1 Report of the U.S. CMS Resource Manager

The funding provided by DOE and NSF to the U.S. CMS Operations Program for 2002 through 2015, as well as the funding guidance for 2016 through 2019, is shown in Figure 1.

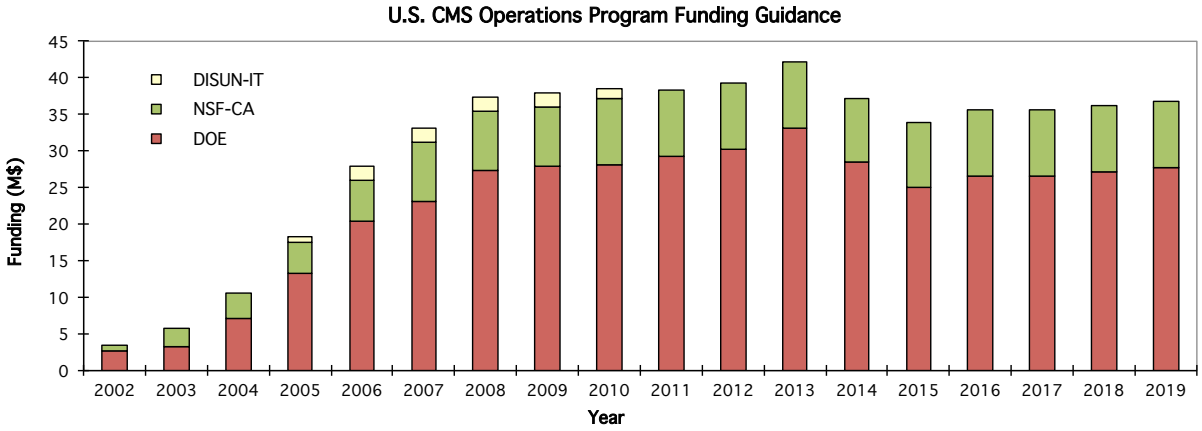

Figure 1: The annual U.S. CMS Operations Program funding provided by DOE and NSF. For 2002 through 2015 the chart shows the actual funding, while for 2016 onward the current funding guidance is shown.

Resources are distributed and tracked across the three areas through which the Operations Program is implemented: Detector Operations (DetOps), Software and Computing (S&C), and Common Operations (ComOps). ComOps is a category for items that would otherwise belong in both, or neither, of the other two categories.

Internal budget reviews for the current calendar year took place this past August and September. Through this process, U.S. CMS Management developed a detailed spending plan. This plan was further refined through the March joint NSF/DOE Operations Program review.

Primarily during the first quarter of the calendar year, Statement of Work (SOW) agreements were established with each institution that is providing a deliverable in exchange for Operations Program funding. The SOWs specify the tasks to be carried out, as well as any portions of salaries, materials and services (M&S), travel funding, or cost of living adjustments (COLA) to be paid from the Operations Program budget. The SOWs must be approved by U.S. CMS Operations Program management, by the Fermilab Director Designee, and by representatives of the collaborating group and institution. Through June of 2015, a total of 106 SOWs (68 DOE and 38 NSF) were produced and approved. After a SOW is approved, any additional changes are considered and, if approved, enacted through a Change Request procedure.

Table 1 shows the Spending Plan Change Log which captures revisions that were made prior to SOW approvals, as well as modifications implemented through Change Requests. The information is reported here down to the level-2 subsystem categories within DetOps, S&C, and ComOps. The CY15 spending plan, as of the end of Q2, is shown for DOE and NSF funds in Table 2. The plan will continue to evolve slightly as Change Requests are executed.

Once funds have been committed through purchase orders, in the case of DOE, and sub-awards, in the case of NSF, they are considered obligated. Figure 2 shows the obligations in the areas of DetOps, S&C, and ComOps, as compared to the spending plan, for DOE funds. The spending plan is plotted as if expenditures are carried out in even allocations each month, but this is intentionally not the case due to equipment purchases and the larger of the transfers to CERN-based Team Accounts, the latter of which are targeted for when exchange rates are favorable.

Spending through Universities and CERN Team Accounts is budgeted and tracked according to the calendar year, while spending at Fermilab has historically been budgeted according to the fiscal year. Of special note is that this year we have transitioned to reporting based on calendar year rather than based on fiscal year. There are two features of Figure 2 related to this transition. First, obligations for DOE spending at Fermilab in the last three months of calendar year 2014 have been included in the plotted obligations for 2015. Second, to accommodate the three month offset between fiscal year and calendar year, a buffer of $3M has been allocated this year, drawing from carry over from previous years. This is indicated by the difference between the solid and dashed blue lines. Figure 3 shows the total obligations and the spending plan, for NSF funds. Of the $9M in NSF funding, $2.7M in subawards went out this quarter, in addition to spending directly at Princeton.

