PPPL
PRINCETON PLASMA PHYSICS LABORATORY

Control Account Manger (CAM)/ Earned Value Management System (EVMS) Training 2

Management Reports, Variance Analysis, Revisions & Change Control Process

Steve Langish

U.S. DEPARTMENT OF ENERGY

Overview

- Quick Refresher & Snap Into EVM Mode
- Analysis & Management Reports, The Extended Version
  - Reporting Process
  - Calculations & Triggers
  - How To On Variance Analysis
  - Information Available To You
- Revisions, The Extended Version
  - Change Control Process
  - Calculations & Triggers
  - How To On Change Control
  - Information Available To You
- Time At The End For Questions & Throughout

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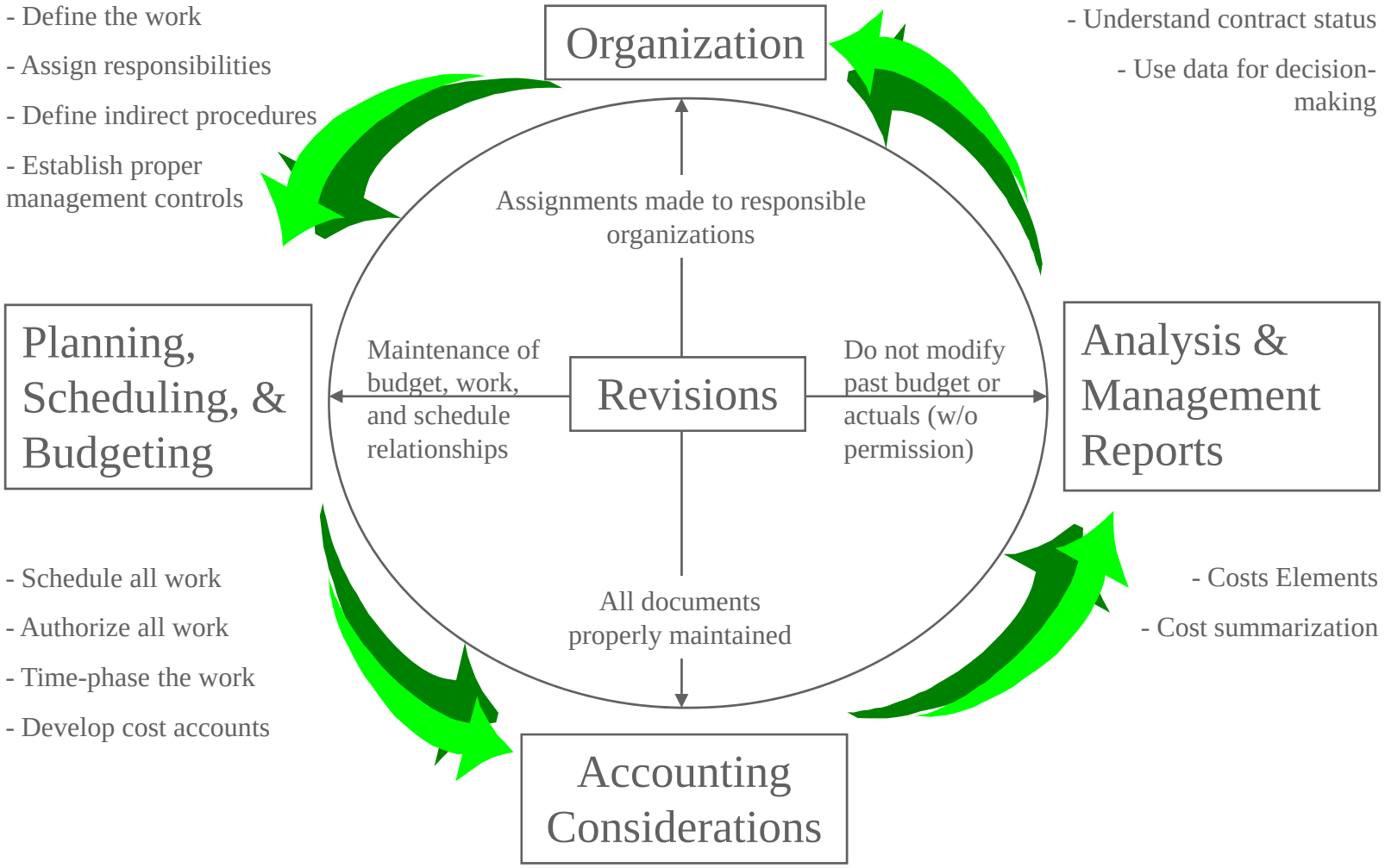
Flashback…

