WBS components as shown in Section 2.4.	Major changes in technology or approach to Level 3 WBS components as shown Appendix 2.	Major changes to WBS below Level 3.
Cost	Increase in TPC, TEC, or OPC as shown in Table 2.2.	Any contingency usage over \$5M for a single item or any cumulative change greater than 50% of a Level 2 WBS.**	Cumulative contingency use of \$1M.**	Any change that increases the cost of a single item by more than \$50k.
Schedule	Any change to CD-4 date as shown in Table 2.3.	Any changes to Tier 1 milestone as shown in Table 2.3.	Any changes to Tier 2 milestone shown in Table 2.3.	Any changes to milestones below Tier 2.
Funding		Any changes to funding profile as shown in Section 2.5 that negatively impacts the Performance Baseline.		

* Any contingency usage will require the approval by the FPD or Federal personnel. Contingency use up to the \$1M threshold is considered management reserve. This threshold may be reduced at the FPD discretion based on the progress and remaining risks of the project.

** After the cumulative threshold has been reached and the next higher change authority has been notified and has approved the changes, the cumulative cost thresholds will reset.

Questions about Change - CCB

What is a Change Control Board (CCB)?

12.PM-007	Change Control	12.PM-007.DT-01 - NOvA Change Request Procedures doc-2968
		12.PM-007.DT-02 - NOvA Project Office Procedures for Processing Open Plan Baseline Change Requests
		12.PM-007.DT-03 - Guidelines for Rate Changes
		12.PM-007.DT-04 - Contingency MR & UB

“The CCB ensures technical performance, scope, cost, schedule, and associated risk impacts are understood and documented. CCB membership typically consists of key members of the project management team, including level 2 managers, the ES&H officer, the QA manager, the Project Controls Manager/Lead, and others as appropriate. The Project Controls Manager/Lead will ensure that all changes are consistent with the EVMS processes. The Project Technical Board or the Project Management Group may also serve as the Change Control Board provided that these groups include the necessary membership. The composition, duties, and responsibilities of the CCB will be included in the Project Management Plan template.”

Questions about Change – Contingency, UB, MR

I hear about Contingency, Undistributed Budget, and Management Reserve.

- What are they?
- Why should I Care?

12.PM-007	Change Control	12.PM-007.DT-01 - NOvA Change Request Procedures – doc-2968 12.PM-007.DT-02 - NOvA Project Office Procedures for Processing Open Plan Baseline Change Requests 12.PM-007.DT-03 - Guidelines for Rate Changes 12.PM-007.DT-04 - Contingency MR & UB
-----------	----------------	--

Contingency = Created by a Combination of Estimate Uncertainty (Bottom-up) & Risk Mitigation (Top-Down) allowances.

Undistributed Budget (UB) = Money Approved but Temporarily not Allocated to Discrete WBS/Activities. Addressed in CA's EAC.

Management Reserve (MR) = Tool for tracking Cumulative total of Contingency transferred to active budget via Change Control. Note: The portion of contingency retained by PM and is equal to PM's approval threshold

More Questions about Change

Who Owns Contingency?

1. CAM
2. PM
3. Funding Agency



Why Do I need to Think About Change Control?

