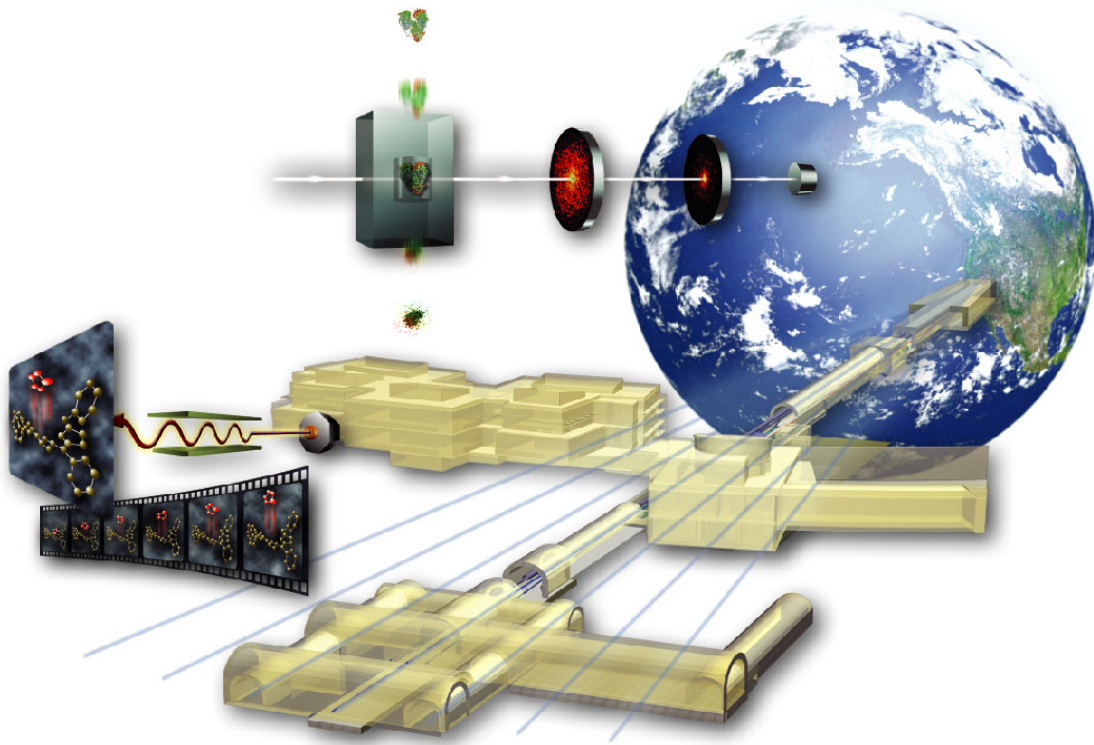


MONTHLY REPORT

June 2006



CONTENTS

PROJECT OVERVIEW AND ASSESSMENT	3
TECHNICAL AND PROGRAMMATIC PROGRESS	
<u>LCLS Project Office & Support</u>	
WBS 1.1, 2.1 Project Planning, Management & Administration	4
<u>Electron Beam Systems</u>	
WBS 1.1.3, 1.X.3 Global Controls	6
WBS 1.2, 2.2 Injector	7
WBS 1.3, 2.3 Linac	8
WBS 1.4, 2.4 Undulator	9
<u>Photon Beam Systems</u>	
WBS 1.5, 2.5 X-Ray Transport & Diagnostics	10
WBS 1.6, 2.6 X-Ray Endstations	12
<u>Conventional Facilities</u>	
WBS 1.9, 2.9 Conventional Facilities	13
COST PERFORMANCE REPORT	
-Cost/Schedule Variance Narrative	14
-Change Control Activity	
-Milestone Performance	
GLOSSARY	19

Project Overview and Assessment

Highlights:

- A one-day DOE status meeting of the LCLS Project was held at SLAC on June 15, 2006. The purpose of the meeting was to inform DOE of the project's progress in preparation for construction and to evaluate the overall cost risk to the project in light of the first bids on LCLS Conventional Facilities. The project's go-forward strategy was found to be acceptable although there remains significant cost risk to the project due to the high cost of LCLS construction activities.
- The Project Management team conducted its annual review Estimate to Complete of WBS 1.1, 2.1 (TEC and OPC Project Office Support). Overall, Project Office support adjusted to be consistent with the phases of the project. Also, the electrical power budget to support LCLS pre-operations was reestimated to be consistent with a 10 Hz commissioning. Overall, the resulting changes reduced WBS 1.1 BAC by ~\$2.9M and WBS 2.1 BAC by ~1.9M. Details of the ETC can be found in BCR PM-31.
- LCLS has begun to identify candidates for strengthening its senior staff in the Project Office. These are:
 - Procurements, LCLS has brought on Mr. Barry Miller, formerly of ORNL and the SNS project, to assist the Project Office.
 - Civil Construction, LCLS is conducting second interviews for this position's top candidates.
 - Engineering, LCLS has a requisition in place and is beginning to actively recruit for this position.
- Both phases of the FFTB cleanout have been completed safely and on schedule. This effort clears the way in SLAC's Research Yard for the excavation of the LCLS Beam Transport Hall which will begin in September under the direction of Turner Construction.

