



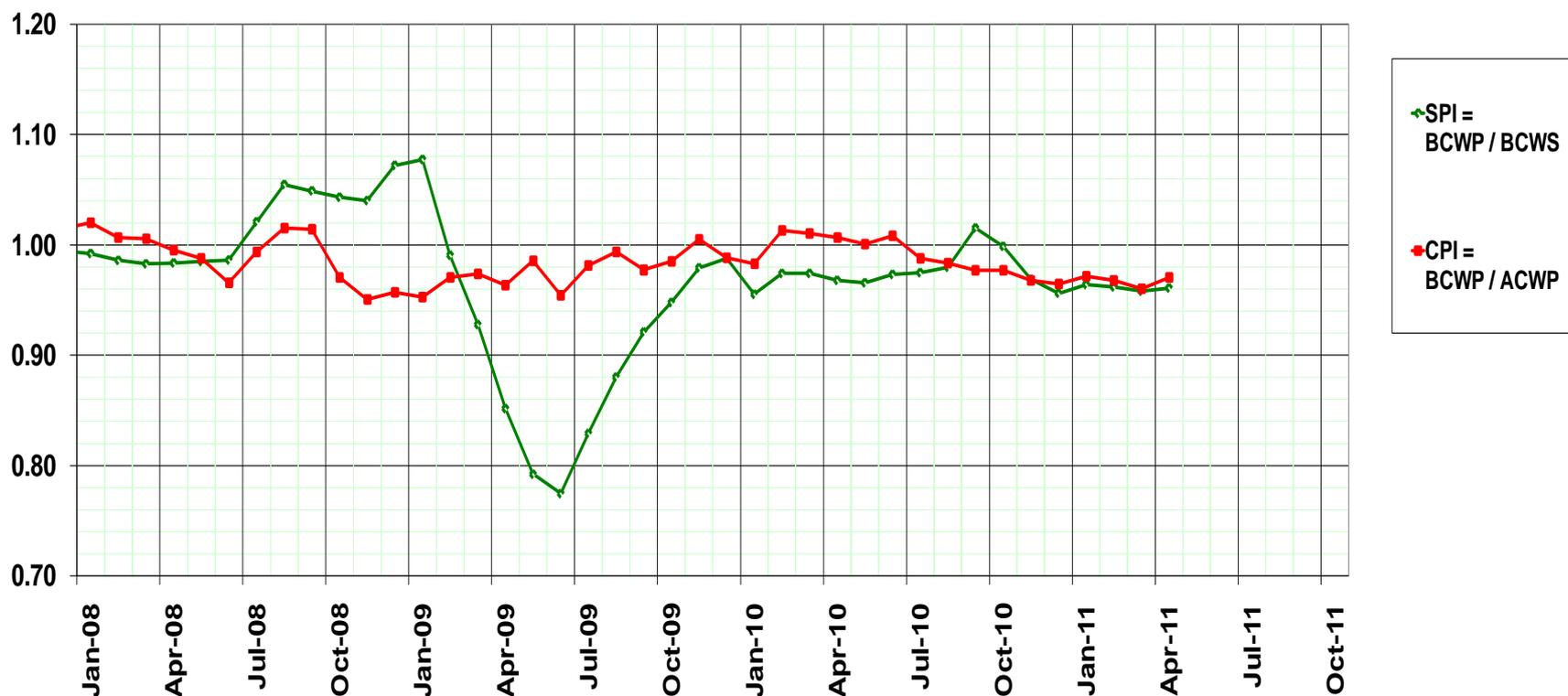
Project Status

John Cooper
Project Manager



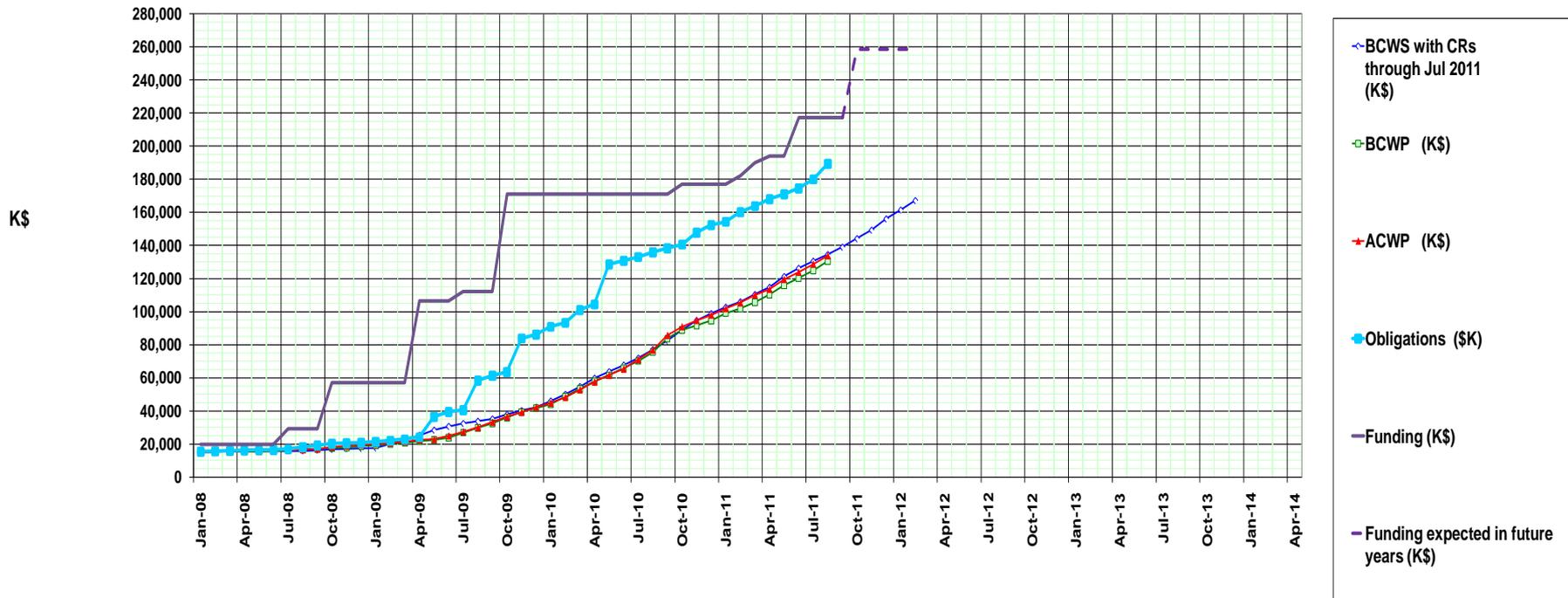
EVMS Reporting Overview

- Data now available through August 2011
 - SPI = **0.971**, compare to 0.957 in Jul, 0.954 in Jun
 - CPI = **0.976**, compare to 0.970 in Jul, 0.972 in Jun
- We are still “Green”



EVMS Reporting Overview

- Basic data in BCWS, BCWP, ACWP, **Funding & Obligations** through Aug 2011
 - BCWS = Budgeted cost of work Scheduled
 - BCWP = Budgeted cost of work Performed
 - ACWP = Actual cost of work Performed
- Project is 53.0 % complete ($BCWP/BAC = 130.6 \text{ M\$} / 246.3 \text{ M\$}$)
 - BAC = Budget at Completion (using EAC, get 52.3%)
- Project is 76.9 % obligated ($Obligations/BAC = 189.3 / 246.3$)
 - EAC = Estimate at Completion (using EAC, get 75.8%)