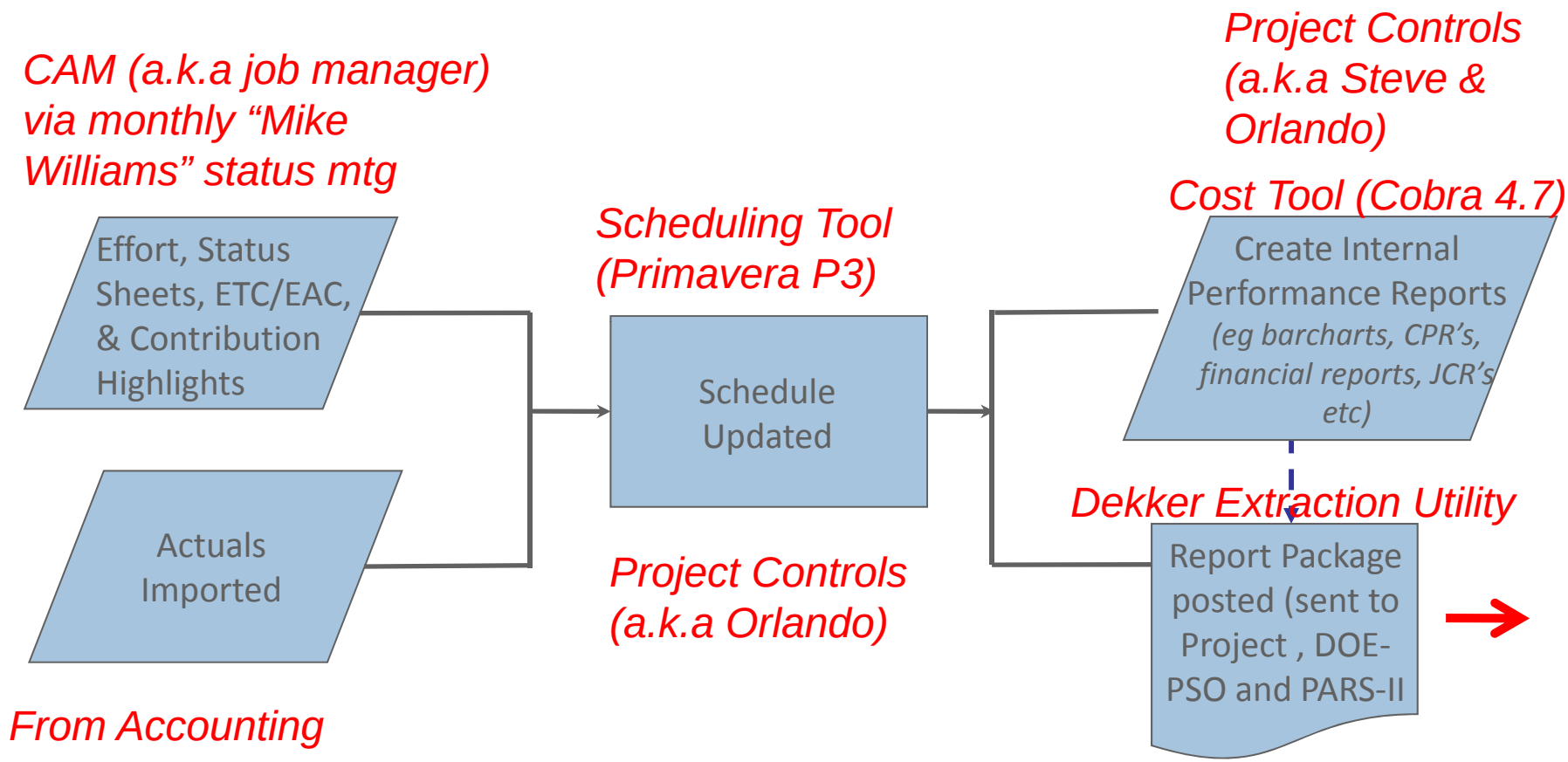


ANSI/EIA 748

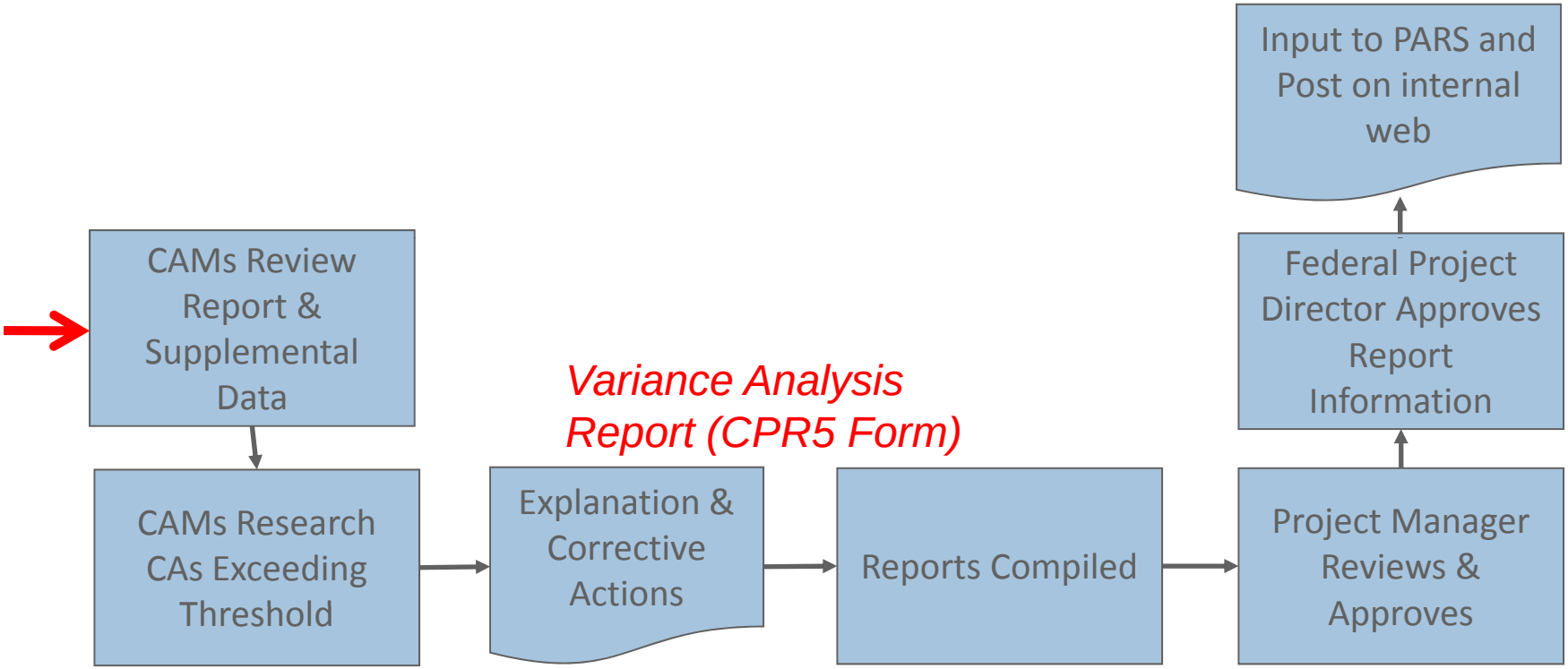
Analysis & Management Reports

- Applicable Procedure(s)
  - PPPL PMSD Appedix 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



Analysis & Management Reports – Analysis Process



If You Recall…

- There Are Three Key Components To Earned Value: Planned Value (PV), Earned Value (EV) & Actual Cost (AC).
  - PV Is The Physical Work Scheduled Or "What You Plan To Do"
  - EV Is The Quantification Of The "Worth" Of The Work Done To Date Or "What You Physically Accomplished"
  - AC Is The Cost Incurred For Executing Work On A Project Or "What You Have Spent"
- Wait…That's Not What You Said Last Time…
  - **BCWS** (Budgeted Cost of Work Scheduled)
    - Value Of Work PLANNED To Be Accomplished During A Given Period Of Time. How Much Work Should Be Done? = PV
  - **BCWP** (Budgeted Cost of Work Performed)
    - Value Of Work Accomplished Or EARNED VALUE. How Much Work Is Done? = EV
  - **ACWP** (Actual Cost Of Work Performed)
    - Cost Of Work Accomplished Or ACTUAL COST. How Much Did It Cost? = AC
- They Are The Same…Use What You Like & Be Familiar With Both
- Remember We Use These For All Kinds Of Fun Calculations

Variance & Performance Indices – Quick Cheat

- These Essentially Help Us Analyze What Has Happened On A Project

Cost Variance (CV) = EV – AC If the result is POSITIVE→ "Underrun" If the result is NEGATIVE→ "Overrun"	**Schedule Variance (SV) = EV – PV** If the result is POSITIVE → "On Schedule" If the result is NEGATIVE → "Behind Schedule"
Cost Variance (CV)% = CV/EV Tells you what percentage cost varies from what has been earned to date.	**Schedule Variance (SV)% = SV/PV** Tells you what percentage schedule varies from what has been planned to date.
Cost Performance Index (CPI) = EV/AC If result is less than 1.0, cost is GREATER than budgeted If the result greater than 1.0, cost is LESS than budgeted	**Schedule Performance Index (SPI) = EV/PV** If result is less than 1.0, project is "BEHIND" schedule If the result greater than 1.0, project is "AHEAD of schedule

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What About Those AC Things?

- The “At Completes” Are Used To Analyze The Future Or What Is Expected To Happen On A Project Given The Progress Measurements Reported To Date
- Anticipating Future Progress Requires Determining When The Project Will Be Completed & How Much It Will Cost To Complete It
- Remember From Last Time
  - **BAC** (Budget At Completion)
    - Sum Of All Budgets Thru Any Given Level (Without Contingency). What Was The Total Job Supposed To 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?
  - **ETC** (Estimate To Completion)
    - Estimated Value Of The Authorized Work Remaining To Be Completed. How Much Will The Remaining Work Cost?
  - **VAC** (Variance At Completion)
    - Projected Variance For The Project Thru Completion. What Is Difference From The Budgeted Amount?

Let Me Count The Ways…

- There Are Many Formulas That Can Be Used To Calculate The EAC
  - EAC = ACWP + ETC
    - Used Early On In Project Execution
    - Uses Actuals & Subjective Estimate To Complete Provided By CAMs
  - EAC = ACWP/BCWP x BAC
    - Assumes That The Burn-rate Will Be The Same For The Remainder Of The Project
    - Uses The Actuals, Performance & The BAC
  - EAC = BAC/CPI
    - Assumes That The Burn-rate Will Be The Same For The Remainder Of The Project
    - Uses BAC & CPI Instead Of Actuals
  - I Can Keep Going But Let's Just Get To The Punch Line…
- We Will Use A Combination Of These Formulas
  - Cost Software Tool Will Suggest A Calculation
  - CAMs Verify All Values
  - PEP currently requires revised EACs every 6 months

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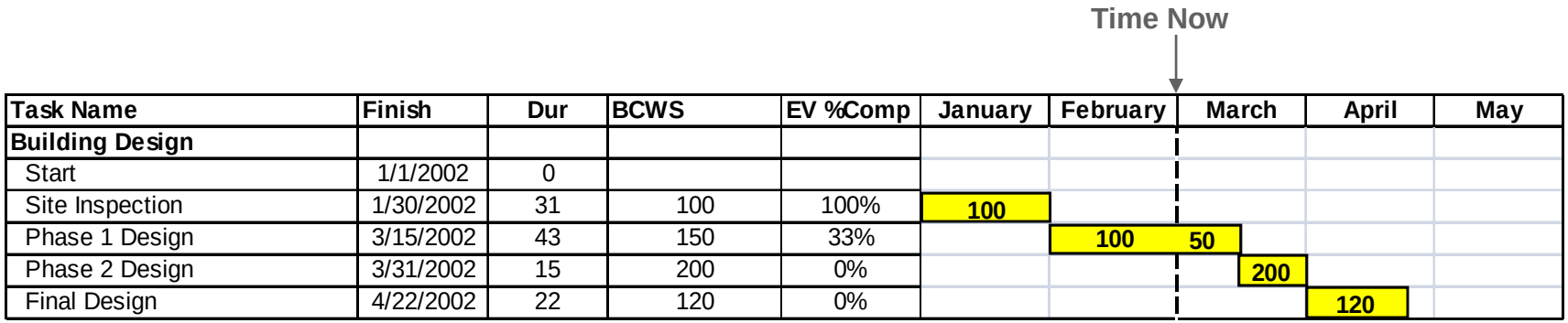
Quick Refresher Example



Using a Building Design Schedule, assume that "Building Design" is your WBS Element and the tasks are your activities. You can see that the Site Inspection task is complete and the Phase 1 design is in progress and 33% complete. Your actual cost (via your timecards, etc) is $275.

What Are The Other Values?

Budget at Complete (BAC)	
Planned Work (BCWS)	
Work Performed (BCWP)	
Actuals (ACWP)	**$275**

CV (BCWP-ACWP)	
SV (BCWP-BCWS)	
CPI (BCWP/ACWP)	
SPI (BCWP/BCWS)	
ETC (BAC-BCWP)	
EAC (ACWP + ETC)	
VAC (BAC-EAC)	

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Quick Refresher Example

Task Name	Finish	Dur	BCWS	EV %Comp	January	February	March	April	May
Building Design									
Start	1/1/2002	0							
Site Inspection	1/30/2002	31	100	100%	100				
Phase 1 Design	3/15/2002	43	150	33%		100	50		
Phase 2 Design	3/31/2002	15	200	0%			200		
Final Design	4/22/2002	22	120	0%				120	

Using a Building Design Schedule, assume that "Building Design" is your WBS Element and the tasks are your activities. You can see that the Site Inspection task is complete and the Phase 1 design is in progress and 33% complete. Your actual cost (via your timecards, etc) is $275.

What Are The Other Values?