Assessment and Issues:

- The June 2006 Cost Performance Reports (CPR) is the 28th month of reporting earned-value on the LCLS TPC. For this month the LCLS cost and schedule indices are 0.96 and 0.91, respectively. Total obligations to date (actual costs + open commitments) are \$106,484K.
- Bids were received for the first major LCLS construction packages. Many packages are in-line with the estimate however four of the bids were much higher. To understand the reasons for these high bids, LCLS has requested that Turner provide full visibility into the cost variance between estimates and bids for these four packages.

- Contractual and performance issues continue to remain unresolved between SLAC and its CMGC (Turner Construction). High-level meetings are underway between Turner corporate, SLAC and Stanford University prior to the start of LCLS construction, which is nominally scheduled for mid-August.

Project Office and Support

WBS 1.1, 2.1 Project Planning, Management and Administration

Highlights:

- The SharePoint web-based data archiving system has been tested and will be used for depositing requirements documents that are used in conjunction with purchase orders including SOWs, Specifications (ESDs), and drawings. Full use of the system will require significant effort to gather the needed data and enter it into the system, but will help with configuration control and record keeping.
- LCLS Environmental, Safety & Health Status – June 2006
 - Injury Status – Through the end of June the project has worked 45 days without a recordable injury incident. Prior to an injury reported in May the project had worked 235 days without a recordable injury incident. The LCLS project recordable incident rate is currently 0.72¹. This compares favorably to general industry rates of 6.8 and that of the Department of Energy which is 2.1 for similar work.
 - Fire Hazards Analysis – SLAC released the final draft of the Fire Hazards Analysis (FHA) for internal and DOE review and comments. The finalized document will be issued on schedule, the second week of July.
 - Tunnel Rescue – With the receipt of the Draeger BG-4 SCBA underground respirator units, LCLS is making final arrangements to begin the first round of Fire Department personnel training during July. A second round of training to capture the balance of the Tunnel Rescue team will follow in August. Tunneling operations are scheduled to begin in September.
 - Oversight Walkthroughs – A Beta version of an LCLS Safety Observation Process reporting tool has been completed by the project programmers. This tool will be used by LCLS system and WBS managers to record the results of their safety inspections, based on the training they have received in this regard during the Management Meetings.
 - ES&H Self Assessment – The Office of Assurance, Interim Director, will suggest that SLAC management also use this process to demonstrate their compliance with the recently approved ESH Chapter 33 – *Self Assessment*. (SLAC will be the object of an Office of Assessment “Self Assessment evaluation” starting on September 11.)
 - Training Compliance - LCLS training compliance is 96%, which exceeds the SLAC goal of 90%. STA’s are currently 94% which also exceeds the SLAC goal of 90%.

¹ The number of injuries sustained by an average work crew of 100 individuals over a year.

- Contracted work – Current contracted work consists of underground utility surveying PEP Ring Road area and demolition of service buildings in the Research Yard. Work is following prescribed safety practices. In June two safety incidents were identified. The first was the identification of a contractor's extension cord with a cut in its insulation, the result of being run into by a piece of mobile equipment. The second, was an observation by a DOE Integrated Safety Management Review which identified an opportunity for improvement in the consistent implementation of Job Safety Analysis documentation in the underground utility surveying activity. The demolition of the Gas Pad was completed without injuries or identified safety incidents.
- LCLS Procurement Status – June 2006
 - Procurement actions continued with heavy activity in June, mainly due to issues surrounding the Jacobs and Turner subcontracts, and investigating Bid Package costs that are higher than anticipated. In light of increasing procurement activity, Business Services Head, Jerry Jobe authorized temporary assistance from other SLAC resources on an as needed basis.
 - CM/GC – Settlement on many issues was reached in June that resulted in several contract modifications. The issues included re-wording the contract as a result of Addenda 2&3, shifting the CLOC schedule, deleting the demolition of buildings, extending phase 1 preconstruction effort, agreeing on CCIP, resolving FAR/Contract discrepancies, and contracting for potholing service to identify underground utilities etc.
 - FFTB Equipment and Block Removal – The work was awarded and well ahead of schedule. Achieved completion in June.
 - Linac BC1 Chicane Dipole Magnets – Subcontract awarded. Design review was completed on April 7, with a final review of drawings completed by SLAC. Significant progress was made in June and arrival at SLAC is planned for late July.
 - BC2 Chicane Dipole Magnets – RFP Addendum issued with 1 month extension provided. Bids were received on March 20 and a technical evaluation was completed on April 21. Award was made in May with a due date of Jan 12, 2007.
 - Controls and Power Supply Racks – Subcontract awarded. Two racks were delayed because of heat sink availability. The heat-sink problem was resolved in June; one rack is due in August and one in October.
 - CMM – Awarded to Brown & Sharpe. The Coordinate Measuring Machine has shipped and was received in late May. The installation began shortly thereafter and completed in June.