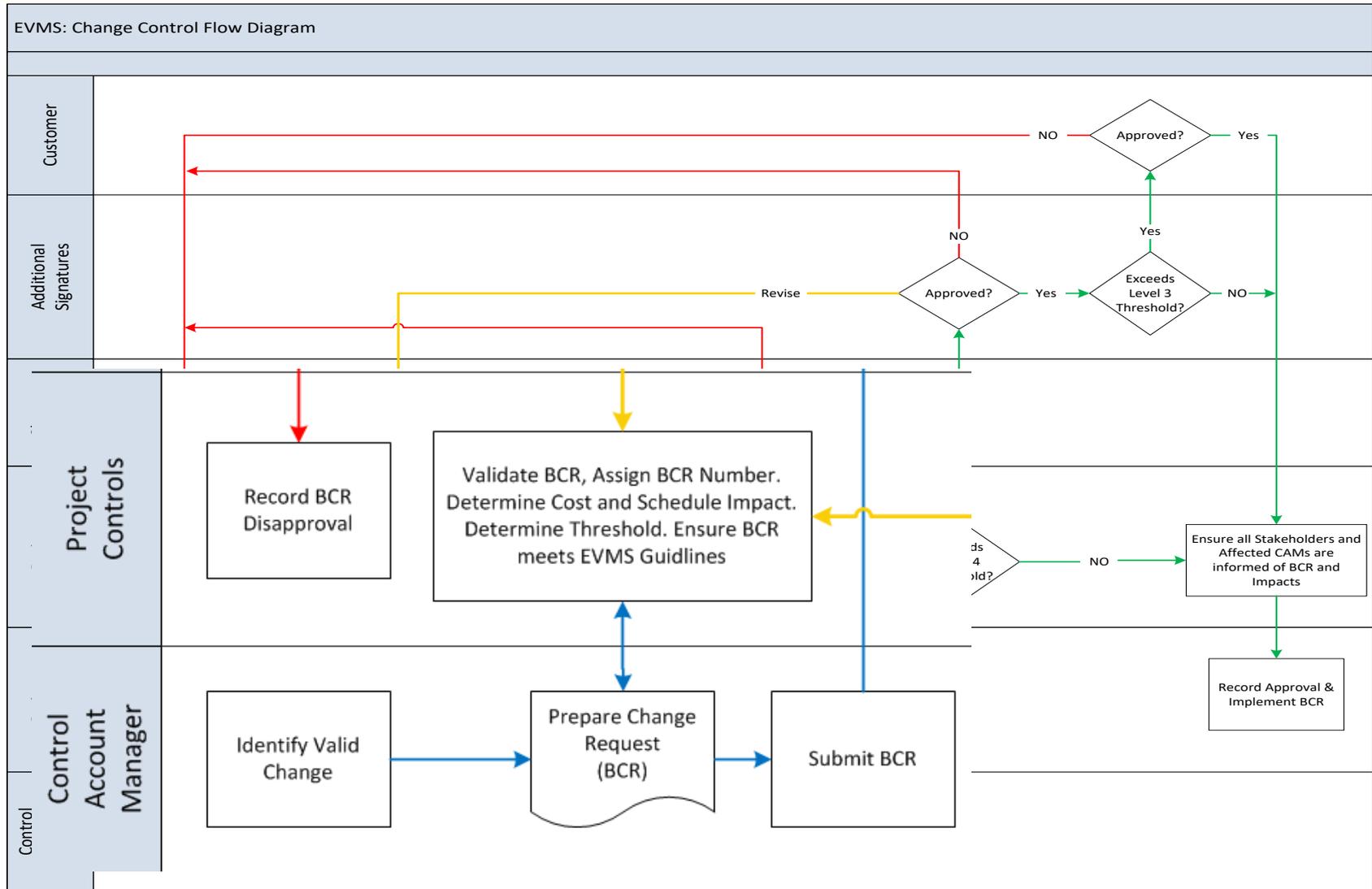
- Responsibility
- Manage
- Inform



How Long Does it Take to Process a Change?



Change Flowchart



Questions regarding Change – Initiating BCR

- Who Can Initiate A BCR?

- Anyone on Project
- Client



- When Can I Initiate BCR?

- Approved Prior to Work Start
 - Future = Managing Scope
 - ~~Past = Reaction Managed~~
- Field Changes (Construction Only)



FNAL Procedure 12.PM-007 Change Control - Clarification

- 3.4 **Control Account Manager (CAM) is responsible for**
- Identifying potential changes
 - Preparing BCRs in conjunction with Project Controls
 - Reviewing, approving, and disapproving applicable CRs
 - Submitting BCRs to Project Manager

What does this mean?

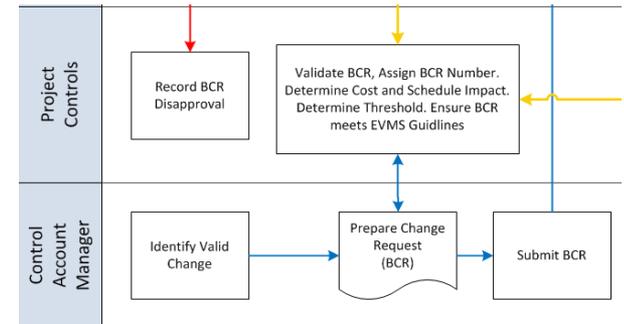
Change Request

- Response to Who can Initiate
- Addresses CAM's
 - Ability to Manage
 - Approve Means
 - Preliminary
 - Continues through Process
 - PM/CCB ultimate approval/disapproval

Questions regarding Change – Action Steps

- What Actions Do I take when Change is Identified?

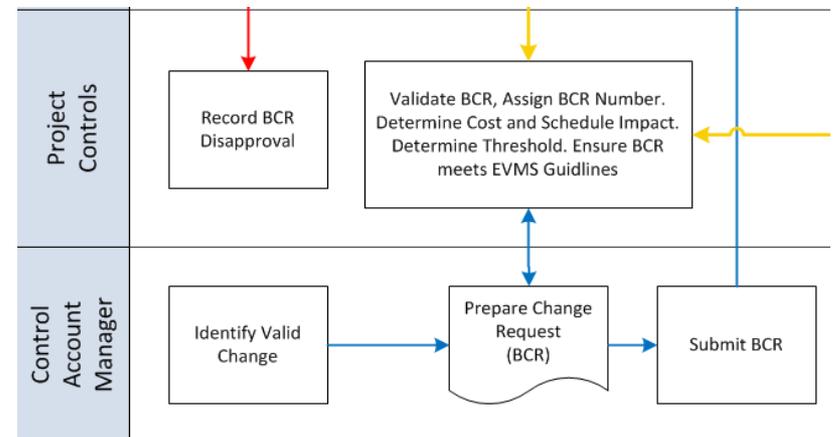
- Start Documentation Process
- Iterative Process With PCS
- Communicate
 - Alternatives
 - Impacts
 - Urgency
 - Consequence of Not Approving
- Submit BCR
- Wait for Approval



