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.

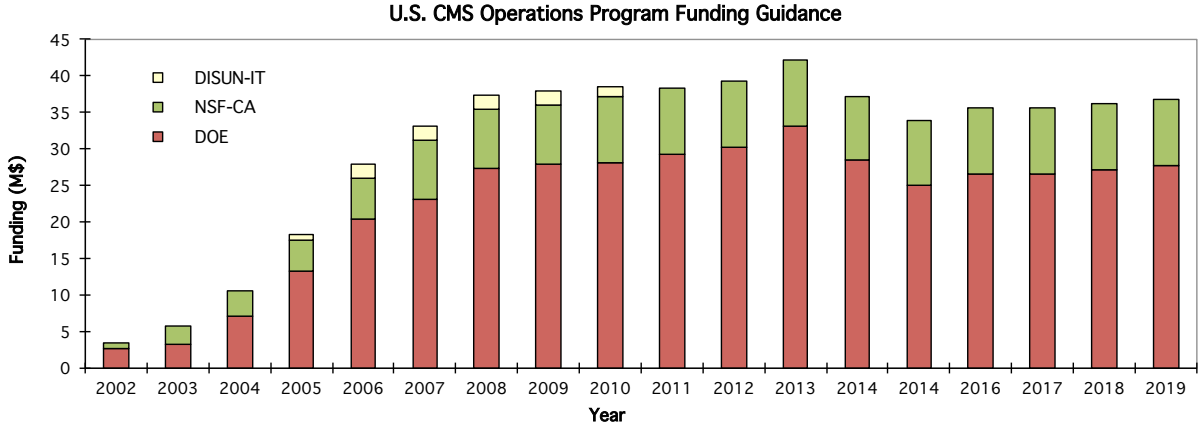

Figure 1: The annual U.S. CMS Operations Program funding provided by DOE and NSF. For 2002 through 2015 the chart shows the actual funding, while for 2016 onward the current funding guidance is shown.

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 March of 2015, a total of 86 SOWs (54 DOE and 32 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 Q1, is shown for DOE and NSF funds in Table 2. The plan will continue to evolve slightly as the remaining SOWs are approved, and as Change Requests are executed. For the allocation of resources among the seven S&C WBS tasks indicated in both Table 1 and Table 2, small differences with respect to what was shown at the most recent Joint Oversight Group meeting are due to a more precise attribution of the travel, COLA, and M&S costs to each of the S&C WBS tasks.

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 transfers to CERN-based Team Accounts, the latter of which are usually made 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 with this quarterly report we transition 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

Table 1: Spending Plan Change Log for CY15 Q1

U.S. CMS Detector Operations Change Control Activity						
WBS	**Subsystem**	**Change Request Number**	**Description of Change**	**CY15Q1 Plan**	**Change $**	**CY15Q2 Plan**
11	Endcap Muon	CR-021	UCSB: added funding for electronics labor and M&S	$1,805,557	$14,682	$1,820,239
12	Hardon Calorimeter	CR-025 & CR-026	UMinn CR-025: uTCA labor and M&S, FSU CR026: Maint&Repairs M&S, & presow adjustment	$1,558,683	$30,834	$1,589,517
13	Trigger	CR-024	Notre Dame TA COLA increase $3333 and Pre-SOW adjustments	$907,000	$12,475	$919,475
14	Data Acquisition		Pre-SOW COLA adjustments	$758,000	$22,208	$780,208
15	Electromagnetic Calorimeter		Pre-SOW adjustments	$851,000	($6,185)	$844,815
16/17	Tracker (Fpix&SiTrk)		Pre-SOW adjustments	$770,000	$5,461	$775,461
18	Detector Support			$209,473	$0	$209,473
19	BRIL		Pre-SOW COLA adjustments	$408,000	($19,820)	$388,180
30	Phase 2 Upgrade R&D		Pre-SOW adjustments, will be allocated in Q2 after EC downselect	$3,542,000	($292,153)	$3,249,847
11-18,30	**Detector Operations**			**$10,809,713**	**($232,498)**	**$10,577,215**