Budget at Complete (BAC)	**$570**
Planned Work (BCWS)	**$200**
Work Performed (BCWP)	**$150**
Actuals (ACWP)	**$275**

CV (BCWP-ACWP)	**($125)**
SV (BCWP-BCWS)	**($50)**
CPI (BCWP/ACWP)	**0.55**
SPI (BCWP/BCWS)	**0.75**
ETC (BAC-BCWP)	**$420**
EAC (ACWP + ETC)	**$695**
VAC (BAC-EAC)	**($125)**

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CPR Format 1

- The Example Given Will Be Just Like Our Reports

CONTRACT PERFORMANCE REPORT
FORMAT 1 - WORK BREAKDOWN STRUCTURE
DOLLARS IN Thousands of $
FORM APPROVED
OMB No. 0704-0188

1. CONTRACTOR	2. CONTRACT		3. PROGRAM	4. REPORT PERIOD
a. NAME	a. NAME		a. NAME	a. FROM (YYYYMMDD)
Princeton University-Plasma Physics Lab	DOE-SC-OFES-NSTX Upgrade		NSTX Upgrade Project	2011 / 06 / 01
b. LOCATION (Address and ZIP Code)	b. NUMBER		b. PHASE	b. TO (YYYYMMDD)
Princeton, New Jersey	DE-AC02-09CH11466		CD-2	
	c. TYPE	d. SHARE RATIO	c. EVMS ACCEPTANCE	
	M&O		NO X YES (YYYYMMDD)	2011 / 06 / 30

5. CONTRACT DATA

a. QUANTITY	b. NEGOTIATED COST	c. ESTIMATED COST OF AUTHORIZED UNPRICED WORK	d. TARGET PROFIT/ FEE	e. TARGET PRICE	f. ESTIMATED PRICE	g. CONTRACT CEILING	h. ESTIMATED CONTRACT CEILING	i. DATE OF OTB/OTS (YYYYMMDD)
1	77,317	0	0	77,317	0	0	0	

6. ESTIMATED COST AT COMPLETION

	MANAGEMENT ESTIMATE AT COMPLETION (1)	CONTRACT BUDGET BASE (2)	VARIANCE (3)
a. BEST CASE	0		
b. WORST CASE	0		
c. MOST LIKELY	0	77,317	77,317

7. AUTHORIZED CONTRACTOR REPRESENTATIVE

a. NAME (Last, First, Middle Initial)	b. TITLE	d. DATE SIGNED (YYYYMMDD)
Ronald Strykowsky	Project Manager	
c. SIGNATURE		

8. PERFORMANCE DATA

WBS[2] ITEM (1)	CURRENT PERIOD BUDGETED COST WORK SCHEDULED (2)	BUDGETED COST WORK PERFORMED (3)	ACTUAL COST WORK PERFORMED (4)	VARIANCE SCHEDULE (5)	VARIANCE COST (6)	CUMULATIVE TO DATE BUDGETED COST WORK SCHEDULED (7)	BUDGETED COST WORK PERFORMED (8)	ACTUAL COST WORK PERFORMED (9)	VARIANCE SCHEDULE (10)	VARIANCE COST (11)	REPROGRAMMING ADJUSTMENTS COST VARIANCE (12a)	SCHEDULE VARIANCE (12b)	BUDGET (13)	AT COMPLETION BUDGETED (14)	ESTIMATED (15)	VARIANCE (16)
1.1 Torus Systems	302	259	531	-43	-272	7,719	7,244	7,222	-475	22	0	0	0	18,268	18,868	-600
1.2 Plasma Heating and Current Drive Systems	119	260	104	141	156	4,590	4,557	4,186	-32	371	0	0	0	24,591	24,907	-316
1.3 Auxiliary Systems	13	29	12	17	17	120	109	38	-11	72	0	0	0	377	316	61
1.4 Plasma Diagnostics	104	116	35	12	81	715	657	658	-58	-1	0	0	0	1,785	1,877	-92
1.5 Power Systems	30	102	84	72	18	2,158	2,137	1,927	-21	210	0	0	0	9,360	9,778	-418
1.6 Central Instrumentation & Control	7	14	5	7	8	115	105	97	-10	9	0	0	0	918	907	11
1.7 Project Support & Integration	181	181	231	0	-50	5,037	5,037	4,671	0	366	0	0	0	14,371	13,876	495
1.8 Site Preparation and Torus Assembly	4	4	7	0	-3	73	90	81	16	9	0	0	0	7,648	9,900	-2,252
b. Cost of Money	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
c. Gen. and Admin.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
d. Undist. Budget														0	0	0
e. Sub Total	758	964	1,009	206	-45	20,528	19,937	18,878	-591	1,059	0	0	0	77,317	80,430	-3,112
f. Management Resrv.														0		
g. Total	758	964	1,009	206	-45	20,528	19,937	18,878	-591	1,059	0	0	0	77,317		
9. Reconciliation to CBB																
a. Variance Adjustment										0						
b. Total Contract Variance									-591	1,059				77,317	80,430	-3,112

CPR Format 2

CONTRACT PERFORMANCE REPORT FORMAT 2 - ORGANIZATIONAL CATEGORIES				DOLLARS IN Thousands of $	FORM APPROVED OMB No. 0704-0188
1. CONTRACTOR	2. CONTRACT		3. PROGRAM		4. REPORT PERIOD
a. NAME Princeton University-Plasma Physics Lab	a. NAME DOE-SC-OFES-NSTX Upgrade		a. NAME NSTX Upgrade Project		a. FROM (YYYYMMDD) 2011/06/01
b. LOCATION (Address and ZIP Code) Princeton, New Jersey	b. NUMBER DE-AC02-09CH11466		b. PHASE CD-2		b. TO (YYYYMMDD) 2011/06/30
	c. TYPE M&O	d. SHARE RATIO	c. EVMS ACCEPTANCE NO X YES (YYYYMMDD)		

5. PERFORMANCE DATA

OBS[2]	CURRENT PERIOD					CUMULATIVE TO DATE					REPROGRAMMING ADJUSTMENTS			AT COMPLETION		
	BUDGETED COST		ACTUAL COST	VARIANCE		BUDGETED COST		ACTUAL COST	VARIANCE							
ITEM	WORK SCHEDULED	WORK PERFORMED	WORK PERFORMED	SCHEDULE	COST	WORK SCHEDULED	WORK PERFORMED	WORK PERFORMED	SCHEDULE	COST	COST VARIANCE	SCHEDULE VARIANCE	BUDGET	BUDGETED	ESTIMATED	VARIANCE
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12a)	(12b)	(13)	(14)	(15)	(16)
CS Center Stack	478	543	712	65	-169	11,336	10,777	10,507	-559	270	0	0	0	39,894	43,212	-3,318
NB Neutral Beam	173	314	149	141	166	5,714	5,681	4,979	-32	702	0	0	0	28,548	28,534	14
PM Project Management	107	107	149	0	-42	3,478	3,478	3,392	0	86	0	0	0	8,875	8,683	192
b. Cost of Money	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
c. Gen. and Admin.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
d. Undist. Budget														0	0	0
e. Sub Total	758	964	1,009	206	-45	20,528	19,937	18,878	-591	1,059	0	0	0	77,317	80,430	-3,112
f. Management Resrv.														0		
g. Total	758	964	1,009	206	-45	20,528	19,937	18,878	-591	1,059	0	0	0	77,317		

CPR Format 2

CONTRACT PERFORMANCE REPORT FORMAT 2 - ORGANIZATIONAL CATEGORIES			DOLLARS IN Thousands of $	FORM APPROVED OMB No. 0704-0188
1. CONTRACTOR	2. CONTRACT		3. PROGRAM	4. REPORT PERIOD
a. NAME Princeton University-Plasma Physics Lab	a. NAME DOE-SC-OFES-NSTX Upgrade		a. NAME NSTX Upgrade Project	a. FROM (YYYYMMDD) 2011/05/01
b. LOCATION (Address and ZIP Code) Princeton, New Jersey	b. NUMBER DE-AC02-09CH11466		b. PHASE CD-2	b. TO (YYYYMMDD) 2011/06/30
	c. TYPE M&O	d. SHARE RATIO	c. EVMS ACCEPTANCE NO X YES (YYYYMMDD)	