Change Control Process

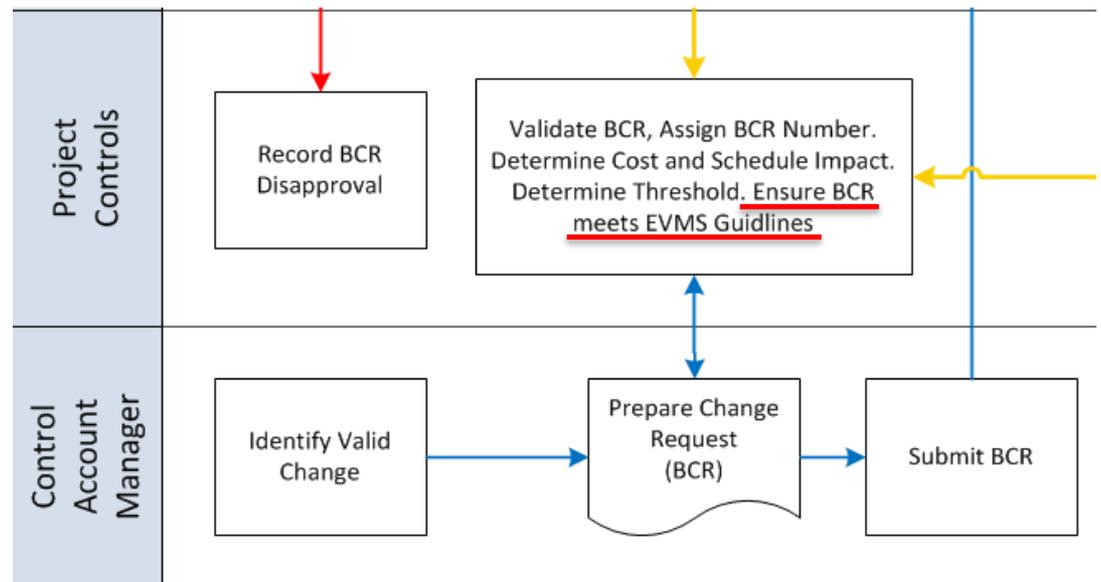
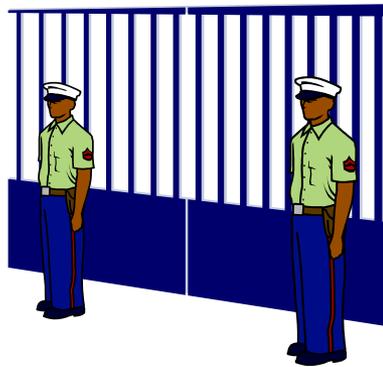
Steps to Change Control:

- 1. Prepare supporting documentation [CAM]
- 2. Fill out and submit Baseline Change Request (BCR) Form in BCR Tool [CAM]
- 3. Enter routing data into BCR database [Config Mgr]
- 4. Obtain approvals – depends on BCR Level [Config Mgr]
- 5. Update cost & schedule information in P6 & Cobra, and finalize BCR database entries [PCS] → *details Beyond Scope of this Training*
- 6. Then actually process the changes...



Questions regarding Change – Gate Keeper

I have Some Changes to Make, but my PCS won't Process them Now - **Why?**



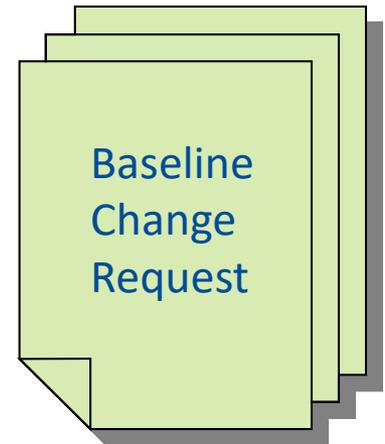
Change Control – PCS Limitations

- Can Take Days or Weeks to Process
- PM – Prioritizes / Approves
- EVMS Guidelines
 - Can NOT Change History
 - Future ONLY with Four Exceptions
 - Rate Changes
 - Obvious Errors
 - Establishing PMB
 - Contract Changes



Change Control System – Formal Documented Process

- **Identified Change**
 - How
 - When
 - Type
- **When Work can Start**
 - Work Authorization & BCR Approval
 - Demonstrate Management
 - Demonstrates Control
- **Impacts of Change**
 - Cost
 - Schedule
 - Scope
 - Risks
 - ✓ Quality
 - ✓ Safety
- **Authority / Responsibility** for Approvals



Baseline Change Request Tool

BCR Tool database is used to Manage Changes.

- Data Input source is BCR form
- Approval Workflow and Routing controlled by Change Manager in Tool
- Tracks approval status
- Records cost impact (both Preliminary and Final amounts) by type (M&S or Labor) and by Labor resource
- Also records schedule impacts (Reflected in P6 Schedule)
- Prints detailed report for each BCR
- Database maintained by OPSS

Change Request Form – Generated by BCR Tool

Fermilab FNAL - Baseline Change Request Tool Richard Marcum

Home Baseline Change Request (BCR) Reports Awaiting Approval Implement a BCR **Account** ?

BCR Number: HL-LHC AUP_0004 Status: Draft

* = required field

Details

*Title:

WBS Number:

*Type of change:

Select at least one type of change.

Cost Schedule Technical Other

Categories:

Directed Change Error or Omission Administrative Change Claims
 Requirements Change Field Condition Design Progression Test
 Scope Change

Detailed Description:

*Impact / Justification

Include consequences of not approving. Risk, ESH, Interface, and Scientific impacts

Attachments/Links

Detail of Preliminary Cost/Schedule Changes

Additional Control Accounts

Relate any additional control accounts that are not in cost or schedule changes

*Approval Workflow

Watchlist

Status Comments:

Write/edit any additional comments about the status of this BCR.

Organization > Office of the Chief Project Officer > Office of Project Support Services > fBCR - Documentation

Home OPSS Website CAM eToolbox fBCR - Documentation

Fermilab Contents

Getting Started

Login
Main Screen
BCR Lifecycle

User Types

General User

Create a BCR
Edit a BCR
Add Cost Changes
Add Schedule Changes
Add Attachments
Add Control Accounts
Requesting Review
Cancel
Searching
Report by CA
Custom Reports

Reviewer

Edit Workflow
Ready to Submit

Submitter

Submit for Approval

Approver

Approve
Send to Draft
Reject
Implementation Mar.