Resources deployed at CERN, and paid directly in Swiss francs, account for approximately 28% of the 2015

Table 1: Spending Plan Change Log for CY15 Q2

U.S. CMS Detector Operations Change Control Activity						
WBS	**Subsystem**	**Change Request Number**	**Description of Change**	**CY15Q2 Plan**	**Change $**	**CY15Q3 Plan**
11	Endcap Muon	CR-022 & CR-023	UCSB CR-022: ME11 Electronics Labor correction, Team Account CR-023: Software/DAQ personnel	$1,820,239	$15,801	$1,836,040
12	Hardon Calorimeter	CR-027 & CR-028	Pre-sow adjust of software personnel, new UMinn SOW for electronics personnel, Iowa CR-027: HF improvements & HCAL sourcing, Brown & KSU CR-028: COLA and Travel	$1,589,517	$8,646	$1,598,163
13	Trigger			$919,475	$0	$919,475
14	Data Acquisition			$780,208	$0	$780,208
15	Electromagnetic Calorimeter		Adjustments	$844,815	($3,000)	$841,815
16/17	Tracker (Fpix&SiTrk)		Pre-sow adjustments	$775,461	($42,663)	$732,798
18	Detector Support	CR-016 & CR-017	Fermilab CR-016: CTPPS front-end board design labor, Fermilab CR-017: 2nd CTPPS module labor and M&S, CERN team account SOW adjustment	$209,473	$48,789	$258,262
19	BRIL			$388,180	$0	$388,180
30	Phase 2 Upgrade R&D	CR-030 & CR-017		$3,249,847	$107,409	$3,357,256
11-18,30	**Detector Operations**			**$10,577,215**	**$134,982**	**$10,712,197**

U.S. CMS Common Operations Change Control Activity						
WBS	**Subsystem**	**Change Request Number**	**Description of Change**	**CY15Q2 Plan**	**Change $**	**CY15Q3 Plan**
21.2	Common Costs (M&OA, LS1, Loan)		LS1 Common Fund overhead reduction	$5,430,822	($15,000)	$5,415,822
21.3	RCMS		Developer contract	$518,857	$35,556	$554,413
21.4	LHC Physics Center			$633,829	$1,808	$635,637
21.5	Operations Support		BU CR-077: Trigger coordinator and convener support	$1,357,534	$98,057	$1,455,591
21.6	Program Office		Travel for Upgrade Planning and other M&S adjust	$980,594	$48,800	$1,029,394
21.7	E&O			$286,480	$0	$286,480
21.8	Collaboration Support			$10,000	$0	$10,000
21	**Common Operations**			**$9,218,117**	**$169,220**	**$9,387,337**

U.S. CMS Software and Computing Change Control Activity						
WBS	**Subsystem**	**Change Request Number**	**Description of Change**	**CY15Q2 Plan**	**Change $**	**CY15Q3 Plan**
22.1	Fermilab Facilities		Changes are a combination of pre-sow adjustments ($41K personnel increase, $8K travel increase), change request CR-008 of $35K for Amazon Cloud Pilot, and reduction of $211K due to a favorable price on LPC Computing Analysis Facility disk purcahse	$6,738,279	($182,010)	$6,556,269
22.2	University Facilities			$4,117,582	$24,926	$4,142,508
22.3	Computing Operations			$1,123,082	$5,949	$1,129,031
22.4	Computing Infrastructure and Services			$2,095,189	$11,742	$2,106,931
22.5	Software and Support			$1,938,046	$13,040	$1,951,086
22.6	Technologies & Upgrade R&D			$902,380	($3,050)	$899,330
22.7	S&C Program Management & CMS Coordination			$691,772	$2,504	$694,276
22	**Software and Computing**			**$17,606,331**	**($126,900)**	**$17,479,431**

U.S. CMS Operations Program Total	**$37,401,663**	**$177,302**	**$37,578,965**

Table 2: Spending plan at the end of CY15 Q2, for funds from DOE, NSF, and the total.