CPR1 Aug 2011

COST PERFORMANCE REPORT													
FORMAT 1 - WORK BREAKDOWN STRUCTURE													
CONTRACTOR					CONTRACT			PROGRAM			REPORT PERIOD		
NAME					NAME			NAME			FROM 01-Aug-2011		
Fermi National Accelerator Laboratory								NOVA Project			TO 31-Aug-2011		
PERFORMANCE DATA													
CTC-FndSrc WBS[2] Results... ITEM (1)	CURRENT PERIOD					CUMULATIVE TO DATE					AT COMPLETION		
	BUDGETED COST		ACTUAL COST	VARIANCE		BUDGETED COST		ACTUAL COST	VARIANCE			LATEST	
	WORK	WORK	WORK	SCHEDULE	COST	WORK	WORK	WORK	SCHEDULE	COST	BUDGETED	REVISED	
	SCHEDULE	PERFORMED	PERFORMED	SCHEDULE	COST	SCHEDULE	PERFORMED	PERFORMED	SCHEDULE	COST	BUDGETED	ESTIMATE	VARIANCE
(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	
DA DOE-ACEL MIE													
2.0 ANU Construction													
Fully burdened AY\$K	954	1,024	1,165	70	(142)	17,440	15,227	17,213	(2,213)	(1,987)	33,234	35,444	(2,210)
CTC-FndSrcTotals:	954	1,024	1,165	70	(142)	17,440	15,227	17,213	(2,213)	(1,987)	33,234	35,444	(2,210)
DC DOE-CA													
2.1 Site and Building													
Fully burdened AY\$K	88	52	75	(36)	(23)	35,060	35,041	34,575	(19)	465	35,060	34,596	463
CTC-FndSrcTotals:	88	52	75	(36)	(23)	35,060	35,041	34,575	(19)	465	35,060	34,596	463
DD DOE-ACEL R&D													
1.0 ANU R&D													
Fully burdened AY\$K	0	29	34	29	(5)	7,025	6,647	6,524	(377)	124	7,119	6,933	186
CTC-FndSrcTotals:	0	29	34	29	(5)	7,025	6,647	6,524	(377)	124	7,119	6,933	186
DE DOE-DET MIE													
2.1 Site and Building													
Fully burdened AY\$K	141	132	532	(9)	(400)	6,321	6,078	4,341	(244)	1,737	6,809	5,074	1,735
2.10 Project Management - Nova Project - Construction													
Fully burdened AY\$K	305	305	218	0	88	6,202	6,202	5,195	0	1,007	11,523	10,529	995
2.2 Liquid Scintillator													
Fully burdened AY\$K	106	263	481	156	(218)	5,324	5,318	5,697	(5)	(379)	21,398	21,796	(398)
2.3 WLS Fiber													
Fully burdened AY\$K	393	760	375	367	386	6,604	7,360	7,179	755	181	12,403	12,198	205
2.4 PVC Extrusions													
Fully burdened AY\$K	553	1,086	883	534	204	7,575	8,348	7,935	773	413	29,994	29,458	536
2.5 PVC Modules													
Fully burdened AY\$K	398	357	99	(41)	258	7,897	7,193	5,578	(705)	1,614	20,160	18,499	1,660
2.6 Electronics													
Fully burdened AY\$K	470	1,024	427	554	597	3,694	3,393	2,169	(302)	1,223	12,753	11,635	1,119
2.7 DAQ													
Fully burdened AY\$K	74	50	225	(24)	(175)	1,259	935	1,444	(324)	(509)	3,841	4,337	(496)
2.8 Near Detector Assembly													
Fully burdened AY\$K	8	2	8	(6)	(6)	961	853	2,060	(108)	(1,207)	5,890	7,109	(1,219)
2.9 Far Detector Assembly													
Fully burdened AY\$K	517	534	525	17	8	4,982	3,931	5,292	(1,050)	(1,361)	21,379	22,820	(1,440)
CTC-FndSrcTotals:	2,966	4,513	3,773	1,547	741	50,819	49,610	46,891	(1,209)	2,719	146,150	143,454	2,697
DO DOE-ACEL OPS													
1.0 ANU R&D													
Fully burdened AY\$K	0	0	2	0	(2)	312	312	537	0	(226)	894	1,119	(226)
CTC-FndSrcTotals:	0	0	2	0	(2)	312	312	537	0	(226)	894	1,119	(226)

July shipment in Aug
 Early receipt of PVC resin
 Components off the shelf 14% → 83%, HV PS, will check accrual

CPR1 Aug 2011 continued

COST PERFORMANCE REPORT FORMAT 1 - WORK BREAKDOWN STRUCTURE													
CONTRACTOR					CONTRACT					PROGRAM			REPORT PERIOD
NAME Fermi National Accelerator Laboratory					NAME					NAME NOvA Project			FROM 01-Aug-2011 TO 31-Aug-2011
PERFORMANCE DATA													
CTC-FndSrc WBS[2] Results... ITEM (1)	CURRENT PERIOD					CUMULATIVE TO DATE					AT COMPLETION		
	BUDGETED COST		ACTUAL COST	VARIANCE		BUDGETED COST		ACTUAL COST	VARIANCE		BUDGETED	LATEST REVISED ESTIMATE	VARIANCE
	WORK SCHEDULED	WORK PERFORMED	WORK PERFORMED	SCHEDULE	COST	WORK SCHEDULED	WORK PERFORMED	WORK PERFORMED	SCHEDULE	COST			
(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	
DR DOE-POST CD-1 DET R&D													
1.1 Site and Building R&D Fully burdened AY\$K	0	0	0	0	0	3,630	3,630	3,168	0	462	3,630	3,168	462
1.2 Liquid Scintillator R&D Fully burdened AY\$K	0	0	(0)	0	0	297	297	389	0	(92)	297	389	(92)
1.3 WLS Fiber R&D Fully burdened AY\$K	0	0	0	0	0	341	341	375	0	(34)	341	375	(34)
1.4 PVC Extrusion R&D Fully burdened AY\$K	0	0	(0)	0	0	1,369	1,369	2,083	0	(714)	1,369	2,083	(714)
1.5 PVC Module R&D Fully burdened AY\$K	0	0	(0)	0	0	2,260	2,260	2,420	0	(160)	2,260	2,420	(160)
1.6 Electronics R&D Fully burdened AY\$K	2	1	0	(1)	1	2,028	2,004	2,581	(24)	(577)	2,028	2,611	(584)
1.7 DAQ R&D Fully burdened AY\$K	13	13	3	(0)	11	1,633	1,585	2,824	(47)	(1,239)	1,635	2,875	(1,239)
1.8 Detector Assembly R&D Fully burdened AY\$K	0	81	(5)	81	86	3,123	3,123	4,929	0	(1,806)	3,123	4,929	(1,806)
1.9 Project Management R&D Fully burdened AY\$K	0	0	0	0	0	383	383	559	0	(176)	383	559	(176)
CTC-FndSrcTotals:	15	95	(3)	80	98	15,064	14,993	19,328	(71)	(4,335)	15,067	19,410	(4,343)
DY DOE CD-0 TO CD-1 R&D													
1.9 Project Management R&D Fully burdened AY\$K	0	0	0	0	0	8,801	8,801	8,801	0	0	8,801	8,801	0
CTC-FndSrcTotals:	0	0	0	0	0	8,801	8,801	8,801	0	0	8,801	8,801	0
Undist. Budget											0	0	0
Sub Total	4,025	5,713	5,047	1,689	666	134,520	130,630	133,870	(3,890)	(3,240)	246,324	249,757	(3,432)
Management Resrv.											31,676		
Total	4,025	5,713	5,047	1,689	666	134,520	130,630	133,870	(3,890)	(3,240)	278,000		