Last modified at 2/15/2018 11:12 AM by Julian Badillo Rojas

Getting Started

The **Fermilab Baseline Change Request Tool (fBCR)** is the main tool for tracking and keeping record of all changes requested over a project baseline (BCRs), in line with the EVMS framework adopted by the Fermilab.

To access fBCR go to:

- **Test environment:** <https://fbc-dev.fnal.gov/> (Only accessible from Fermilab or through a secure VPN).
- **Production environment:** <https://fbc.fnal.gov/>

Requirements

For using the fBCR you only need:

- A browser with javascript support on:
 - Mozilla 4.0 or above
 - Internet Explorer 10.0 or above (Edge).
 - Chrome 20.0 or above.
 - Safari 9.0 or above.
- A Fermilab Services Account.

Login

For accessing the fBCR tool you need:

- A **Fermilab Services Account**.
- Your fBCR administrator should add at least the **Reader** role on your account.

Otherwise, you'll see a message like this, right after logging in:

Your session has expired.

Your session has timed out, please [Login again](#).

If this is the first time you login into fBCR, please contact the system administrator to add your user/roles to the system.

For logging out, click on the **Account** → **Logout** option on the main menu.

Change Request Form – Generated by BCR Tool (Cont.)

 FNAL - Baseline Change Request Tool

Home | Baseline Change Request (BCR) | Reports | Awaiting Approval | Implement a BCR **1** | Account | ?

BCR Number: HL-LHC AUP_0004

* = required field

Details

*Title:

WBS Number:

*Type of change:

Select at least one type of change.

Cost Schedule Technical Other

Categories:

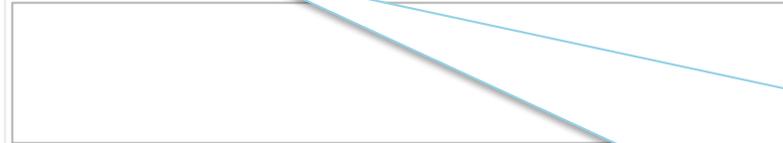
Directed Change Error or Omission Administrative Change Claims
 Requirements Change Field Condition Design Progression Test
 Scope Change

Title: Very Brief Summary

WBS Number: Single Lowest common WBS Element that encompasses all work.
Example 1: Work affects the following WBS elements 123.01.02, 123.01.04, 123.01.06 then Lowest common WBS Element would be 123.01
Example 2: Work affects the following WBS elements 1234.01.02, 123.01.04, 123.02.01 then Lowest common WBS Element would be 123

Change Request Form – Generated by BCR Tool (Cont.)

Detailed Description:



*Impact / Justification

Include consequences of not approving, Risk, ESH, Interface, and Scientific impacts



Attachments/Links



Describe all details of the change such as why it is needed, How need was discovered, Basic BOE information – what is the Basis for the Change (remember the BCR is used instead of BOE and should contain equivalent back-up. Can use Attachments later but at least brief description and note that will bring reviewers to attachment)

Include Consequences of NOT approving this Change. Also, specify and Risk, ESH, Interface, and Scientific impacts.

Change Request Form – Generated by BCR Tool (Cont.)

Detail of Preliminary Cost/Schedule Changes

Additional Control Accounts

Relate any additional control accounts that are not in cost or schedule changes

*Approval Workflow

Watchlist

Status Comments:

Write/edit any additional comments about the status of this BCR.

Filled out by Change Manager and Read Only for CAM after Request is Submitted.

Who will be Notified. Edited out by Change Manager and Read Only for CAM after Request is Submitted.

Example: Change Request Detail Report



Mu2e Change Request

Mu2e CR Num 3

Date submitted: 8/20/2014

Change Level: 4

Requestor: Frances Leavell

Request Status: Approved

Change_type:
 Cost

Supporting Documents:
4470

L2 Subprojects:
All

WBS: 475
 WBS Description: Mu2e Project

Approvals: CCB OK:

Ron Ry 8/29/14
 Project manager Date Approved

Description: Routine rate adjustments were made in July 2014 by Finance to more accurately reflect labor fringe and DSC overhead rates. The new rates were applied to the project resources. Cost impact: net decrease of \$21,549,86.

Justification: Implementing the new rates provides up-to-date pricing of resources.

Cost Impacts:

Estimate type	Cost type	Labor resource type	Before amount	After amount	Cost Units
Final	M&S	none	107,025,671	106,434,256	dollars
Final	Labor	various	110,808,408	111,378,273	dollars

Schedule Impacts:

Task Description	Before			After			Duration units
	Start	End	Duration	Start	End	Duration	
none							

Technical Impact: None

Risk Impact: None

This printable form is produced by Access for each BCR.

- Stored as PDF in DocDB
- Contains signature box for approvals
- Lists cost, schedule impacts, supporting documents, change type and level, affected L2 subprojects, WBS, justification, technical & risk impacts...