U.S. CMS Common Operations Change Control Activity						
WBS	**Subsystem**	**Change Request Number**	**Description of Change**	**CY15Q1 Plan**	**Change $**	**CY15Q2 Plan**
21.2	Common Costs (M&OA, LS1, Loan)			$5,431,000	($178)	$5,430,822
21.3	RCMS			$519,000	($143)	$518,857
21.4	LHC Physics Center		Pre-SOW adjustments	$688,000	($54,171)	$633,829
21.5	Operations Support		Pre-SOW adjustments	$1,201,000	$156,534	$1,357,534
21.6	Program Office			$980,594	$0	$980,594
21.7	E&O			$286,000	$480	$286,480
21.8	Collaboration Support			$10,000	$0	$10,000
	Other		Moved from "Other" to LPC, Ops Support, & small adjustments	$162,000	($162,000)	$0
21	**Common Operations**			**$9,277,594**	**($59,477)**	**$9,218,117**

U.S. CMS Software and Computing Change Control Activity						
WBS	**Subsystem**	**Change Request Number**	**Description of Change**	**CY15Q1 Plan**	**Change $**	**CY15Q2 Plan**
22.1	Fermilab Facilities		Pre-SOW adjustments	$6,735,279	$3,000	$6,738,279
22.2	University Facilities			$4,117,582		$4,117,582
22.3	Computing Operations			$1,123,082		$1,123,082
22.4	Computing Infrastructure and Services			$2,095,189		$2,095,189
22.5	Software and Support			$1,938,046		$1,938,046
22.6	Technologies & Upgrade R&D			$902,380		$902,380
22.7	S&C Program Management & CMS Coordination		Pre-SOW adjustments	$710,772	($19,000)	$691,772
22	**Software and Computing**			**$17,622,331**	**($16,000)**	**$17,606,331**

U.S. CMS Operations Program Total	**$37,709,638**	**($307,976)**	**$37,401,663**

Table 2: Spending plan at the end of CY15 Q1, for funds from DOE, NSF, and the total.

WBS	Subsystem	DOE Funds	NSF Funds	Total
11	Endcap Muon	$1,485,519	$334,720	$1,820,239
12	Hadron Calorimeter	$1,516,106	$73,411	$1,589,517
13	Trigger	$771,665	$147,810	$919,475
14	Data Acquisition	$780,208	$0	$780,208
15	Electromagnetic Calorimeter	$844,815	$0	$844,815
16/17	Tracker (Fpix-SiTrk)	$735,924	$39,537	$775,461
18	Detector Support	$209,473	$0	$209,473
19	BRIL	$134,100	$254,080	$388,180
30	Phase 2 Upgrade R&D	$2,647,904	$601,942	$3,249,847
11-19,30	**Detector Operations**	**$9,125,714**	**$1,451,500**	**$10,577,215**
21.2	Common Costs (M&OA,LS1,UpgrdLoan)	$4,341,559	$1,089,263	$5,430,822
21.3	Run Coordination and Monintoring	$518,857	$0	$518,857
21.4	LHC Physics Center	$633,829	$0	$633,829
21.5	Operations Support	$1,229,704	$127,830	$1,357,534
21.6	Program Office	$863,044	$117,550	$980,594
21.7	Education and Outreach	$170,000	$116,480	$286,480
21.8	Collaboration Support	$10,000	$0	$10,000
21	**Common Operations**	**$7,766,994**	**$1,451,123**	**$9,218,117**
22.1	Fermilab Facilities	$6,752,842	$0	$6,752,842
22.2	University Facilities	$110,737	$3,988,418	$4,099,156
22.3	Computing Operations	$710,490	$412,240	$1,122,730
22.4	Software and Support	$1,670,757	$428,176	$2,098,933
22.5	Computing Infrastucture and Services	$1,687,530	$255,791	$1,943,321
22.6	Technologies & Upgrade R&D	$205,518	$691,966	$897,484
22.7	S&C Program Management and CMS Coordination	$462,014	$229,852	$691,866
22	**Software and Computing**	**$11,599,888**	**$6,006,443**	**$17,606,331**
U.S. CMS Operations Program Total		**$29,259,289**	**$8,750,758**	**$37,401,662**

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, a first installment of $6M arrived during this quarter. In addition to spending at Princeton, which hosts the NSF cooperative agreement, only one subaward went out this quarter. Obligations of NSF funds will increase substantially in the next quarter as the bulk of the subawards are issued.