Schedule variance due to Accel and Det MIE
Cost variance due to Det R&D



EVMS analysis

- Now divide the project into 4 parts and look at Schedule and Cost variations
- The four parts:
 - Accelerator work, R&D + Construction
 - R&D and Const are mixed until very near the end
 - ~ ends with the end of the 2012 long shutdown for installation
 - Cooperative Agreement work, building
 - Concludes ~ now
 - Detector R&D
 - Concludes ~ now
 - Detector Construction
 - This is the bulk of the project (59.3% of BAC)



4 part data

- Aug:

	Accelerator Upgrades	Ash River Building	Detector R&D	Detector Construction
BAC	\$ 41.2 M	\$ 35.1 M	\$ 15.1 M	\$ 146.2 M
EAC	\$ 43.5 M	\$ 34.6 M	\$ 19.4 M	\$ 143.5 M
BCWS	\$ 24.8 M	\$ 35.1 M	\$ 15.1 M	\$ 50.8 M
BCWP	\$ 22.2 M	\$ 35.0 M	\$ 15.0 M	\$ 49.6 M
ACWP	\$ 24.3 M	\$ 34.6 M	\$ 19.3 M	\$ 46.9 M
% Complete (BCWP/BAC)	53.8%	99.9%	99.5%	34.8%
SPI = BCWP/BCWS	0.90	1.00	1.00	0.98
CPI = BCWP/ACWP	0.91	1.01	0.78	1.06

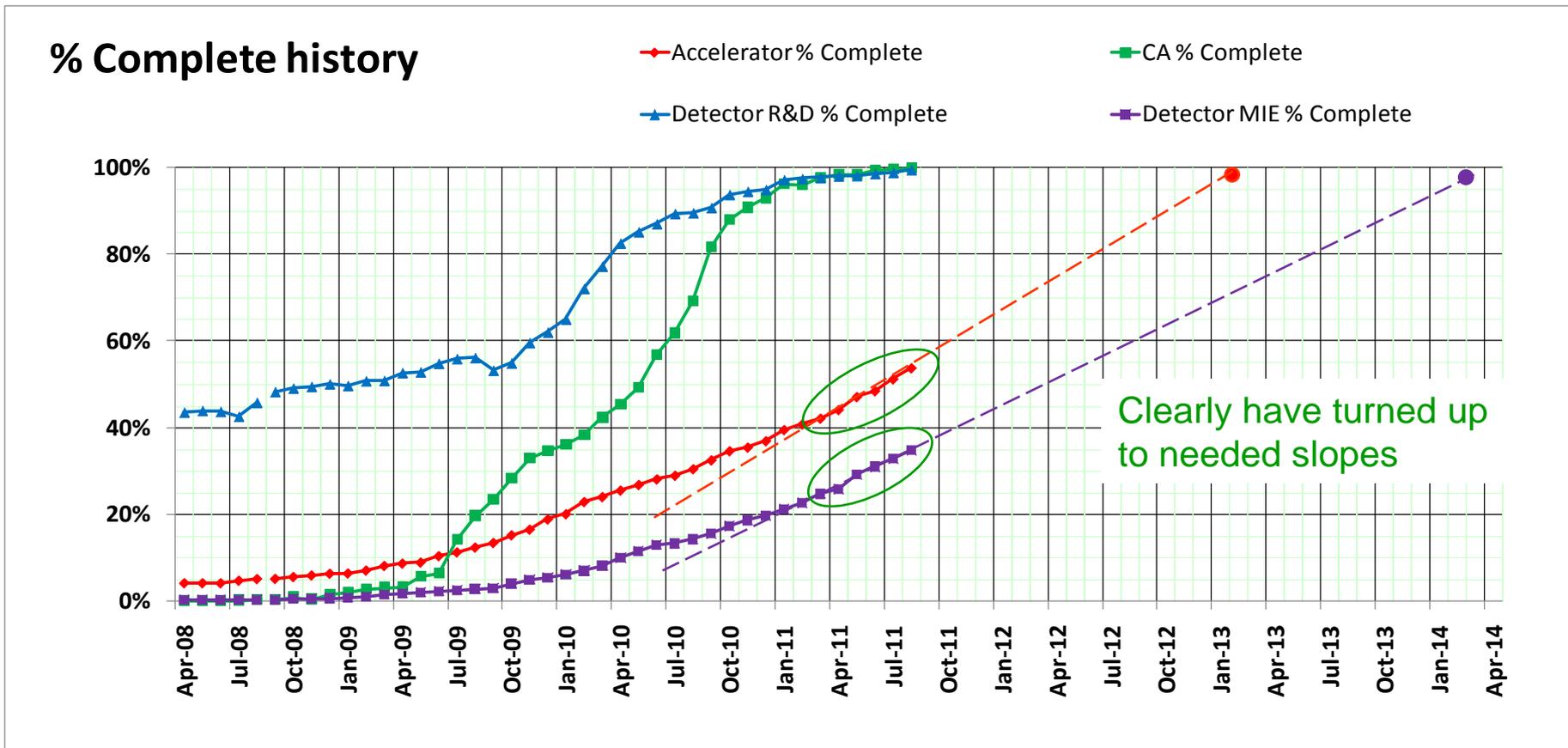
- July

	Accelerator Upgrades	Ash River Building	Detector R&D	Detector Construction
BAC	\$ 41.2 M	\$ 35.1 M	\$ 15.0 M	\$ 145.3 M
EAC	\$ 43.5 M	\$ 34.6 M	\$ 19.5 M	\$ 143.3 M
BCWS	\$ 23.8 M	\$ 35.0 M	\$ 15.0 M	\$ 47.9 M
BCWP	\$ 21.1 M	\$ 35.0 M	\$ 14.9 M	\$ 45.1 M
ACWP	\$ 23.1 M	\$ 34.5 M	\$ 19.3 M	\$ 43.1 M
% Complete (BCWP/BAC)	51.2%	99.8%	98.9%	32.9%
SPI = BCWP/BCWS	0.89	1.00	0.99	0.94
CPI = BCWP/ACWP	0.92	1.01	0.77	1.05

- June

	Accelerator Upgrades	Ash River Building	Detector R&D	Detector Construction
BAC	\$ 41.0 M	\$ 35.1 M	\$ 15.0 M	\$ 144.2 M
EAC	\$ 43.2 M	\$ 34.3 M	\$ 19.6 M	\$ 142.2 M
BCWS	\$ 22.7 M	\$ 34.9 M	\$ 15.0 M	\$ 44.8 M
BCWP	\$ 19.9 M	\$ 34.9 M	\$ 14.9 M	\$ 42.0 M
ACWP	\$ 21.9 M	\$ 34.2 M	\$ 19.3 M	\$ 39.6 M
% Complete (BCWP/BAC)	48.5%	99.5%	98.6%	31.1%
SPI = BCWP/BCWS	0.88	1.00	0.99	0.94
CPI = BCWP/ACWP	0.91	1.02	0.77	1.06