Example: Change Request Log (Summary)

PROJECT_BCR_log.xlsx

Baseline Change Summary Log

- Summary record of all changes
- Tracks contingency and mgmt reserve used

Project Baseline Change Summary

	BCWS	MR	Contingency	TCP	Start Date	Finish Date
Original Baseline	\$ 218,549,966	\$ 1,000,000	\$ 52,450,033	\$ 271,000,000		
Current Net Approved Adjusted Base Line	\$ 219,267,777	\$ (611,163)	\$ 55,020,385	\$ 273,677,000		

Project Log of Baseline Change Requests

BCR #	Description of change	Date Submitted	Level	BCWS Impact	MR Impact	Contingency Impact	TPC Impact	Schedule Impact (Days)	Approval Status	Date of Last Status	Month-Year of BCR Implementation	Reference Document
001	changes to remote target handling control room	8/20/2013	3	\$ 95,489	\$ (95,489)	\$ -	\$ -	0	approved			4412
002	recommendations from Director's Review.	8/8/2014	3	\$ 361,274	\$ (361,274)	\$ -	\$ -	9	approved			4448
003	New rate adjustments for labor fringe and overhead.	8/20/2014	3	\$ (21,550)	\$ 21,550	\$ -	\$ -	0	approved			4473
004	Cost leveling, new CD-3c strategy	10/2/2014	3	\$ 500,080	\$ (500,080)	\$ -	\$ -	-7	approved			4599
005	Resource/Code corrections	10/29/2014	3	\$ (34,284)	\$ 34,284	\$ -	\$ -	0	approved			4705
006	Corrections made to CRO02	11/7/2014	3	\$ (172,650)	\$ 172,650	\$ -	\$ -	0	approved			4731
007	Changes due to DOE Review recommendations	11/12/2014	2	\$ 78,083	\$ (78,083)	\$ -	\$ -	30 days (T2)	approved		Nov-14	4736
008	FY 15 Rate changes	11/13/2014	3	\$ (1,699,794)	\$ 806,442	\$ 893,352	\$ -	0	approved		Nov-14	4749
009	include central ES&H support	11/21/2014	3	\$ 518,178	\$ (518,178)	\$ -	\$ -	0	approved		Dec-14	4837
010	Solenoid (prototype TS coil module), minor CRV and Muon Beam line changes	11/24/2014	3	\$ 203,446	\$ (203,446)	\$ -	\$ -	47 days (T4)	approved		Dec-14	4840
011	CD-2/3b Approval Delay	12/11/2014	2	\$ 73,574	\$ (73,574)	\$ -	\$ -	76 days (T2)	approved		Dec-14	4969
012	PS & DS contract terms; Accelerator design reviews	1/7/2015	2	\$ 815,964	\$ (815,964)	\$ (1,000,000)	\$ -	68 days (T2)	approved	28-Jan-2015	Feb-15	5029
--	DOE Increased funding - extra amount added to contingency	1/26/2015				\$ 2,677,000	\$ 2,677,000		approved			

Approved Net Impact	\$ 717,811	\$ (1,611,163)	\$ 2,570,352	\$ 2,677,000
Pending Net Impact	\$ -	\$ -	\$ -	\$ -
Total Net Impact	\$ 717,811	\$ (1,611,163)	\$ 2,570,352	\$ 2,677,000

Data Check with Cobra change Log	\$ 219,267,776	\$ 1,000,000
Delta	\$ (1)	\$ 1,611,163

BCR Control Account Log (Control Account)

PROJECT_change_control_log.xlsx

Baseline Change Control Account Log

1 of 1

BCR #	BCR Description	Control Account	CAM	Prior Start	Revised Start	Start Impact (Days)	Prior Finish	Revised Finish	Finish Impact (Days)	Values		
										BAC Before	BAC After	Cost Impact Increase/(Decrease)
001										12,680,712.38	12,776,201.38	95,489.00
002										186,839,049.71	187,200,323.73	361,274.02
003										201,545,611.44	201,524,061.58	(21,549.86)
004										202,943,386.82	203,443,466.43	500,079.61
005										30,303,038.86	30,268,754.75	(34,284.11)
006										191,299,097.75	191,126,448.06	(172,649.69)
007										101,599,396.87	101,677,479.52	78,082.65
008										197,543,525.86	195,843,731.78	(1,699,794.08)
009										14,227,346.44	14,745,524.70	518,178.26
010										52,076,260.12	52,279,706.40	203,446.28
011	CD-2/3b Approval Delay	475.03.02	06758 N Lackowski, Thomas	7/2/2012	7/2/2012	0	2/15/2017	4/4/2017	-34	45,377.84	45,511.40	133.57
		475.03.04.01	06758 N Lackowski, Thomas	1/21/2015	1/21/2015	0	3/21/2016	5/6/2016	-34	12,991,260.76	13,058,780.11	67,519.35
		475.03.04.03	06758 N Lackowski, Thomas	4/8/2015	4/8/2015	0	10/15/2019	10/15/2019	0	752,873.32	758,424.48	5,551.16
		475.03.04.04	05374 N Coleman, Rick	11/21/2014	1/16/2015	0	6/3/2015	7/16/2015	-30	0.00	0.00	0.00
		475.03.05	06758 N Lackowski, Thomas	2/29/2016	2/29/2016	0	5/10/2017	6/28/2017	-39	374,466.35	374,836.53	370.18
011 Total										14,163,978.27	14,237,552.52	73,574.26
012										157,695,665.36	158,511,629.64	815,964.28
(blank)										0.00	0.00	0.00
Grand Total												717,810.60

Work Authorization Document (WAD)

Work Authorization Document

Control Account Information	
Control Account Manager:	Hays, Steven L
Control Account Number:	475.04.06
Control Account Description:	Magnet Power System

Period of Performance			
Start:	1/2/2013	Finish:	10/16/2018

WAD Scope
BCR# 004 Cost leveling; new CD-3c strategy_Impact: Cost \$19,039 & Sched Days 0
This includes design, analysis, procurement, assembly, acceptance testing, installation, commissioning and close-out activities for the magnet power system. The magnet power system includes the power supplies, the dump switch, and the dump resistor.