5. PERFORMANCE DATA

OBS[3]	CURRENT PERIOD					CUMULATIVE TO DATE					REPROGRAMMING ADJUSTMENTS			AT COMPLETION		
	BUDGETED COST		ACTUAL COST	VARIANCE		BUDGETED COST		ACTUAL COST	VARIANCE							
ITEM	WORK SCHEDULED	WORK PERFORMED	WORK PERFORMED	SCHEDULE	COST	WORK SCHEDULED	WORK PERFORMED	WORK PERFORMED	SCHEDULE	COST	COST VARIANCE	SCHEDULE VARIANCE	BUDGET	BUDGETED	ESTIMATED	VARIANCE
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12a)	(12b)	(13)	(14)	(15)	(16)
1000 CSU Analytical Support (Titus)	12	17	7	5	11	194	164	124	-30	40	0	0	0	385	788	-404
1001 CS Plasma Facing Components (Tresemer)	54	112	20	58	92	777	811	617	34	194	0	0	0	2,169	1,929	241
1002 Passive Plate Analysis & Upgrade (Titus)	0	0	17	0	-17	251	242	241	-9	0	0	0	0	251	272	-21
1200 Structures & Supports (Smith)	65	62	105	-3	-43	2,290	2,192	2,294	-99	-102	0	0	0	3,554	3,910	-357
1300 Center Stack (Chrzanowski)	20	20	24	0	-3	355	355	300	0	55	0	0	0	1,063	994	69
1301 Outer TF Coils (Chrzanowski)	0	0	0	0	0	20	20	20	0	0	0	0	0	338	330	8
1302 Center Stack Assembly (Chrzanowski)	0	0	0	0	0	0	0	10	0	-10	0	0	0	990	994	-4
1303 TF Joint Test Stand & Test (Kozub)	0	4	16	4	-12	353	352	203	-1	149	0	0	0	353	191	162
1304 Inner TF Bundle (Chrzanowski)	121	5	252	-116	-247	1,034	786	788	-247	-2	0	0	0	2,595	2,503	92
1305 Ohmic Heating Coil (Chrzanowski)	29	22	72	-7	-50	1,661	1,557	1,736	-104	-180	0	0	0	4,556	4,842	-286
1306 Inner PF Coils (Chrzanowski)	0	10	2	10	8	175	167	198	-8	-30	0	0	0	669	715	-46
1307 CS Casing Assembly (Chrzanowski)	0	6	16	6	-10	167	157	248	-11	-92	0	0	0	904	958	-54
1310 CSU Magnets Systems (Chrzanowski)	0	0	0	0	0	442	442	442	0	0	0	0	0	442	442	0
3200 Water Cooling System Mods (Denault)	13	27	3	15	24	74	68	23	-6	45	0	0	0	195	172	24
3300 Bakeout System Mods CSU (Raki)	0	0	0	0	0	5	5	0	0	5	0	0	0	79	73	6
3400 Gas Delivery System Mods (Blanchard)	0	1	9	1	-7	41	36	14	-5	22	0	0	0	102	71	31
4100 Center Stack Diagnostics (Kaita)	20	32	7	12	25	183	183	137	0	46	0	0	0	836	807	29
4500 MPTS VV Modification (Labik)	84	84	28	0	56	532	474	521	-58	-47	0	0	0	949	1,071	-121
5000 CSU Power Systems (Raki)	19	28	46	9	-18	1,363	1,359	1,306	-4	53	0	0	0	5,736	5,930	-195
5200 DCPS (Hatcher)	9	66	36	57	30	415	397	314	-18	84	0	0	0	2,493	2,384	109
5501 Coil Bus Runs (Smith)	1	8	2	6	6	380	380	307	0	74	0	0	0	1,131	1,464	-332
6100 Control Sys Data Acquisition (Sichta)	7	14	5	7	8	115	105	97	-10	9	0	0	0	918	907	11
7200 Center Stack Management (Dudek)	19	19	38	0	-18	435	435	486	0	-51	0	0	0	1,539	1,565	-26
8200 CS & Coil Sprt Structure Install (Viola)	4	4	7	0	-3	73	90	81	16	9	0	0	0	6,474	8,775	-2,301
8250 Remove/Install Centerstack (Perry)	0	0	0	0	0	0	0	0	0	0	0	0	0	1,174	1,125	49
2300 ECH Analysis (Titus)	3	13	0	10	13	84	81	29	-3	53	0	0	0	84	44	40
2420 2nd NBI Sources (Cropper)	2	4	1	1	3	4	4	1	0	3	0	0	0	1,094	1,072	22
2425 BL Relocation (Denault)	5	20	3	15	17	101	95	53	-6	42	0	0	0	1,860	2,159	-299
2430 2nd NBI Decontamination (Stevenson)	0	0	0	0	0	2,057	2,057	2,070	0	-13	0	0	0	2,057	2,070	-13
2440 2nd NBI Beamline (Denault)	41	34	35	-7	0	311	268	176	-43	92	0	0	0	2,590	2,471	119
2450 2nd NBI Services (Denault)	14	23	26	9	-3	352	340	352	-13	-13	0	0	0	4,516	4,621	-105
2460 2nd NBI Armor (Tresemer)	18	28	1	10	27	382	392	357	10	35	0	0	0	700	700	0
2470 2nd NBI Power (Raki)	3	3	10	0	-6	245	245	257	0	-12	0	0	0	3,335	3,568	-233
2475 2nd NBI Controls (Cropper)	8	95	5	87	90	248	211	60	-37	151	0	0	0	2,089	2,012	77
2480 2nd NBI/TVPS Duct (Denault)	14	9	15	-5	-6	444	418	438	-27	-20	0	0	0	2,260	2,208	53
2485 Vacuum Pumping System (Blanchard)	11	24	6	13	18	82	89	112	7	-23	0	0	0	388	402	-14
2490 NTC Equipment Relocations (Perry)	0	7	3	7	4	278	358	281	80	77	0	0	0	3,618	3,581	37
7300 NB2 Management (Stevenson)	10	10	34	0	-24	362	362	324	0	38	0	0	0	1,450	1,382	68
7400 Health Physics Support (Stevenson)	45	45	11	0	33	762	762	468	0	294	0	0	0	2,507	2,245	262
7100 Project Management & Integration (Strykowsky)	73	73	125	0	-52	2,028	2,028	2,021	0	7	0	0	0	5,812	5,718	94
7710 NSTX-U HP and Other Allocations (Strykowsky)	33	33	23	0	10	1,445	1,445	1,368	0	77	0	0	0	2,985	2,904	81
7900 Integrated System (Gentile)	0	0	0	0	0	5	5	4	0	1	0	0	0	78	61	17
b. Cost of Money	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
c. Gen. and Admin.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
d. Undist. Budget														0	0	0
e. Sub Total	758	964	1,009	206	-45	20,528	19,937	18,878	-591	1,059	0	0	0	77,318	80,430	-3,112
f. Management Resrv.														0		
g. Total	758	964	1,009	206	-45	20,528	19,937	18,878	-591	1,059	0	0	0	77,318		

PPPL PRINCETON PLASMA PHYSICS LABORATORY

CPR Format 3

CONTRACT PERFORMANCE REPORT FORMAT 3 - BASELINE				DOLLARS IN Thousands of $	FORM APPROVED OMB No. 0704-0188
1. CONTRACTOR	2. CONTRACT		3. PROGRAM		4. REPORT PERIOD
a. NAME Princeton University-Plasma Physics Lab	a. NAME DOE-SC-OFES-NSTX Upgrade		a. NAME NSTX Upgrade Project		a. FROM (YYYYMMDD) 2011/06/01
b. LOCATION (Address and ZIP Code) Princeton, New Jersey	b. NUMBER DE-AC02-09CH11466		b. PHASE CD-2		b. TO (YYYYMMDD) 2011/06/30
	c. TYPE M&O	d. SHARE RATIO	c. EVMS ACCEPTANCE NO X YES (YYYYMMDD)		

5. CONTRACT DATA						
a. ORIGINAL NEGOTIATED COST	b. NEGOTIATED CONTRACT CHANGES	c. CURRENT NEGOTIATED COST (a. + b.)	d. ESTIMATED COST OF AUTHORIZED UNPRICED WORK	e. CONTRACT BUDGET BASE (c. + d.)	f. TOTAL ALLOCATED BUDGET	g. DIFFERENCE (e. - f.)
77,317	0	77,317	0	77,317	77,317	0

h. CONTRACT START DATE	i. CONTRACT DEFINITIZATION DATE	j. PLANNED COMPLETION DATE	k. CONTRACT COMPLETION DATE	l. ESTIMATED COMPLETION DATE
2009 / 02 / 23		2020 / 12 / 31		2020 / 12 / 31

6. PERFORMANCE DATA

ITEM	BCWS CUMULA-TIVE TO DATE	BCWS FOR REPORT PERIOD	BUDGETED COST FOR WORK SCHEDULED (BCWS) (Non-Cumulative)											UNDIS-TRIBUTED BUDGET	TOTAL BUDGET
			SIX MONTH FORCAST						ENTER SPECIFIED PERIODS						
			+1 31JUL2011	+2 31AUG2011	+3 30SEP2011	+4 31OCT2011	+5 30NOV2011	+6 31DEC2011	31JAN2012	29FEB2012	31MAR2012	30APR2012	31MAY2012		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
PM Baseline (Beginning of Period)	19,769	758	539	589	413	839	786	893	938	969	688	1,037	930	0	77,317
PM Baseline (End of Period)	20,528		539	589	413	839	786	893	938	969	688	1,037	930	0	77,317
Management Reserve															0
Total															77,317

CPR Format 5

CONTRACT PERFORMANCE REPORT FORMAT 5 - EXPLANATIONS AND PROBLEM ANALYSES										FORM APPROVED OMB No. 0704-0188
1. CONTRACTOR			2. CONTRACT			3. PROGRAM				4. REPORT PERIOD
a. NAME Princeton University-Plasma Phys			a. NAME DOE-SC-OFES-NSTX Upgrade			a. NAME NSTX Upgrade Project				a. FROM (YYYYMMDD) 2011/06/01
b. LOCATION (Address and ZIP Princeton, New Jersey			b. NUMBER DE-AC02-09CH11466			b. PHASE CD-2				b. TO (YYYYMMDD) 2011/06/30
			c. TYPE M&O	d. SHARE RATIO		c. EVMS ACCEPTANCE (YYYYMMDD NO X YES				
1.5 Power Systems										
	BCWS	BCWP	ACWP	SV in $	SV in %	CV in $	CV %	SPI	CPI	
Current:	30	108	84	77	254%	24	22%	3.54	1.28	
Cumulative:	2,164	2,142	1,927	-22	-1%	216	10%	0.99	1.11	
	BAC	EAC	VAC in $	VAC in %	CPI to BAC	CPI to EAC				
At Complete:	9,359	9,254	105	1%	0.97	0.98				
Thresholds Exceeded: **Cumulative Cost**										
Explanation of Variance/Description of Problem:										
Impact:										
Corrective Action:										
Monthly Summary (to include technical causes of VARs, Impacts) and Corrective Action(s):										
Prepared by: Date: Approved by: Date:										

Deltek Cobra (R) Legend: Red = threshold exceeded Report in Thousands of $

Problem Analysis

You WILL have variances on your jobs!
The real question is what's the impact, how are you communicating, and what are you doing to minimize impact. In other words are you managing your job.