% Complete history for the 4 parts



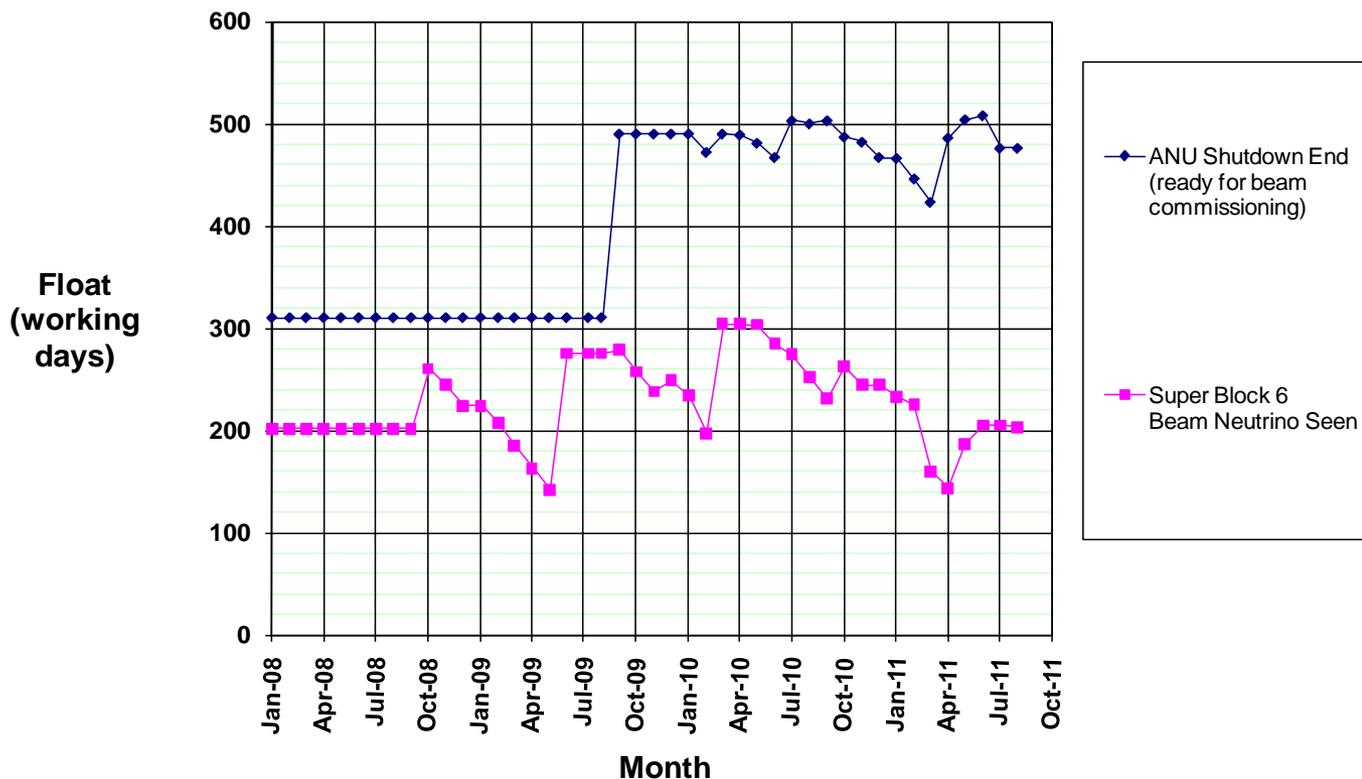
- Building & Detector R&D near the end
- ANU to be complete by ~ Feb 2013
 - ANU R&D is 99% complete, construction is 52% complete
- Detector complete by ~ Feb - March 2014



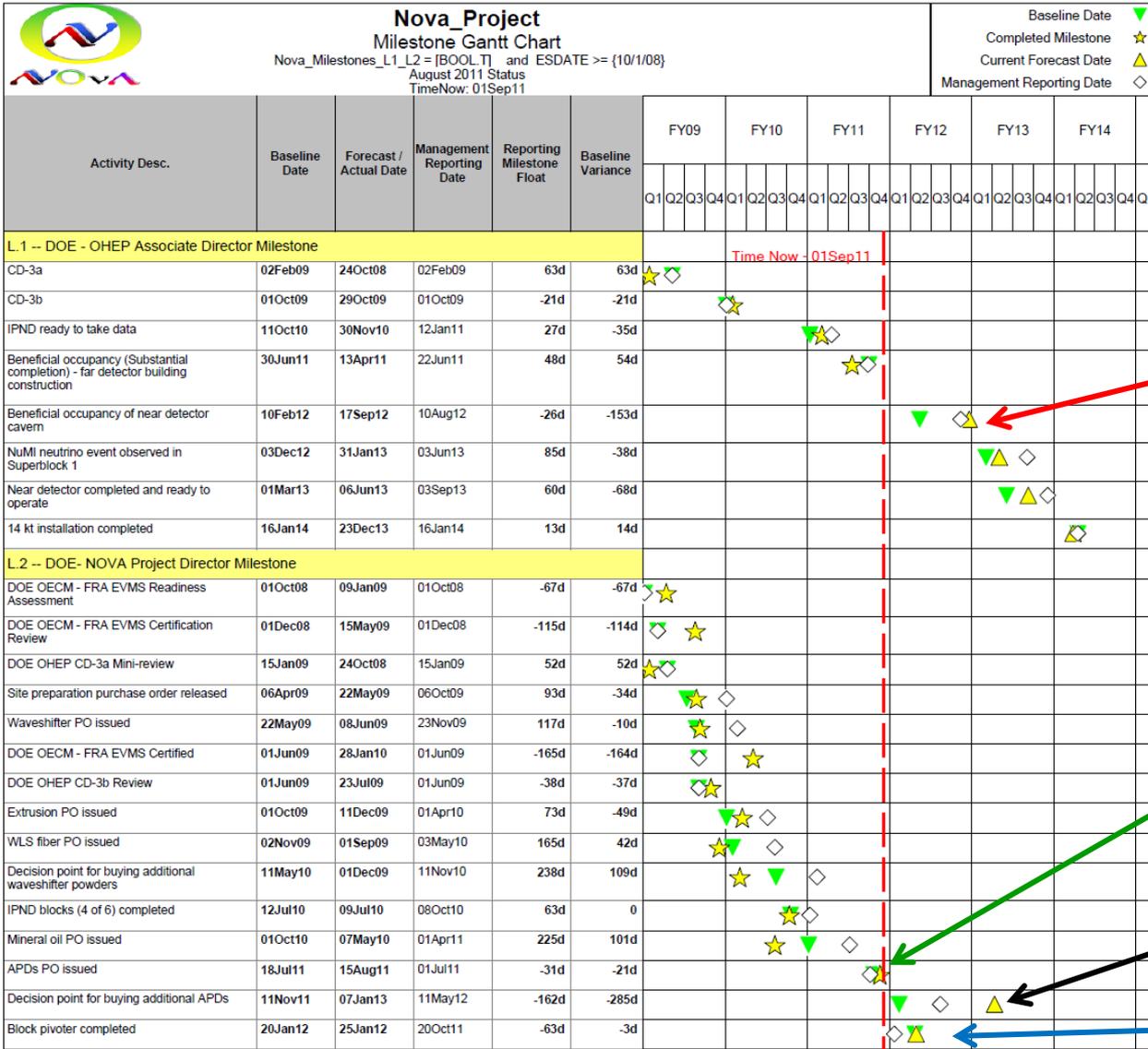
Milestones: What about CD-4 ?