Budget	HOURS	DIRECT	BAC
Funding Type DOE.HEP.LNI.CNSTR	2,201.00	784,946.33	1,159,471.82
Labor	2,201.00	94,478.33	275,677.21
Material	0.00	690,468.00	883,794.62
Funding Type DOE.HEP.LNI.PED	2,582.95	78,361.73	330,113.86
Labor	2,582.95	53,810.65	305,562.78
Material	0.00	24,551.08	24,551.08
Total Budget:	4,783.95	863,308.06	1,489,585.68

Authorization Signatures	
CAM:	Date:
Project Manager:	Date:

WAD Attachments: Control Account Plan

3/2/2018

Control Account Plan

1 of 2

Pivot From BCF Data in K Dollars

Results DIRECT_AYS

Sum of Value		Cost Set												Budget Total													
Control Account Manager	Control Account	Fund Type	CA Start	CA Finish	CTC	WP	Resource TYPE	2013	2014	2015	AQ-1				AQ-2				AQ-3				AQ-4		2016	2017	Budget Total
Alber, Russell J	600.02 Project Management	DOE Non-F	2/10/2014	7/31/2017	600.PM01 600.0	600.02.01.1040	L Labor	152.51		47.97	1/31/2015	2/28/2015	3/31/2015	4/30/2015	5/31/2015	6/30/2015	7/31/2015	8/31/2015	9/30/2015								
						600.PM01	M Material		34.58																180.48		
						600.PM02	M Material		145.50																325.98		
						900.PM01 900.01.01	Project Management Preliminary Design (PED) Total		310.59	47.97															308.56		
						600.PM02 600.0	L Labor				34.85	37.97	37.97	34.83	37.97	36.57									220.14		
						900.PM02 900.01.02	Project Management Final Design (PED) Total				34.85	37.97	37.97	34.83	37.97	36.57									220.14		
						DOE Non-FP, SU, PED DOE Science Laboratories Infrastructure PED Fundin Total		310.59	47.97	34.85	37.97	37.97	34.83	37.97	36.57										578.71		
						DOE Non-F	2/10/2014	7/31/2017	600.PM03 600.0	600.02.05.1040	L Labor							2.40	50.49	50.49					305.59		
						600.PM03	M Material											151.07	475.01						854.07		
						900.PM03 900.01.03	Project Management Construction (LIC) Total											2.40	50.49	50.49	131.07	626.33	633.99		944.70		
						600.PM04 600.0	L Labor																		245.86		
						900.PM04 900.01.04	Project Management Closeout (LIC) Total																		245.86		
						DOE Non-FP, SU, CNST DOE Science Laboratories Infrastructure Construct Total												2.40	50.49	50.49	151.07	626.33	509.55		1,100.56		
						DOE Non-F	2/10/2014	9/30/2016	600.HV01 600.02	600.02.01.01.1020	M Material	355.55	-49.93												305.41		
						600.HV01	L Labor		47.79	7.85															55.63		
						900.HV01 600.02.01	HV Electrical Preliminary Design (PED) Total		393.34	-42.10															361.04		
						600.HV02 600.02	600.02.01.02.1020	M Material			16.15	16.94	19.26	16.11	16.92	17.95										107.33	
						600.HV02	L Labor			36.01	61.61	14.00														151.83	
						600.HV02 600.02.02	HV Electrical Final Design (PED) Total				72.16	88.55	199.36	46.02	161.10	59.29	20.66									644.73	
						DOE Non-FP, SU, PED DOE Science Laboratories Infrastructure PED Fundin Total		655.51	-42.10	72.16	88.55	199.36	46.02	161.10	59.29	20.66										1,108.15	
						DOE Non-F	2/10/2014	9/30/2016	600.HV03 600.02	600.02.01.05.1020	L Labor															80.53	
						600.HV03	M Material																			34.59	
						600.HV03 600.02.03	HV Electrical Construction (LIC) Total																			43.24	
						600.HV03 600.02.01	M Material																			391.89	
						600.HV03 600.02.02	M Material																			459.87	
						600.HV03 600.02.03	M Material																			459.87	
						600.HV03 600.02.04	M Material																			459.87	
						600.HV03 600.02.05	M Material																			459.87	
						600.HV03 600.02.06	M Material																			459.87	
						600.HV03 600.02.07	M Material																			459.87	
						600.HV03 600.02.08	M Material																			459.87	
						600.HV03 600.02.09	M Material																			459.87	
						600.HV03 600.02.10	M Material																			459.87	
						600.HV03 600.02.11	M Material																			459.87	
						600.HV03 600.02.12	M Material																			459.87	
						600.HV03 600.02.13	M Material																			459.87	
						600.HV03 600.02.14	M Material																			459.87	
						600.HV03 600.02.15	M Material																			459.87	
						600.HV03 600.02.16	M Material																			459.87	
						600.HV03 600.02.17	M Material																			459.87	
						600.HV03 600.02.18	M Material																			459.87	
						600.HV03 600.02.19	M Material																			459.87	
						600.HV03 600.02.20	M Material																			459.87	
						600.HV03 600.02.21	M Material																			459.87	
						600.HV03 600.02.22	M Material																			459.87	
						600.HV03 600.02.23	M Material																			459.87	
						600.HV03 600.02.24	M Material																			459.87	
						600.HV03 600.02.25	M Material																			459.87	
						600.HV03 600.02.26	M Material																			459.87	
						600.HV03 600.02.27	M Material																			459.87	
						600.HV03 600.02.28	M Material																			459.87	
						600.HV03 600.02.29	M Material																			459.87	
						600.HV03 600.02.30	M Material																			459.87	
						600.HV03 600.02.31	M Material																			459.87	
						600.HV03 600.02.32	M Material																			459.87	
						600.HV03 600.02.33	M Material																			459.87	
						600.HV03 600.02.34	M Material																			459.87	
						600.HV03 600.02.35	M Material																			459.87	
						600.HV03 600.02.36	M Material																			459.87	
						600.HV03 600.02.37	M Material																			459.87	
						600.HV03 600.02.38	M Material																			459.87	
						600.HV03 600.02.39	M Material																			459.87	
						600.HV03 600.02.40	M Material																			459.87	
						600.HV03 600.02.41	M Material																			459.87	
						600.HV03 600.02.42	M Material																			459.87	
						600.HV03 600.02.43	M Material																			459.87	
						600.HV03 600.02.44	M Material																				