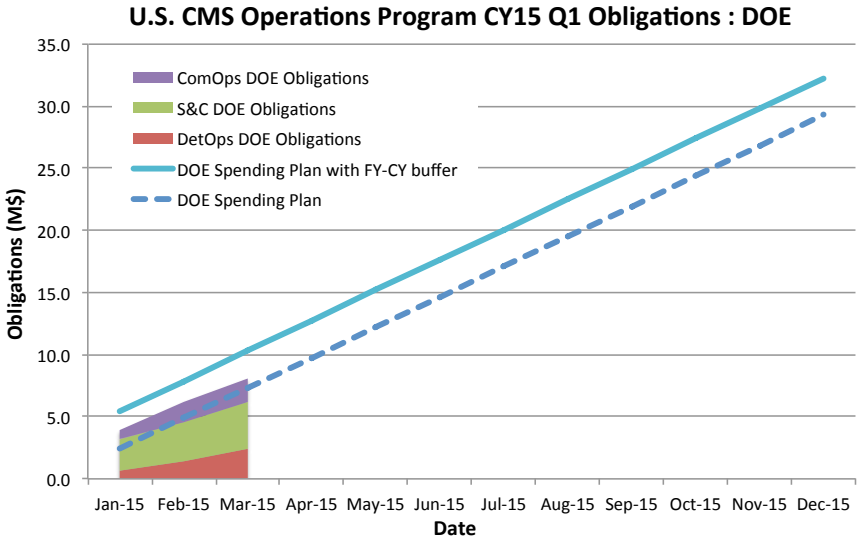

Figure 2: Obligations and spending plan for DOE funds. The spending plan is indicated with the assumption of equal monthly increments just as a rough guide. The lines show the spending plan with (solid) and without (dashed) a required buffer to bridge the difference between fiscal year and calendar year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

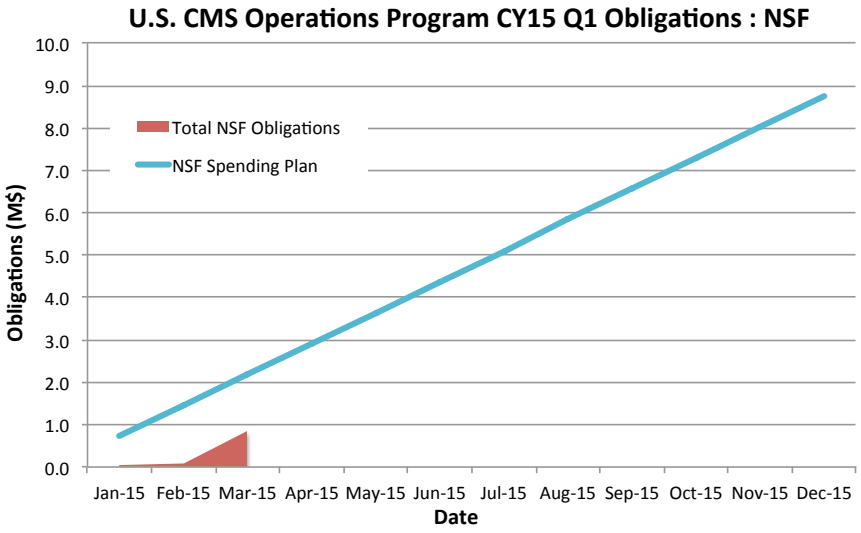

Figure 3: Obligations and spending plan for NSF funds. The spending plan is indicated with the assumption of equal monthly increments as a rough guide. Only one subaward was issued during this quarter. The majority of subawards will be issued during the next quarter.