WBS	Subsystem	DOE Funds	NSF Funds	Total
11	Endcap Muon	$1,501,320	$334,720	$1,836,040
12	Hadron Calorimeter	$1,524,752	$73,411	$1,598,163
13	Trigger	$771,665	$147,810	$919,475
14	Data Acquisition	$780,208	$0	$780,208
15	Electromagnetic Calorimeter	$841,815	$0	$841,815
16/17	Tracker (Fpix-SiTrk)	$703,520	$29,278	$732,798
18	Detector Support	$258,262	$0	$258,262
19	BRIL	$134,100	$254,080	$388,180
30	Phase 2 Upgrade R&D	$2,719,814	$637,442	$3,357,256
11-19,30	**Detector Operations**	**$9,235,456**	**$1,476,741**	**$10,712,197**
21.2	Common Costs (M&OA,LS1,UpgrdLoan)	$4,326,559	$1,089,263	$5,415,822
21.3	Run Coordination and Monintoring	$554,413	$0	$554,413
21.4	LHC Physics Center	$635,637	$0	$635,637
21.5	Operations Support	$1,327,761	$127,830	$1,455,591
21.6	Program Office	$911,844	$117,550	$1,029,394
21.7	Education and Outreach	$170,000	$116,480	$286,480
21.8	Collaboration Support	$10,000	$0	$10,000
21	**Common Operations**	**$7,936,214**	**$1,451,123**	**$9,387,337**
22.1	Fermilab Facilities	$6,556,269	$0	$6,556,269
22.2	University Facilities	$111,217	$4,031,291	$4,142,508
22.3	Computing Operations	$713,568	$415,463	$1,129,031
22.4	Software and Support	$1,677,995	$428,936	$2,106,931
22.5	Computing Infrastucture and Services	$1,694,841	$256,245	$1,951,086
22.6	Technologies & Upgrade R&D	$206,191	$693,139	$899,330
22.7	S&C Program Management and CMS Coordination	$464,016	$230,260	$694,276
22	**Software and Computing**	**$11,424,097**	**$6,055,334**	**$17,479,431**
U.S. CMS Operations Program Total		**$28,595,767**	**$8,983,198**	**$37,578,965**

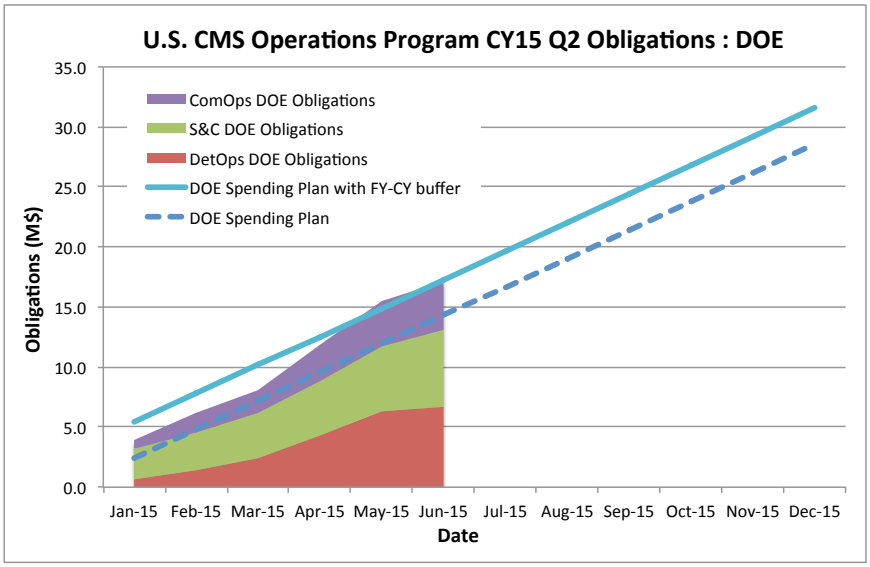

Figure 2: Obligations and spending plan for DOE funds. The spending plan is indicated with the assumption of equal monthly increments just as a rough guide. The lines show the spending plan with (solid) and without (dashed) a required buffer to bridge the difference between fiscal year and calendar year for funds spent at Fermilab, as described in the text.

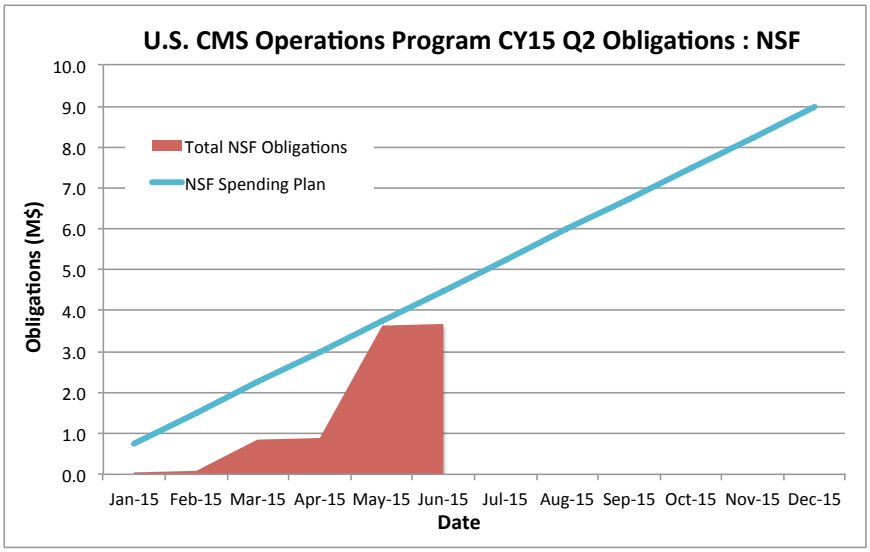

Figure 3: Obligations and spending plan for NSF funds. The spending plan is indicated with the assumption of equal monthly increments as a rough guide.