BCR Documentation: Validation Reports (CA Impact i.e. Before & After)

Muon g-2 BCR111 (example).xlsx

BCR Implementation Control Account Impact

1 of 1

BCR Comparison Data in K Dollars

Prior Fund Type

DOE.HEP.MIE DOE-...

DOE.HEP.OPC DOE-...

EC Early Career Grant

In Kind In-Kind Contri...

NSF National Scienc...

(blank)

BCR Fund Type

DOE.HEP.MIE DOE-H...

DOE.HEP.OPC DOE-...

EC Early Career Grant

In Kind In-Kind Contri...

NSF National Scienc...

(blank)



BCR #	BCR Description	WBS L2	CAM	Control Account	Control Account Description	Prior BAC	Revised BAC	Cost Impact	Prior Start	Revised Start	Start Impact (Days)	Prior Finish	Revised Finish	Finish Impact (Days)
111	Test of Reporting Data	476.01 Project Management	Polly, Chris	476.01	476.01 Project Management	3,974	4,037	-63	10/1/2012	10/1/2012	0	4/11/2017	4/11/2017	0
		476.01 Project Management Total				3,974	4,037	-63			0			0
111	Test of Reporting Data	476.02 Accelerator	Convery, Mary	476.02.01	476.02.01 Accelerator Project Management	2,622	2,622	0	10/1/2012	10/1/2012	0	4/13/2017	4/13/2017	0
111	Test of Reporting Data	476.02 Accelerator	Drendel, Brian	476.02.04	476.02.04 Controls & Instrumentation	1,822	2,089	-217	10/1/2012	10/1/2012	0	3/13/2017	3/13/2017	0
111	Test of Reporting Data	476.02 Accelerator	Morgan, Jim	476.02.03	476.02.03 Beamlines	11,768	11,451	317	10/1/2012	10/1/2012	0	3/30/2017	3/30/2017	0
111	Test of Reporting Data	476.02 Accelerator	Still, Dean	476.02.02	476.02.02 Target Station	1,548	1,652	-105	10/1/2012	10/1/2012	0	12/29/2016	12/29/2016	0
		476.02 Accelerator Total				17,759	17,764	-4			0			0
111	Test of Reporting Data	476.03 Ring	Allspach, Delwyn H	476.03.02	476.03.02 Magnet	3,473	3,446	27	10/1/2012	10/1/2012	0	2/19/2016	2/19/2016	0
111	Test of Reporting Data	476.03 Ring	Allspach, Delwyn H	476.03.04	476.03.04 Storage Ring Vacuum	713	744	-31	10/1/2012	10/1/2012	0	7/15/2016	7/15/2016	0
111	Test of Reporting Data	476.03 Ring	Allspach, Delwyn H	476.03.07	476.03.07 Controls & Instrumentation	658	658	0	10/1/2012	10/1/2012	0	10/29/2015	10/29/2015	0
111	Test of Reporting Data	476.03 Ring	Nguyen, Hogan	476.03.01	476.03.01 Ring Project Management	1,143	1,143	0	10/1/2012	10/1/2012	0	4/13/2017	4/13/2017	0
111	Test of Reporting Data	476.03 Ring	Nguyen, Hogan	476.03.03	476.03.03 Inflector	1,138	1,138	0	10/1/2012	10/1/2012	0	8/2/2016	8/2/2016	0
111	Test of Reporting Data	476.03 Ring	Nguyen, Hogan	476.03.05	476.03.05 Kickers	1,155	1,155	0	10/1/2012	10/1/2012	0	8/2/2016	8/2/2016	0
111	Test of Reporting Data	476.03 Ring	Tishchenko, V.	476.03.06	476.03.06 Quadrupoles	824	824	0	10/1/2012	10/1/2012	0	6/20/2016	6/20/2016	0
111	Test of Reporting Data	476.03 Ring	Winter, Peter	476.03.08	476.03.08 Precision Field	1,129	1,129	0	10/1/2012	10/1/2012	0	6/27/2016	6/27/2016	0
		476.03 Ring Total				10,232	10,236	-5			0			0
111	Test of Reporting Data	476.04 Detectors	Casey, Brendan	476.04	476.04 Detectors	670	670	0	10/1/2012	10/1/2012	0	4/13/2017	4/13/2017	0
		476.04 Detectors Total				670	670	0			0			0
111	Test of Reporting Data	476.05 BNL Equipment Disassembly & Transport	Polly, Chris	476.05	476.05 BNL Equipment Disassembly & Transport	4,183	4,183	0	10/1/2012	10/1/2012	0	5/28/2014	5/28/2014	0
		476.05 BNL Equipment Disassembly & Transport Total				4,183	4,183	0			0			0
		Grand Total				36,819	36,890	-72			0			0