Resources deployed at CERN, and paid directly in Swiss francs, account for approximately 28% of the 2015 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 Q1 averaged 0.95 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 615K CHF of the Upgrade Common Fund payments (paid in February) and the M&O-A payments (3,827K CHF, to be paid in three installments later this year), as these are discrete payments to a separate Team Account.

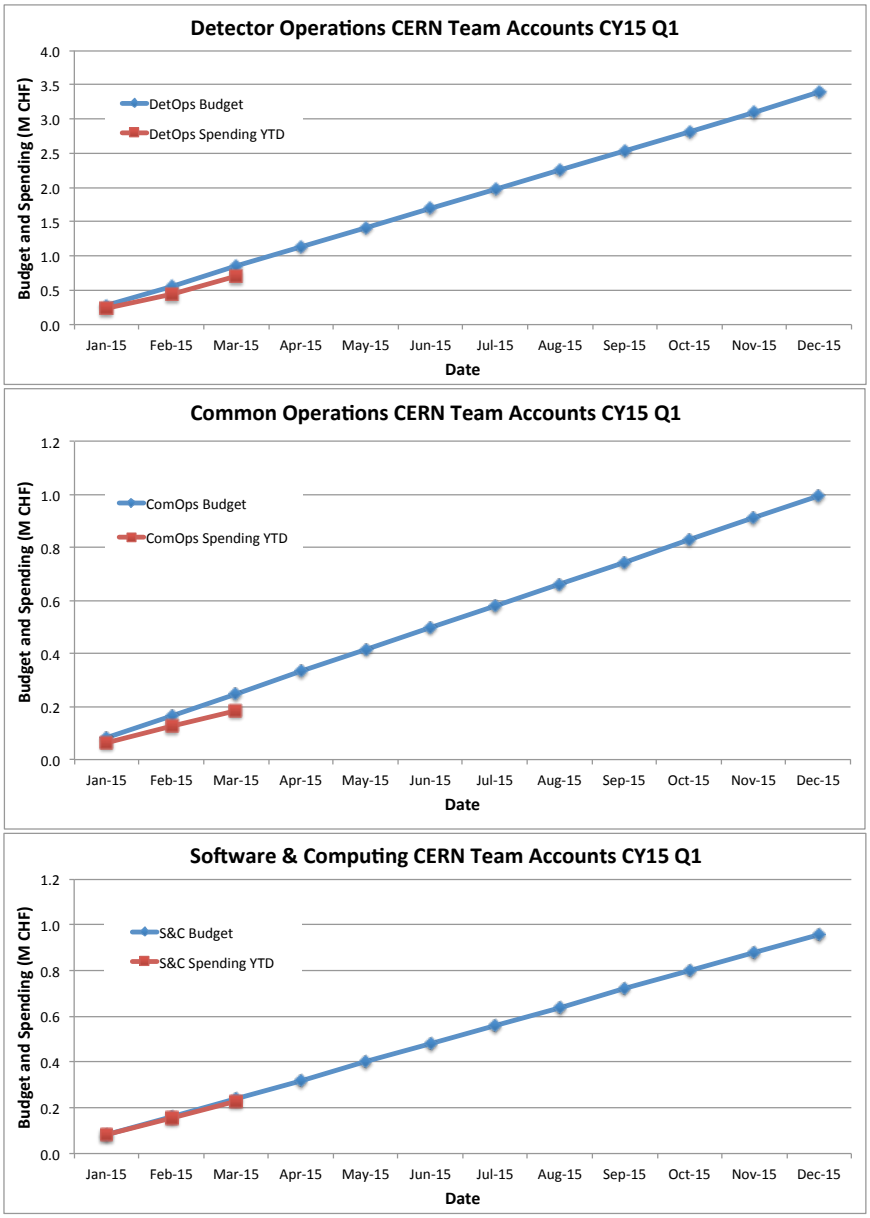

Figure 4: Budget plan and year-to-date spending, in Swiss francs, through DetOps (top), ComOps (middle), and S&C (bottom) Team Accounts.