- **ANU stayed at constant days of float in Aug** -- Now at 476 days
 - Kicker schedule drives the float
- **The Detector lost 2 days of float in Aug** -- Now at 203 days
 - Pivoter readiness drive the float still.

Tracking Float to CD-4



Milestones held by DOE



Will need to move this one, best estimate is now June 2013, but several options exist

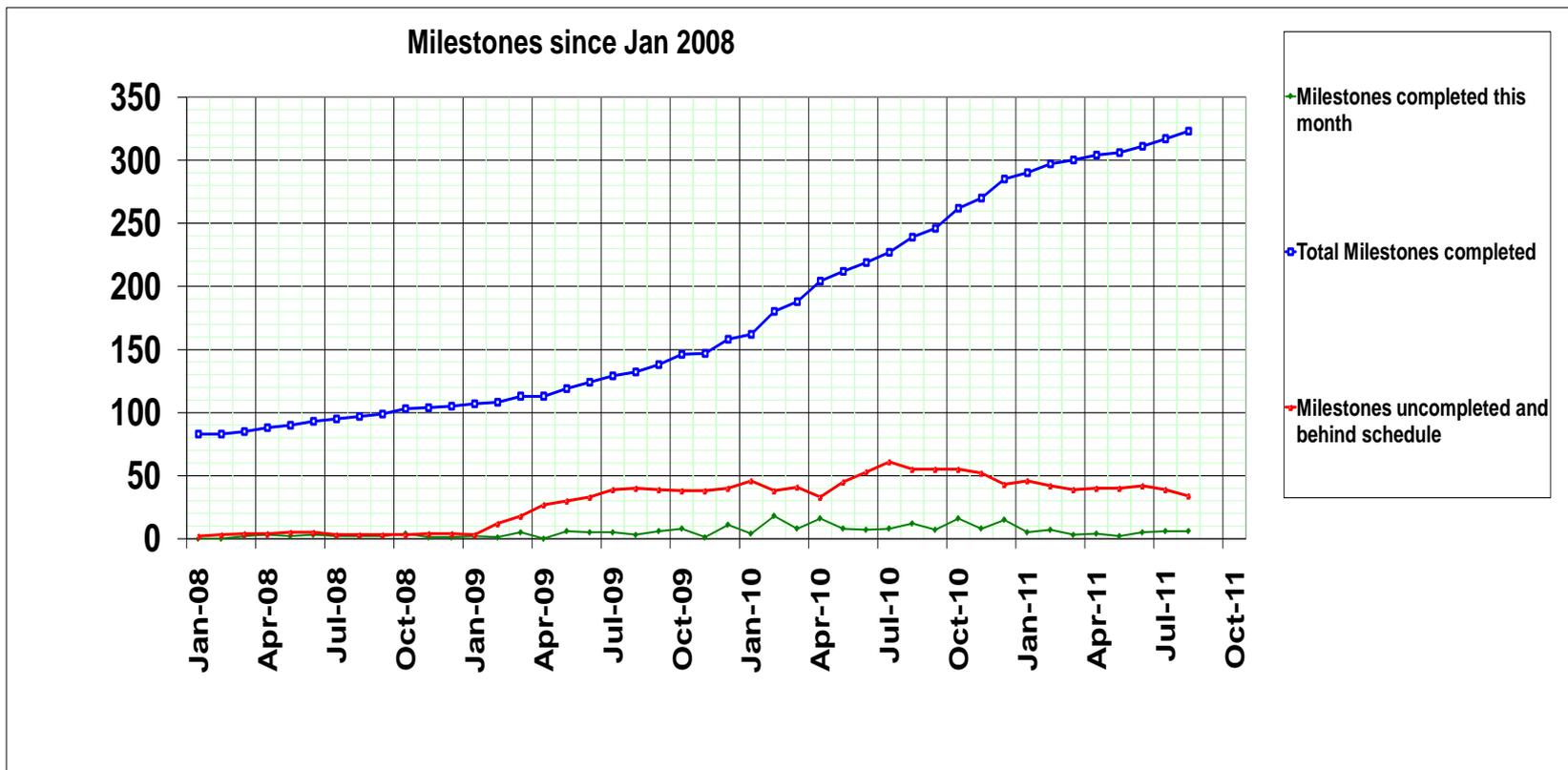
Did complete APD P.O., about 15 days late

Will need to move this one since no deliveries until Jan 2012, but need to decide by ~ Fall 2012

CR moved to best estimate



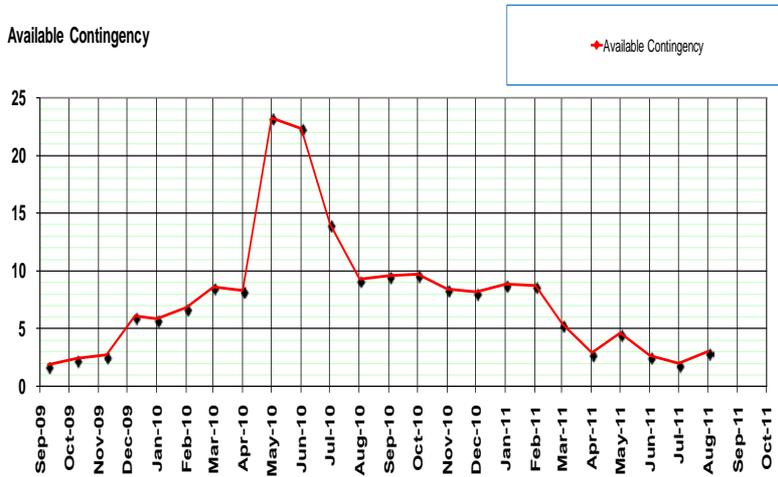
Analysis of all milestones (696 now)



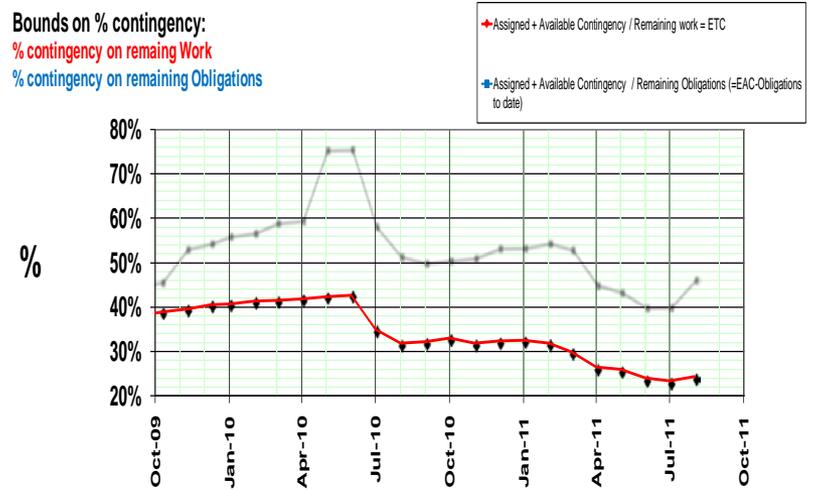
- Of the 34 missed milestones as of August (smallest number since Apr2010)
 - 1 are Detector R&D
 - 5 are ANU
 - 28 are Detector Construction