- Start With What You Are Talking About
  - Unfavorable Cumulative Cost Variance Of 17K
    - Round Amounts To The Nearest K Dollar & Eliminate The $
    - Don't Worry About Negative Signs, Just Use Unfavorable
- Itemize The Reasons For The Variance If There Were More Than One & Number The List Of Reasons
  - (1) Contributing To 6K Of The Unfavorable Variance, Labor…
  - (2) Materials Made Up 4K Of The Unfavorable Variance
- Why Did The Variance Occur & If Cumulative Variance, When?
  - Contributing To 6K Of The Unfavorable Variance, The Task Was More Complex Than Originally Planned, Resulting In More Labor Being Used Than Was Planned In May
- Won't Earn You An Ice Cream Surprise To Only Say
  - Spent More Than I Planned
  - Someone Charged Extra Hours
  - I Didn't Earn Enough BCWP
  - See Last Month's Report
  - Billing Lag

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Uh…What Kind?

- Determine What Type Of Variance
  - Technical
    - Design Issues
    - Manufacturing Process Problems
    - Hardware/Software Problems
  - Organizational
    - Personnel Availability
    - Skill Mix
    - Priorities
    - Interfaces/Communication
  - External
    - Contractual Issues With Subs & Vendors
    - Acts Of Nature
    - Approvals
  - Management System
    - Time-phasing
    - BCWP Technique
    - Original Estimate

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Impact

- What Is The Impact To The Delivery Or Program? Why Is The Impact Recoverable Or Unrecoverable?
  - The Variance Will Be Recovered When Labor Returns To This Task In The Next Reporting Period, Resulting In No Overall Impact To The Program
  - Without More Budget, The Impact Is Unrecoverable
- Won't Win You A Gold Star To Only Say
  - None
  - No Impact
  - This Control Account Will Continue To Overrun In Coming Months

Corrective Action

- Who Will Undertake The Action? When Will It Take Place?
  - CAM Will Work Closely In Weekly Telecons With Subcontractor To Expedite Delivery, Impact Will Be Recovered
  - We Have Been In Contact With The Supplier To Make Sure The Delivery Will Be Made In August. We Will Take Full EV Upon Receipt
- What Are The Cost Trade Offs?
- Not So Hot Examples
  - None Required
  - I Should Be Able To Make Up The Overrun Downstream

Make Sure You Do What You Said You Will. They Will Be Checking…And We Will Be Watching…

Examples Of Good Variance Analysis

- Problem Analysis (Cause)
  - The $14k negative cost variance is due to reworking the upper housing design ($8.4k) and using a more expensive design of the tracking mechanism ($5.6k).
  - The $17.5k negative schedule variance is due to the slip in the deliveries of the microprocessor. The entire $17.5k was the value (BCWS) of that particular delivery.
- Impact
  - The rework of the upper housing is not recoverable ($8.4k); however, the more senior experienced engineer is expected to perform the next task in less time which will eliminate the negative $5.6k variance.
  - There is no impact. The earned value (BCWP) will be taken as soon as the microprocessor is delivered (in approximately 2 weeks) which will eliminate the $17.5k negative schedule variance. Also, this late delivery will not affect any subsequent deliveries.
- Corrective Action
  - Modify the documentation on the upper housing to ensure this will not happen to similar type design. Monitor more closely the design engineers to ensure their efficiency.
  - Have been in contact with the microprocessor supplier to make sure any further slippage in schedule will not happen.

How To Analyze Cost Variance

- Compare Actual Cost To Date (ACWP) To The Planned Cost (BCWS)
- Ask Yourself The Following Questions:
  - What Is Causing The Cost Overrun/Underrun?
  - Are The Costs Recoverable?
  - Does The Cost Variance Represent What Is Actually Happening?
- Cost Variances Can Impact Contingency
- Depending On The Answer To The Questions, Several Things Can Happen
  - Are The Overruns/Underruns Due To Bad Charges Or Accruals? If So, Back Out The Mischarge Or Accrual
  - If The Costs Are Recoverable By Replanning Future Work (Not Removing Scope) Then Do So. However, If The Task Has Already Started This Will Not Be possible. You Have To Be Forward Looking & Replan Tasks That Lend Themselves To Saving Money.

Cost Variance Statements – Favorable

BCWP > ACWP

Favorable

- The Cost Variance Is Favorable Because…
  1. The Complexity Of The Task Is Less Than Originally Estimated
  2. The Less Complex Tasks Have Been Completed Early
  3. Fewer Revisions & Rework Than Planned
  4. The Task Is Primarily LOE & Has Not Been Fully Staffed
  5. Earned Value Is Incorrect
  6. Material Or Services Have Been Used But Not Paid For
  7. Material Or Services Were Cheaper Than Planned (Favorable Market Fluctuations, Rate Decrease)
  8. Efficiencies Were Realized (Leveraging Of Other Work)
  9. The Plan Is Poorly Time-phased

Cost Variance Statements – Unfavorable

BCWP < ACWP

Unfavorable

- The Cost Variance Is Unfavorable Because…
  1. The Task Is More Complex Than Originally Planned
  2. The More Complex Tasks Have Been Completed Early
  3. Program Priorities Have Resulted In Application Of Resources In An Inefficient Manner : More Overtime, Additional Staffing, Etc
  4. Delays In Receipt Of Data Have Resulted In Implementation Of Work-A-Rounds To Make Schedule: More Overtime, Additional Staffing, Etc
  5. Changes, Redesign, Additional Requirements, Unclear Requirements, Or Out Of Scope Effort
  6. The Plan Is Poorly Time-phased
  7. Earned Value Is Incorrect
  8. Opposite Rate Changes Or Use Variances Noted In Favorable

How To Analyze Schedule Variance

- Compare The Current Schedule To The Baseline Schedule.
- Ask Yourself The Following Questions:
  - Have you accomplished the tasks that were planned thus far?
  - Are the tasks not accomplished still valid?
  - Does the schedule variance represent what is actually happening?
- "Yes" To These Questions, The Schedule Variance Is Legitimate & Reportable
- "No", The Tasks Beyond The Current Period Should Be Reviewed & Can Be Updated
- **Change Requests To Correct A Variance That Has Already Occurred Are NOT Allowed**
  - Can Be Used To Correct The Plan For Future Work
  - Accommodate A New Workaround Plan To Enable You To Bring The Work In On Schedule On Budget

Schedule Variance Statements – Favorable

BCWP > BCWS

Favorable

- The Schedule Variance Is Favorable Because…
  1. The Task Is Less Complex & Will Be Completed Earlier Than Planned
  2. Early Effort Has Been Confined To Tasks Which Are Less Complex Than Those That Follow
  3. The Task Has Been Overstaffed Early In Order To Recognize The Establishment Of A Higher Priority
  4. Deliveries Of Hardware Have Been Accomplished In Advance Of Need Date
  5. Efficiencies Were Realized (Leveraging Of Other Work)
  6. Earned Value May Be Incorrect & Require An Adjustment In The Next Reporting Period
  7. The Plan Is Poorly Time-phased & The Current Status Is Not Reflective Of What Is Really Happening

Schedule Variance Statements – Unfavorable

BCWP < BCWS

Unfavorable

- The Schedule Variance Is Unfavorable Because…
  1. The Task Is More Complex Than Originally Planned
  2. Early Effort Has Been More Complex Than The Effort That Follows
  3. Delays In Staffing Have Slowed Progress
  4. Hardware Deliveries Are Late
  5. Redesign Of Rework Activities Has Delayed Progress
  6. Data From Another Organization (Drawings Or Technical Analysis) Has Been Late
  7. Additional Requirements Have Been Established Or Changed
  8. Higher Priority Has Been Established On Other Work
  9. The Plan Is Poorly Time-phased
  10. Earned Value Is Incorrect

Variance Write-Ups Key Points

- Be Specific
  - Without Being Too Wordy, Describe Each Reason For The Variance In Detail
- Avoid Using A Lot Of Explanation To Essentially Say Nothing (no jokes here)
  - Back Your Variance With Facts
- After The Variance, Take Action To Ensure That The Next Report Is Not Just As Unfavorable
  - Make Sure To Follow Through With Your Corrective Action
- Don't Hesitate To Seek Help In Writing Your Variance Analysis Reports (VARs)
  - It's Easier To Learn How To Write It Correctly The First Time Than To Edit It In A Lengthy Review
- Essentially, All Roads Lead Back To The CAM – It's Your Control Account
  - Be Prepared To Explain What You Write
  - Take Ownership Of Your VAR