BCR Documentation: Validation Reports (History Unchanged)

Before-After change PivotTable.xlsx

BCR Implementation History Unchanged Validation

1 of 2

Pivot From Prior Data (in K Dollars)		Pivot From BCR Data (in K Dollars)		Prior Data - BCR Data (in K Dollars)	
Fund Type	(Multiple Items)	Fund Type	(Multiple Items)		
Results	F-BDN-AY\$	Results	F-BDN-AY\$		
Sum of Value	Cost Set	Sum of Value	Cost Set	Date	Budget
Date	Budget	Date	Budget		
10/31/2012	535	10/31/2012	535	10/31/2012	0
11/30/2012	465	11/30/2012	465	11/30/2012	0
12/31/2012	418	12/31/2012	418	12/31/2012	0
1/31/2013	488	1/31/2013	488	1/31/2013	0
2/28/2013	464	2/28/2013	464	2/28/2013	0
3/31/2013	486	3/31/2013	486	3/31/2013	0
4/30/2013	509	4/30/2013	509	4/30/2013	0
5/31/2013	509	5/31/2013	509	5/31/2013	0
6/30/2013	463	6/30/2013	463	6/30/2013	0
7/31/2013	509	7/31/2013	509	7/31/2013	0
8/31/2013	509	8/31/2013	509	8/31/2013	0
9/30/2013	450	9/30/2013	450	9/30/2013	0
10/31/2013	754	10/31/2013	754	10/31/2013	0
11/30/2013	623	11/30/2013	623	11/30/2013	0
12/31/2013	621	12/31/2013	621	12/31/2013	0
1/31/2014	467	1/31/2014	467	1/31/2014	0
2/28/2014	373	2/28/2014	373	2/28/2014	0
3/31/2014	375	3/31/2014	375	3/31/2014	0
4/30/2014	349	4/30/2014	349	4/30/2014	0
5/31/2014	845	5/31/2014	845	5/31/2014	0
6/30/2014	954	6/30/2014	954	6/30/2014	0
7/31/2014	812	7/31/2014	812	7/31/2014	0
8/31/2014	933	8/31/2014	933	8/31/2014	0
9/30/2014	1,232	9/30/2014	1,232	9/30/2014	0
10/31/2014	1,055	10/31/2014	1,055	10/31/2014	0
11/30/2014	959	11/30/2014	943	11/30/2014	16
				12/31/2014	884
				1/31/2015	1,308
				2/28/2015	939
				3/31/2015	1,501
				4/30/2015	1,050
				5/31/2015	725
				6/30/2015	1,055
				7/31/2015	1,364
				8/31/2015	873
				9/30/2015	585
				10/31/2015	1,235
				11/30/2015	944
				12/31/2015	697
				1/31/2016	623
				2/29/2016	639
				3/31/2016	641
				4/30/2016	861
				5/31/2016	450
				6/30/2016	337
				7/31/2016	264
				8/31/2016	678
				9/30/2016	614
				10/31/2016	659
				11/30/2016	563
				12/31/2016	351
				1/31/2017	409
				2/28/2017	205
				3/31/2017	177
				4/30/2017	29
				Grand Total	36,819
				12/31/2014	858
				1/31/2015	1,223
				2/28/2015	966
				3/31/2015	1,875
				4/30/2015	1,221
				5/31/2015	945
				6/30/2015	853
				7/31/2015	930
				8/31/2015	622
				9/30/2015	687
				10/31/2015	1,266
				11/30/2015	929
				12/31/2015	669
				1/31/2016	715
				2/29/2016	694
				3/31/2016	725
				4/30/2016	1,326
				5/31/2016	747
				6/30/2016	542
				7/31/2016	255
				8/31/2016	190
				9/30/2016	154
				10/31/2016	583
				11/30/2016	632
				12/31/2016	317
				1/31/2017	341
				2/28/2017	291
				3/31/2017	170
				4/30/2017	23
				Grand Total	36,890
				12/31/2014	26
				1/31/2015	85
				2/28/2015	-27
				3/31/2015	-374
				4/30/2015	-171
				5/31/2015	-220
				6/30/2015	202
				7/31/2015	435
				8/31/2015	250
				9/30/2015	-102
				10/31/2015	-31
				11/30/2015	15
				12/31/2015	28
				1/31/2016	-91
				2/29/2016	-56
				3/31/2016	-84
				4/30/2016	-465
				5/31/2016	-297
				6/30/2016	-205
				7/31/2016	9
				8/31/2016	488
				9/30/2016	461
				10/31/2016	76
				11/30/2016	-69
				12/31/2016	34
				1/31/2017	67
				2/28/2017	-86
				3/31/2017	7
				4/30/2017	6
				Grand Total	-72

Other Documents Possibly needing Update with BCR

- Manage the documents is detailed in the project's Configuration Management Plan

- WBS
- WBS Dictionary
- Milestone Dict.
- PEP
- PMP