Contingency Status

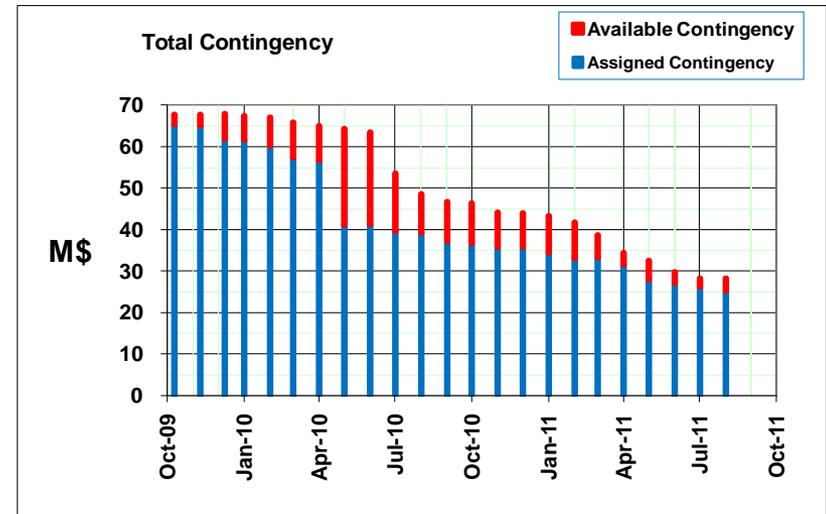
- Available Contingency = \$ 3.04 M in Aug (Jul = \$ 1.97 M, Jun = \$ 2.67 M)
- 24% Contingency on remaining work
- 47% on remaining Obligations



Bounds on % contingency:
 % contingency on remaining Work
 % contingency on remaining Obligations



- “Available” still varying around a low level
 - Still cautious
 - We did do ~ 1M\$ of Change Requests in August, so these are not slowing down as I had expected.
- Total Contingency is 28.2 M\$





AY\$ by Level 2 with MIE/OPC split

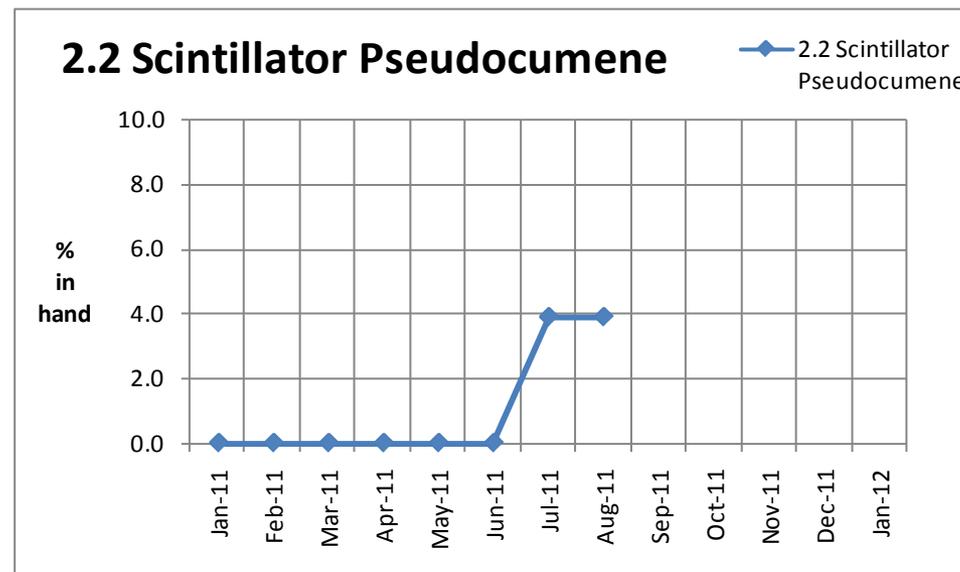
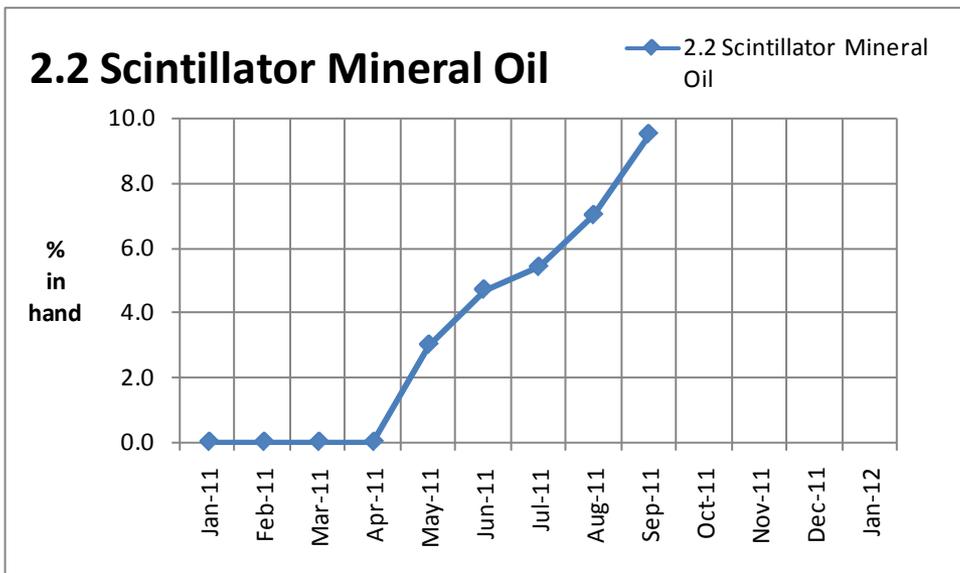
	WBS	Items	NOVA Costs to Date (\$M)	NOVA's Cost Estimate AY \$M (for September 1, 2011 to project end)									
			as of 31-Aug-2011	Estimated Cost (with indirects)			Mgmt Reserve Estimate			Contingency %			Total
				M&S	Labor ¹	Total	M&S	Labor ¹	Total	M&S	Labor ¹	Total	Cost
TE C	2.0	Accelerator & NuMI Upgrades	\$ 17.2	\$ 5.9	\$ 12.4	\$ 18.2	\$ 2.0	\$ 3.9	\$ 5.9	34%	32%	32%	\$ 41.3
	2.1	Far Detector Site and Building	\$ 4.3	\$ 0.7	\$ 0.0	\$ 0.7	\$ 0.1	\$ 0.0	\$ 0.1	11%	11%	11%	\$ 5.2
	2.2	Liquid Scintillator	\$ 5.7	\$ 15.7	\$ 0.4	\$ 16.1	\$ 4.4	\$ 0.2	\$ 4.6	28%	43%	29%	\$ 26.4
	2.3	Wave-Length-Shifting Fiber	\$ 7.2	\$ 4.6	\$ 0.4	\$ 5.0	\$ 0.2	\$ 0.0	\$ 0.3	5%	11%	5%	\$ 12.5
	2.4	PVC Extrusions	\$ 7.9	\$ 20.6	\$ 0.9	\$ 21.5	\$ 1.1	\$ 0.3	\$ 1.4	6%	29%	7%	\$ 30.9
	2.5	PVC Modules	\$ 5.6	\$ 5.2	\$ 7.7	\$ 12.9	\$ 0.6	\$ 1.3	\$ 1.9	11%	17%	15%	\$ 20.4
	2.6	Electronics Production	\$ 2.2	\$ 8.4	\$ 1.1	\$ 9.5	\$ 1.0	\$ 0.3	\$ 1.3	12%	28%	13%	\$ 12.9
	2.7	Data Acquisition System	\$ 1.4	\$ 1.9	\$ 0.9	\$ 2.9	\$ 0.4	\$ 0.3	\$ 0.7	22%	32%	25%	\$ 5.1
	2.8	Near Detector Assembly	\$ 2.1	\$ 4.8	\$ 0.3	\$ 5.0	\$ 1.6	\$ 0.2	\$ 1.7	33%	53%	34%	\$ 8.8
	2.9	Far Detector Assembly	\$ 5.3	\$ 7.8	\$ 9.7	\$ 17.5	\$ 1.8	\$ 5.2	\$ 7.0	23%	53%	40%	\$ 29.8
	2.10	Project Management	\$ 5.2	\$ 0.2	\$ 5.1	\$ 5.3	\$ 0.1	\$ -	\$ 0.1	24%	0%	1%	\$ 10.6
		Subtotal Construction	\$ 64.1	\$ 75.9	\$ 38.9	\$ 114.8	\$ 13.2	\$ 11.6	\$ 24.9	17%	30%	22%	\$ 203.8
OP C		R&D - Accelerator	\$ 6.5	\$ 0.0	\$ 0.4	\$ 0.4	\$ 0.0	\$ 0.1	\$ 0.1	30%	29%	29%	\$ 7.1
		R&D - Detector	\$ 28.1	\$ 0.0	\$ 0.1	\$ 0.1	\$ 0.0	\$ 0.0	\$ 0.0	100%	17%	22%	\$ 28.2
		Cooperative Agreement	\$ 34.6	\$ 0.0	\$ -	\$ 0.0	\$ -	\$ -	\$ -	0%	0%	0%	\$ 34.6
		Operating	\$ 0.5	\$ 0.1	\$ 0.5	\$ 0.6	\$ 0.0	\$ 0.2	\$ 0.2	43%	35%	36%	\$ 1.3
		Total OPC:	\$ 69.8	\$ 0.1	\$ 1.0	\$ 1.1	\$ 0.0	\$ 0.3	\$ 0.3	35%	31%	32%	\$ 71.2
		Available Contingency						\$ 3.036				\$ 3.0	
		TPC:	\$ 133.9	\$ 76.0	\$ 39.9	\$ 115.9	\$ 13.3	\$ 11.9	\$ 28.2	17%	30%	24%	\$ 278.000