Context, Consistency, Clarity, Completeness, Conciseness, Correctness

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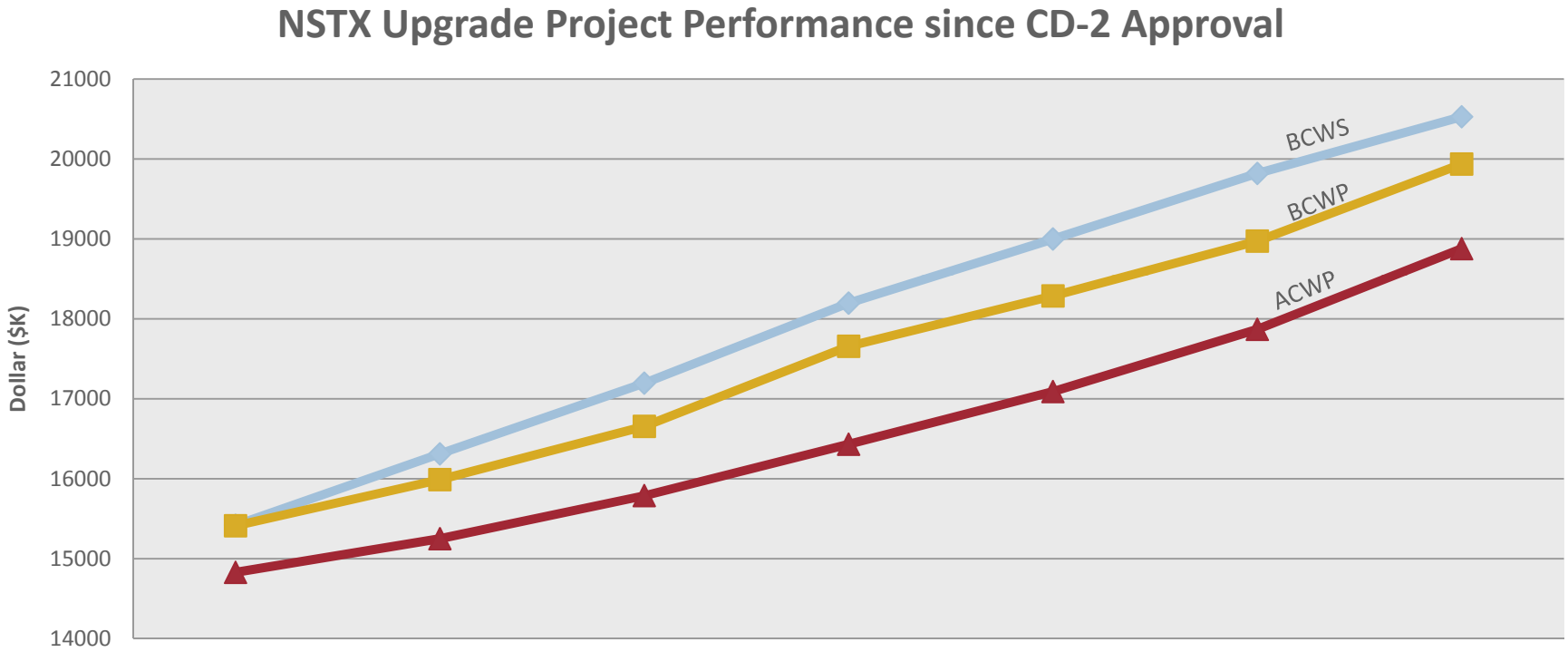
Chasing It All Down

- Start With The CPR Provided
  - Review Every Exceeded Threshold For Your Control Account Level
  - Look At Cumulative & Current
- Review The Report Package Provided
  - Detailed Monthly Cost/Hours Report
  - Check For Unusual Trends Or Upcoming Spikes In Activity
- Look At The SPI/CPI & SV/CV Charts For Trends

Analysis & Management Reports – Reporting Example



	Dec-10	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11
BCWS	15419	16311	17196	18197	18999	19819	20528
BCWP	15412	15989	16655	17656	18287	18972	19937
ACWP	14828	15249	15788	16431	17090	17869	18878

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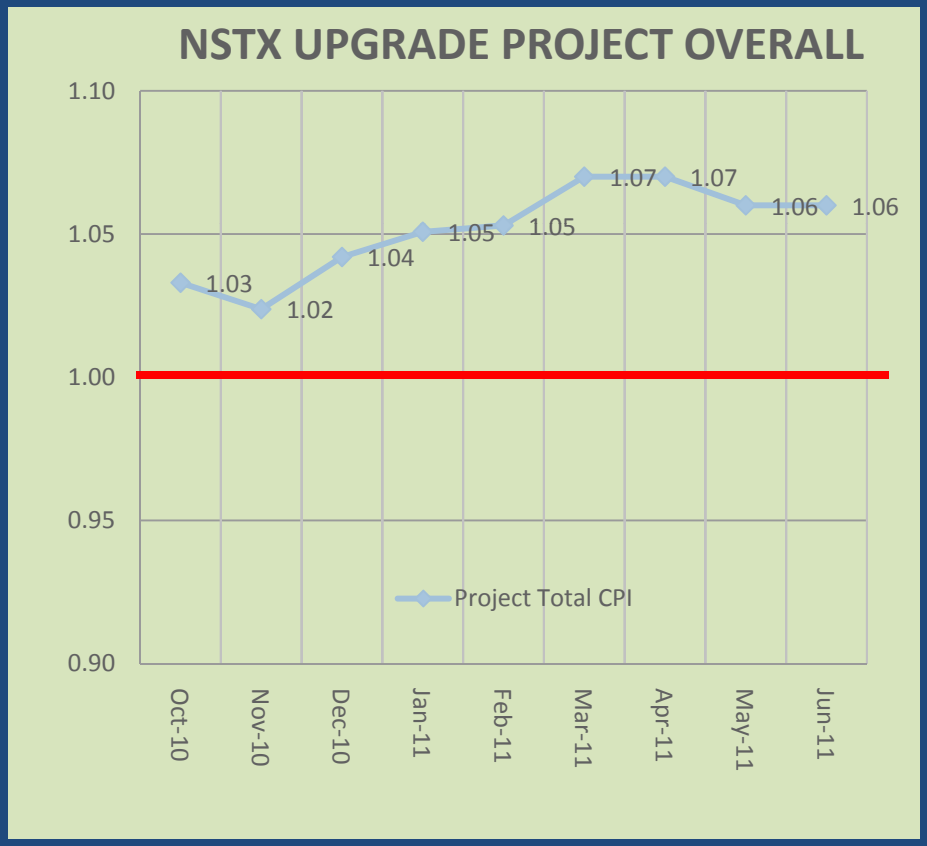
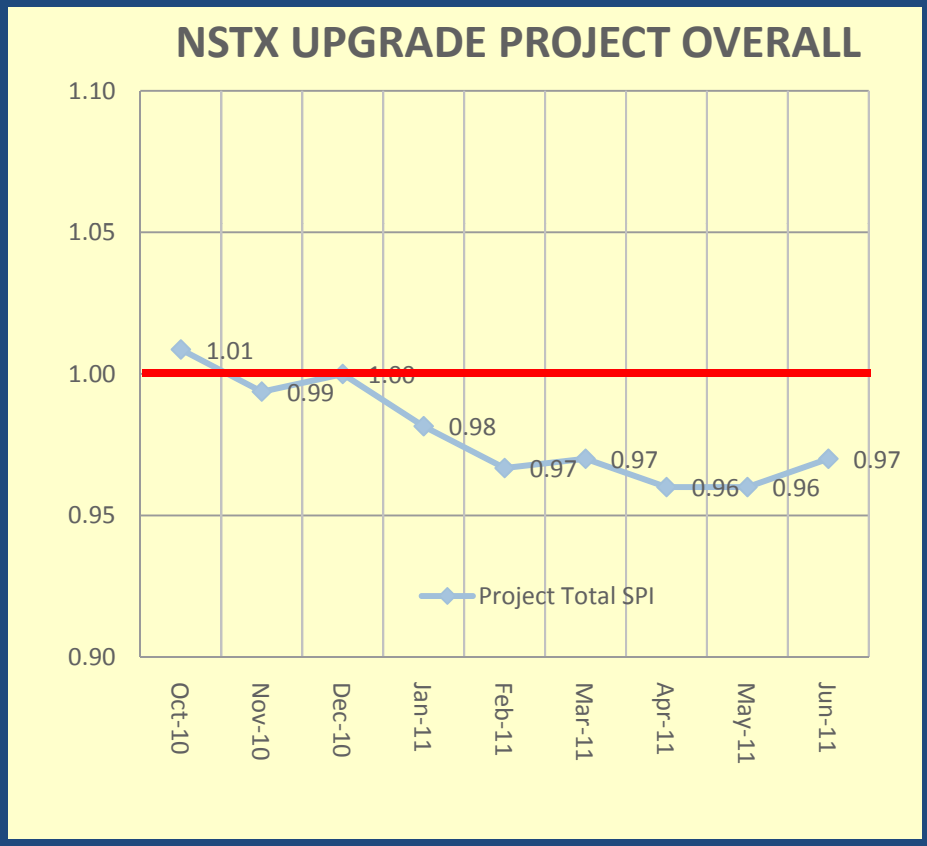
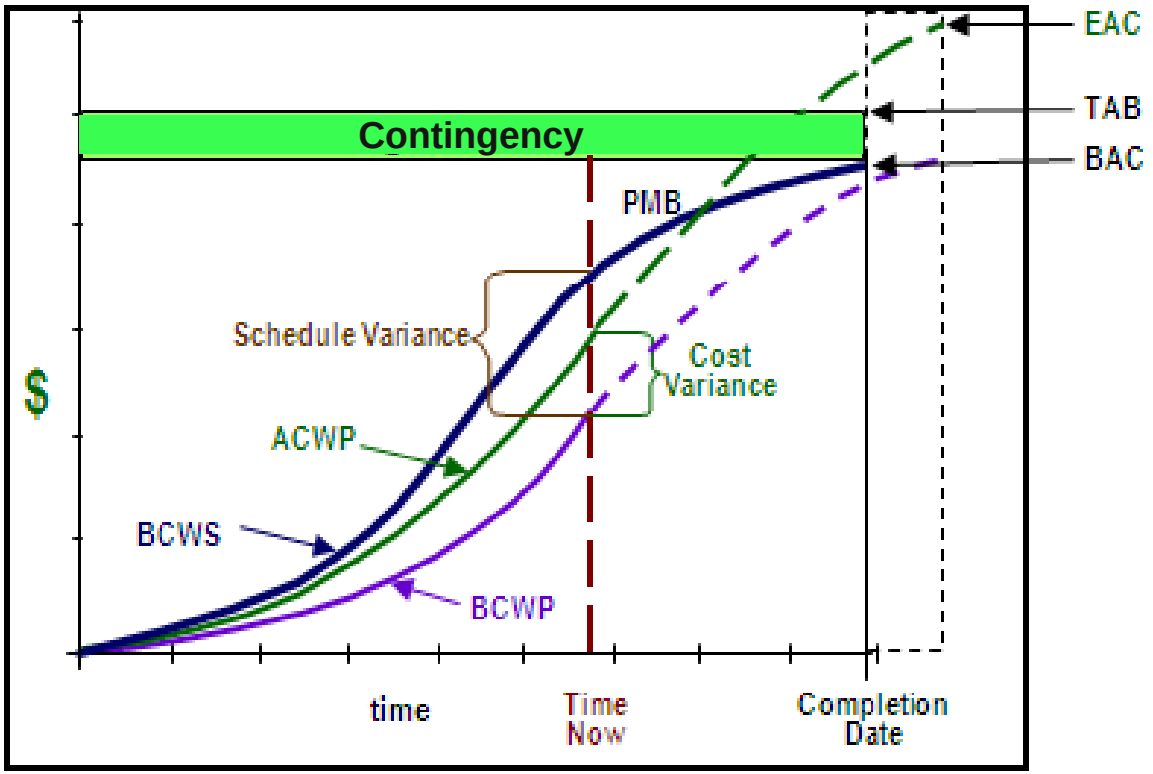
Analysis & Management Reports – Reporting Example