spending plan. This carries considerable exposure to the exchange rate. A rate of 0.9 CHF/USD has been used for planning, while the actual rate in CY15 Q2 averaged 0.94 CHF/USD. Figure 4 shows the allocated budgets and year-to-date spending through the Team Accounts that are used for expenditures at CERN. Spending for labor and cost of living adjustments occurs at a fairly constant rate. Figure 4 does not include the last 823K CHF of the Upgrade Common Fund payments and the 3,827K CHF M&O-A payments, as these are each made through multiple payments to a separate Team Account.

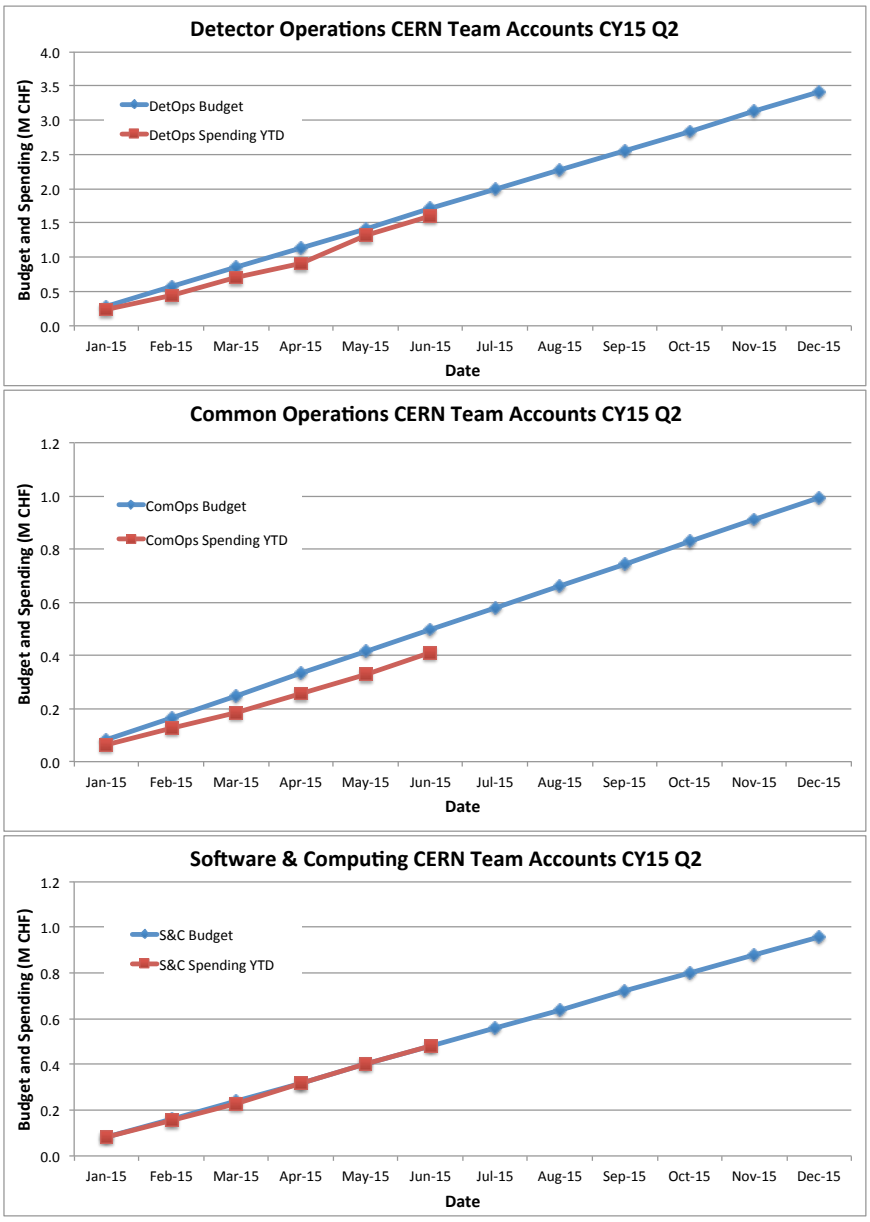

Figure 4: Budget plan and year-to-date spending, in Swiss francs, through DetOps (top), ComOps (middle), and S&C (bottom) Team Accounts.