Quick Overview of Detector Construction

- **Scintillator**

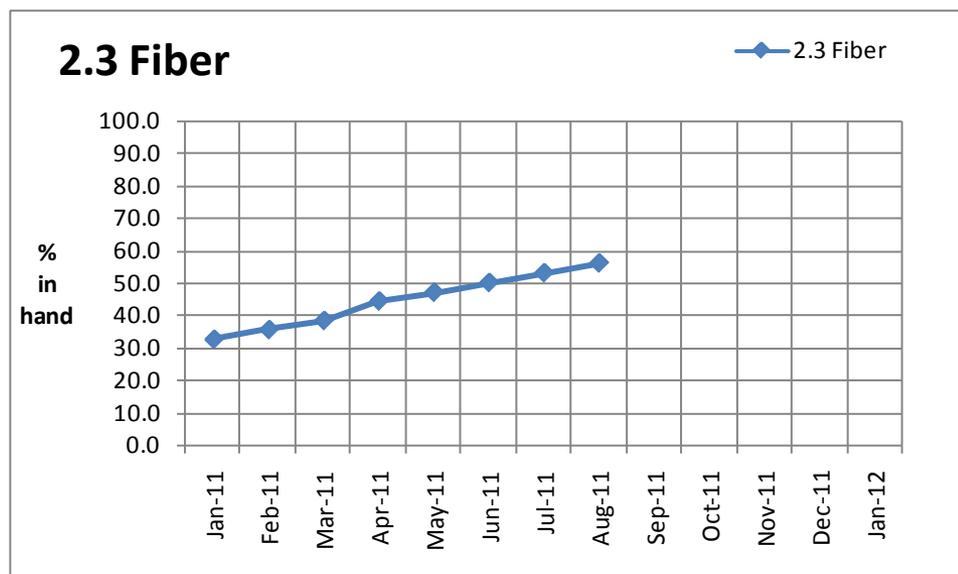
- Have 100% of waveshifters
- Have 286,000 gallons of mineral oil
 - 3,000,000 gallons required
 - New price agreement
 - Now indexed directly to the relevant lubrication oil
 - Current price is \$5.04/gal
- Have 6,038 gallons of pseudocumene
 - 155,000 gallons required
- Blending infrastructure in progress, expect first blend week of Oct 24
 - 220,000 gal blend in Oct/Nov





Quick Overview of Detector Construction

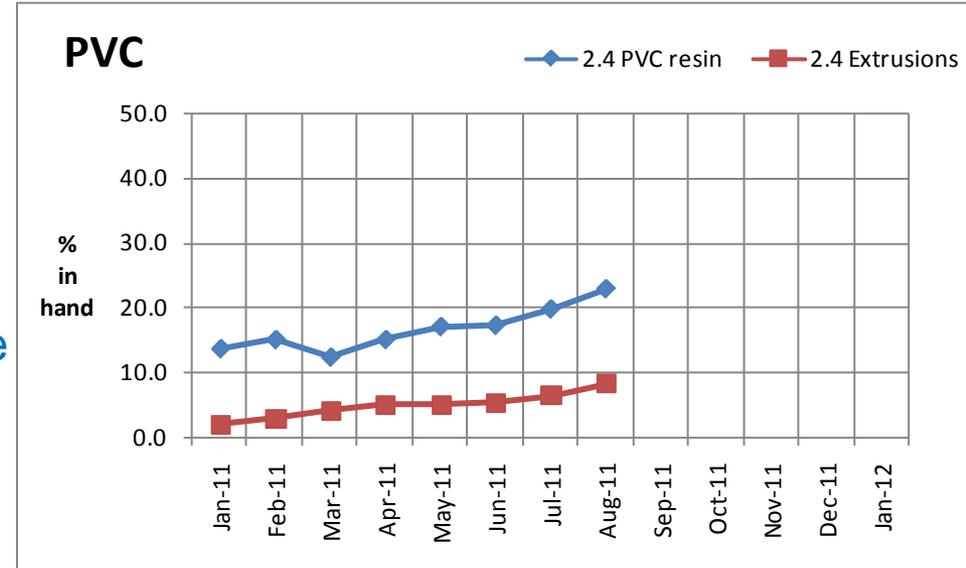
- Fiber
 - Have 6,840 km delivered
 - Out of 12,183 km required
 - 56%