When Is It Most Useful?

- Due To The Natural Behavior Of Projects, There Are Points Where EVM Is Less Useful Than Others
  - The First Few Months (Anywhere From 3 – 6) Can Be Misleading
  - The Last 10% Of Execution
- Notice What Happens As The Project Reaches Completion…
- BCWS = BCWP
  - Thus SPI = 1.0 & SV = 0
- This Can Permeate Through The Other EVM Metrics
- Never Fear…We Will Watch
- Doesn't Get You Out Of Explaining Variances



Revisions

- Applicable Procedure(s)
  - PMSD Appendix E Procedure 9 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
- What Formal Documents Are Used?
  - Engineering Change Proposal (ECP)
- When Can Changes Occur?
  - Contractual Changes/Modifications
  - The Use Of Contingency
  - Re-Planning
  - Formal Reprogramming
  - Bottom Line: Any Change To Scope (Technical), Responsibility, Schedule, Or Budget

ECP Form

General Information & Explanation:
This section covers general info and is used to explain the drivers, abnormal conditions, and factors creating the need for change. Information is taken from the next page

Levels:
This section outlines if DOE Approval is required and what the proposed change Level will be.

Result & Signatures:
This section documents the final approval and dates. It is also used to outline the signatures required (either for approval or concurrence).

NATIONAL SPHERICAL TORUS EXPERIMENT UPGRADE PROJECT
Engineering Change Proposal (ECP)

COVER PAGE
(TO BE COMPLETED BY SYSTEMS ENGINEERING SUPPORT MANAGER)

Originator:	Date:
ECP No:	ECP Title:

Required Reviewers

Required Reviewers for this ECP:

ECP Approval Level

Expedited ECP? ☐ Yes ☐ No
Change Level: 3 Project
Approving Official: 3 Reg ECP - Project Manager

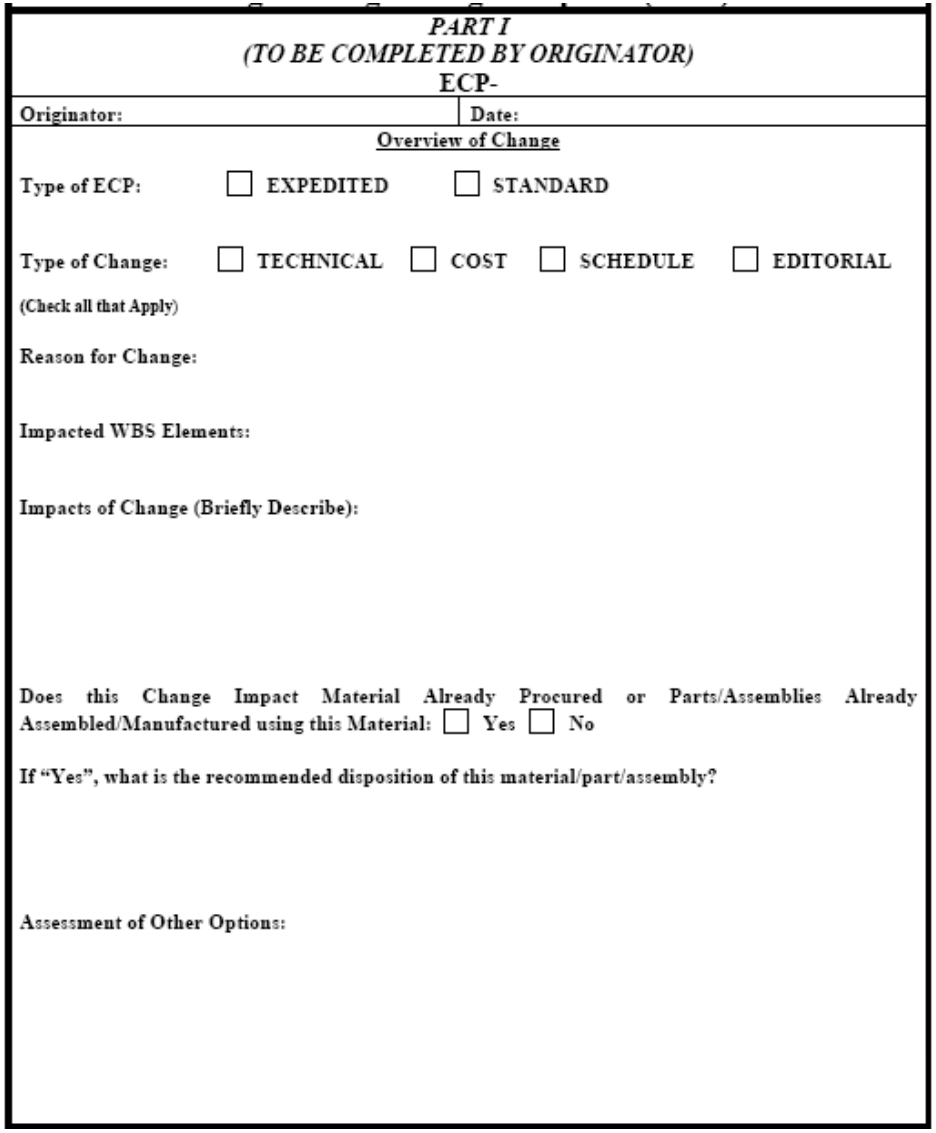
Actions

APPROVALS
(TO BE COMPLETED BY APPROVING OFFICIALS)

Change Level	Approving Official	Approval?	Signature
3	NSTXU Project Manager	☐ Yes ☐ No	
3a (Expedited ECP)	NSTXU Engineering Lead	☐ Yes ☐ No	
2	NSTXU Federal Project Director	☐ Yes ☐ No	
1	Associate Director OFES	☐ Yes ☐ No	
0	Deputy Secretary of Energy	☐ Yes ☐ No	

ECP Form

This section is completed by the originator.



PART I
(TO BE COMPLETED BY ORIGINATOR)
ECP-

Originator:	**Date:**

Overview of Change

Type of ECP: ☐ EXPEDITED ☐ STANDARD

Type of Change: ☐ TECHNICAL ☐ COST ☐ SCHEDULE ☐ EDITORIAL

(Check all that Apply)

Reason for Change:

Impacted WBS Elements:

Impacts of Change (Briefly Describe):

Does this Change Impact Material Already Procured or Parts/Assemblies Already Assembled/Manufactured using this Material: ☐ Yes ☐ No

If "Yes", what is the recommended disposition of this material/part/assembly?