Quick Overview of Detector Construction

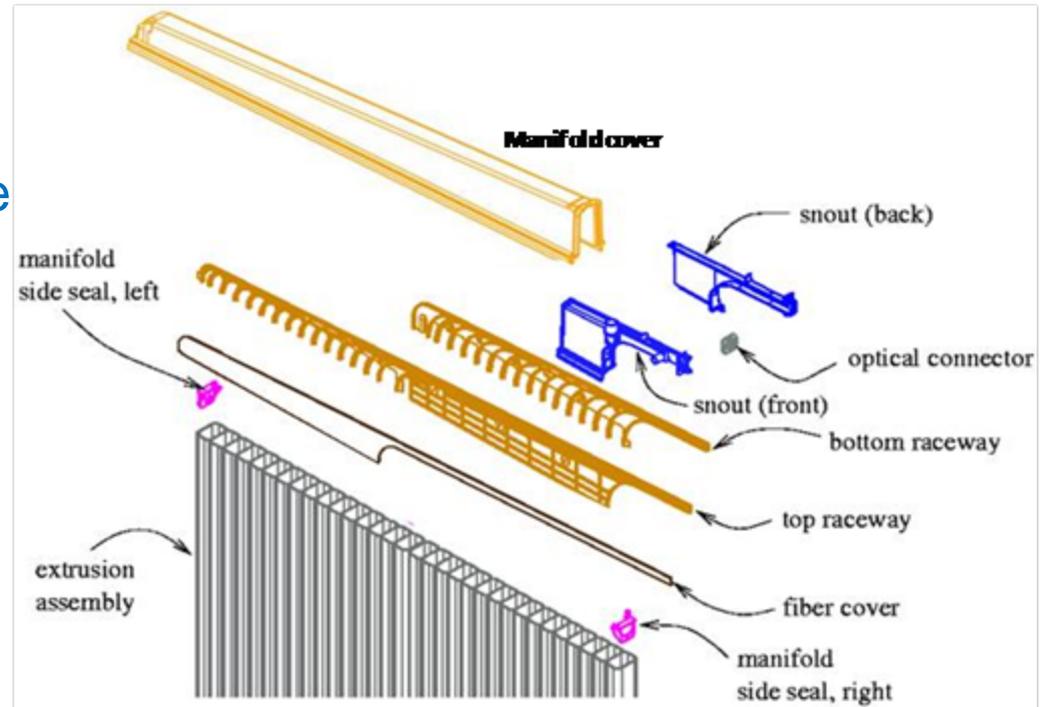
- PVC extrusions
 - 3,136,400 pounds of resin delivered
 - 13,750,000 pounds required
 - So have 22.8%
 - 1880 extrusions made so far
 - 23,040 required
 - So have 8.2%
 - During August, 404 extrusions made but we wasted 30% more resin than contained in the 404.
 - Concentrating on minimizing waste, e.g., can we reduce tolerances to keep more parts
 - Open plan assumes 6% waste
 - Concentrating on full production – goal is to extrude as much as possible in Oct & Nov to see what the current resin / die / extruder are capable of.





Quick Overview of Detector Construction

- PVC Modules
 - Have one saw fixture complete for the cuts of the extrusion ends.
 - 2 perpendicular tolerances at both ends
 - 1 length tolerance for the modules
 - 2nd pass on manifolds due any moment
 - Expect better flow characteristics in the injection molding
 - Hired 40 new student workers in August
 - Training now
 - Total of 70 workers now on board (200 eventually)





Quick Overview of Detector Construction

- Electronics

- APD P.O. complete for 12,000 parts with up to 30% more as a Fermilab option.
- Trip to Japan on September 9 (Leon Mualem and John Oliver)
 - APD silicon is passivated with SiO₂ but then etched back off the actual pixels
 - 1 micron coating, ~ 500 nm light, get interference filter
 - Thicker coatings of Silicone will wash this out – **this will be Plan A**
 - Hamamatsu can't get wafers in production quickly and can only offer 250 new parts with delivery in late Jan through late Feb 2012.
 - Meanwhile they do have 10 "Grade B" APDs left from our first order and will coat them with Silicone by the end of October
- Tried a coating in U.S. with Parylene, 12.5 microns
 - Seems a candidate but loses 5% of the light
 - **This will be Plan B**
- Developed a technique at Caltech to pull a vacuum on all the various seals which are supposed to keep water vapor away from the -15°C APD silicon.
 - Found 90% of heat sinks leak – some fast, some slowly
 - Explains why we continue to lose cold APDs, about 5 per week.
 - Fixes have been developed and will be applied in tests.
 - Leaks now 1/300 of size before, now harder to test.....
- Able to recover some APDs after cleaning & drying, OK on tester



Quick Overview of Detector Construction

- MORE Electronics – near term Test Plan:
 - Silicone Coated APDs:
 - One unit @FNAL to be installed ASAP (this week).
 - This unit was delayed since we decided to mount and test the final spacer frame at Caltech, and mount a leaky heat sink. (VERY leaky, no o-ring between HS and spacer frame)
 - Silicone Coated APDs:
 - 10 coming from Hamamatsu at end of October.
 - These will get sealed & tested heat sinks
 - Parylene Coated APDs:
 - One unit in hand to be installed ASAP (this week?).
 - Will be mounted with a leaky heat sink. (VERY leaky, no o-ring between HS and spacer frame)
 - Parylene Coated APDs:
 - Getting 10 of our “recovered” APDs coated
 - These will get sealed & tested heat sinks, install 1st week in Oct?
 - If this is successful, may attempt further recoveries, & would get remaining 150 APDs on the detector coated
 - Uncoated APDs:
 - 10 recovered after cleaning and drying
 - These will get sealed & tested heat sinks, install next week?
 - Uncoated APDs:
 - 10 never used yet
 - These will get sealed & tested heat sinks, install 2nd week of Oct?
 - Install next week?
 - All tests start warm to see performance, then go cold to failure (hoping for no failure)



Quick Overview of Detector Construction

- MORE Electronics – Review as suggested by IPR:
 - IPR says have review by Oct 31.
 - Roger Rusack and Peter Denes have agreed to review our understanding to date and our test plan
 - Results of our tests will not be available by Oct 31.
 - Working on a date where both are available.
 - Review by phone link is likely solution, avoids travel time
- Final goal with prototype Near Detector
 - All APDs coated, all operating cold
 - Enough for all channels? Maybe only 450 of 500 required
 - Ready? About March 1.



Quick Overview of Detector Construction

- Near Cavern
 - Schedule from Russ Alber / Jon Hunt:
 - Nov-11 Design Complete
 - Dec-11 Issued for Proposals
 - Feb-12 Receive Proposals
 - Mar-12 Issue PO
 - Apr-12 NTP - Start **Site Prep Package**
 - Aug-12 Start Excavation - **Tunnels & Halls Package**
 - Jan-13 Excavation Complete - Start **Outfitting Package**
 - Jun-13 Project Complete
 - Need to decide on cavern width first – wider cavern delays the above schedule by 2 months
 - Trying to decide this week if simulation work and opinions converge.



Quick Overview of Detector Construction

- Full Height Engineering Prototype (FHEP)
 - PVC block construction at ANL completed last week
 - Moves to Fermilab (CDF pit) next week
 - Initial test will be to rotate the full distributed plastic load.
 - Other tests not possible due to Pivoter parts shortage
- Ash River Block Pivoter
 - Lower weldments assembled at Wide Band, then taken apart and shipped to Ash River during the week of September 12.
 - Upper weldments (yellow in picture) there now as well
 - Assembly in progress using parts from FHEP, Pushka & Alignment there next week
 - Table parts (30 welded sections)
 - 6 in progress at vendor
 - All 30 should get to Ash River by Thanksgiving.