Assessment of Other Options:

Revisions – Thresholds

- Change Approval Thresholds

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

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Project Change Control Log Example

http://nstx-upgrade.pppl.gov/Engineering/ProjectStatus/Configuration_Control/ECPindex.htm

National Spherical Torus Experiment (NSTX) Upgrades

Engineering Change Proposal Status

NSTX Upgrade Projects Configuration Control Procedure

ECP	Title	Class of ECP	Date Submitted	Date Approved	Master Schedule	Summary Schedule	Cost Table by WBS	Cost Profile by FY	Table of Milestones
ECP-001	Capture two direct allocation accounts in one account	3	06/02/2011	06/03/2011	N/A	N/A	N/A	N/A	N/A
ECP-002	Move the BL Start date for task 6100-0041 to 12April2012	3	06/07/2011	06/08/2011	N/A	N/A	N/A	N/A	N/A

Revised: 12/6/2010 / R. Simmons

Look Ahead

- EVMS Rules State That The Past Through The Current Month Baseline Is Frozen
- Changes Can Only Be Made To The Work Beyond The Current Month
- Compare, In Detail, The Current Schedule To The Baseline Schedule Every 2-3 Months
- What Is Coming Up? (Look Ahead About 6 Months)
  - What Are Your Critical Paths & Key Milestones?
- Ask Yourself The Following Questions
  - Does The Current Schedule Still Track Closely To The Baseline Schedule?
  - Does The Baseline Schedule Represent The Work That Will Be Performed In The Next 6 Months?
  - Is The Planned Budget Sufficient?
  - Are The Risks Sufficiently Captured & Controlled?
  - Are Your Requirements Or Scope The Same?
- If You Answer “Yes” To These Questions, No Update Is Necessary
- If You Answer “No” To These Questions, The Future Scheduled Plan Should Be Reviewed & Updated With A Change Request – If Needed

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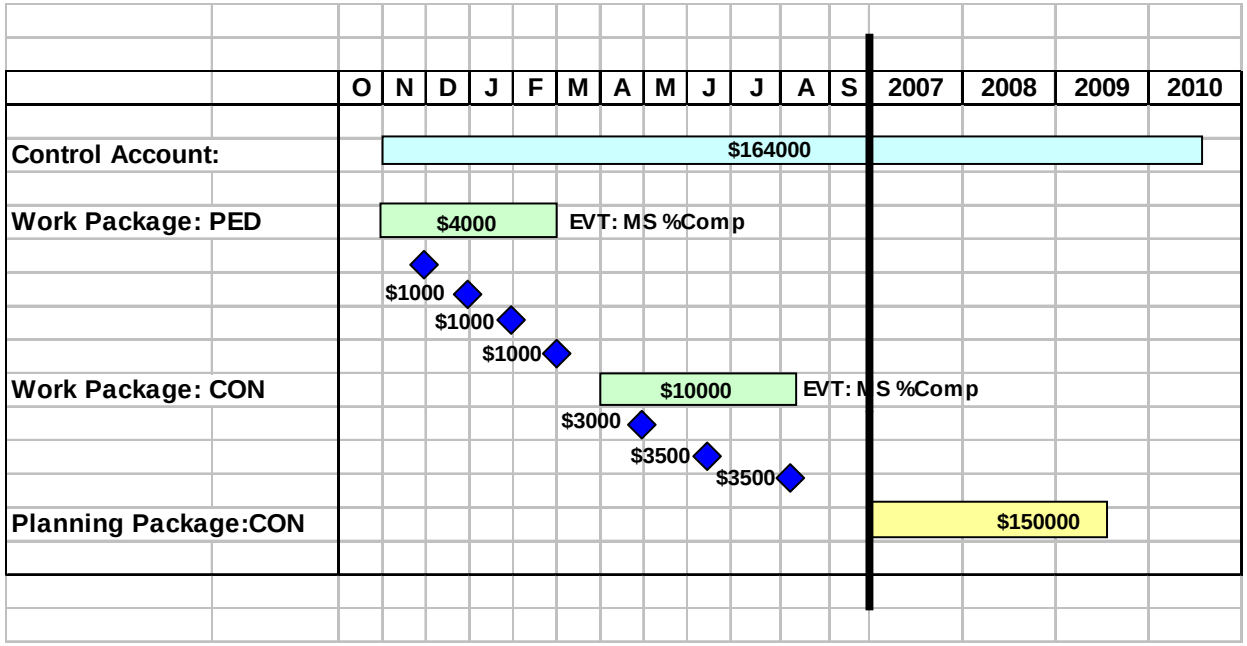
Hiding The Uglies

- Changes Are Not To Be Made To Hide Or Eliminate Variance
- This Is Not Allowed In EVM, As Continuous Changes To The Baseline:
  - Signals Poor Planning
  - Hides Potential Problems
  - Could Be A Constant Drain On Contingency
  - Inhibits Accurate Forecasting & Trend Analysis
  - Decreases Confidence In Baseline
  - Causes Controls Group To Drink Heavily & Be Cranky…You Don't Want To See Sherese Cranky…It Isn't Pretty
- Change Requests Should Only Be Processed When The Plan Diverges From The Baseline So Much That It Becomes Obsolete

Rebaselining (Replanning vs. Reprogramming)

- Replanning: is a realignment of schedule or reallocation of budget for remaining effort **within the existing constraints** of the contract.
  - Total allocated budget does not exeed CBB (PMB + MR)
  - Schedule is NOT adjusted to extend beyond the contractually defined milestones
  - Includes movement of budget within a Control Account, between Control Accounts, and application of MR
- Reprogramming: is a comprehensive replanning of the remaining performance management baseline that results in a total budget and/or total schedule in excess of contractual requirements.
  - Remaining available budget insufficient to ensure valid performance measurement
  - Restores much needed control to a contract that has had poor execution or an unrealistic plan for the remaining work
  - Key benefit is an executable and achievable baseline plan, renewed buy-in from the project team, and meaningful performance indicators, and restored confidence

You're Rolling What?



- Work Which Cannot Readily Be Planned In Detailed Work Packages Is Planned In Planning Packages
- Planning Packages Should Be Decomposed Into Detailed Work Packages As Soon As The CAM Has Sufficient Visibility
- Ideally, This Is At Least 6 Months Before The Work In The Planning Package Is Scheduled To Start

Funding Vs Budget

- You Mean They Aren't The Same Thing? → NO! They Are Very Different...
- Budget (***Money agreed to! Money needed!)***
  - Typically Developed By Project Team
  - Estimate For Total Tasks
  - Phased Over Baseline Schedule
  - Basis For Earned Value Performance Measurement
- Funding ***(Money in the bank ready to be spent***)
  - Typically Issued From Sponsor
  - Current Estimate Of Total Dollar Requirements
  - Phased By Distribution Period (FY)
  - Typically Handled Thru Division Office

- Oh…Maybe This Will Help, Too…You Can Go To Jail For Funding…Not For Budget

Aaaaaaahhhhhhhhh!

WHAT DO I DO?!?!

Get To Know Your CAM Notebook

Relax…We've Got You Covered:

- Stay Calm…
- Review Your CAM Notebook (Including The Procedures)
- We Are All Available To Take Questions
- You Will Not Be All Alone…Your Notebook Is Your Binky

1. Control Account Manager Responsibilities
2. Work Authorization Document(s)
3. Organizational Breakdown Structure
4. Responsibility Assignment Matrix
5. Schedules/Variances
6. Critical and Near Critical Paths
7. Project Specific Procedures
8. Performance Trends
9. Earned Value Methods
10. Reference Documents
11. Performance Reports
12. Training Slides
13. Work Package Summary
14. Questions & Answers
15. Risk

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Questions, Questions, Questions…

- System Focused
  - Is The System Documented & In Compliance With The EVMS Guidelines?
  - Does The Entire Project Team Understand How To Use The System & Data?
  - Are The Internal & External Reporting Structures Operating Effectively?

- Control Account Focused
  - What Is The Scope Of Work & How Is It Verified?
  - What Is The Period Of Performance?
  - What Organization Is Responsible For The Work?
  - What EV Measurement Methods Are Used & Why?
  - What Milestones Are Included Or Relate & What Are The Entrance/Exit Criteria?
  - What Is The Scheduled Completion Date For Activity XYZ?
  - What Is The Unit Of Measure For Resources?
  - How Was The Budget For Your Work Developed?
  - Is Your Budget Adequate? If It Is Not, What Are Your Options?
  - Explain The Time-phasing Of Your Budget

Still Going…

- Still Control Account Focused
  - How Do You Develop Estimates To Complete?
  - What Rates Are Used In The Baseline?
  - How Does The Team Communicate?
  - How Did You Plan The Work?
  - How Do You Identify & Manage Schedule Impacts?
  - Who Owes You Things & How Do You Track Them?
  - Is All Of Your Work Authorized?
  - What Risks Exist & How Are They Addressed?
  - What Assumptions Are Built Into Your Schedule (Task & Budget)?
  - How Is Contingency Calculated?
  - What Is The BAC & EAC (LRE)?
  - What Is The SV & CV?

Questions?