Assessment and Issues:

- None

Electron Beam Systems

WBS 1.1, 1.x.2 Controls System

Highlights:

- Controls Group – A number of LCLS controls engineers attended the EPICS collaboration meeting at Argonne and presented talks on LCLS control system including the Timing system, LLRF, Applications Software, etc.
- PPS/LSS (Personnel Protection System/Laser Safety System) – The LSS installation is on course for the start of the laser operation in August. The LSS rack internal wiring has been completed, and the PPS/LSS Rack is being prepared to be moved to sector 20 for installation. Presentations for the Radiation Safety Committee meeting are being finalized. Long haul cable will be terminated in the next two weeks. All Laser Bay components have been ordered, items that have been received are either installed or in paint being silk-screened.
- Cable Plant, Racks, Crates, etc.
 - The phase I cable plant installation in the injector vault and laser room was completed, including DC cables, I&C cables and conduits for HV cables in the Injection Tunnel.
 - The design and documentation of cable plant for phase II installation to start in August 2006 was completed.
 - The first shipment of racks for PPS, magnet power supply controllers and data network boxes were received at SLAC.
- Vacuum Controls
 - Most controls hardware for injector installation including Gauge controllers, Pump controllers, and PLC hardware are now available at SLAC.
 - All PLC hardware and most of the intra-rack wiring hardware are ordered and about 90% of the wiring diagrams for the vacuum system is complete.
- Magnet Controls
 - Design of magnet cable plant, intra rack wiring, and rack layout is complete. The racks will be loaded and tested in SLAC's Building 24 High Bay area where a test stand for magnet power supply control hardware and software is being setup. The racks will be fully loaded and tested before being moved for installation.
 - Most power supplies, including all MCOR hardware, are on hand in SLAC's Building 24. Bench-testing and installation should begin early July when all the racks arrive. All Ethernet PS Controllers (EPSC) are built and bench tested and one is being used in the test stand. The remaining electronics are expected in early July.

- Software: Databases for the legacy control system (SCP) and EPICS have been generated and the software for magnet control is nearing completion. EPICS and SCP operator displays are nearly complete.
- Beam Instrumentation and Diagnostics
 - The system design of the Profile monitor is complete. Critical tests of camera/fiber converter interface were completed successfully. The cable plant design and crate profile layout has been completed. The Profile control chassis is under development.
 - Work continues on the design of 2nd version of the Analog Front End (AFE) board for the Stripline BPM, including assembling schematic for automatic calibration function.
 - The design of the data acquisition system for the BLM (Bunch Length Monitor) is complete. All of the electronics components including CAEN QDC (charge integrating ADC) have been received and effort is focused on software drivers.
 - A preliminary design review was held for the Beam Current Monitor. The design is nearing completion and we are proceeding with the electronics board layout.
- Low-Level RF (LLRF)
 - All 3 Phasing Cavities are fabricated and cold tested. Final tuning will be done once installed, under vacuum and at temperature.
 - RF multiplier chassis from 2.856GHz to 11.424GHz have been fabricated and await testing. These chassis is the first subsystem of the X-Band LLRF system.
 - The 2830.5MHz Local Oscillator chassis has been fabricated. A band-pass filter in the I&Q signals does not allow DC offset corrections to suppress fundamental feed-through to be made. A second chassis will be made with a low pass filter. The opposite sideband suppression is better than 60dB. Initial test results on a spectrum analyzer look good. Noise floor is below that of the spectrum analyzer.
 - The RF Phase/Amplitude Control module is being modified to improve the high frequency match at the I&Q ports. Work has begun on Phase/Amplitude Detector RF board design. Filters and amplifiers are being tested.
 - The RF gun windows have been successfully tested using a PAC and solid state sub-booster to drive a klystron at Test Stand 5 in the Klystron Test Lab.

Assessment and Issues:

- The Non-Ionizing Radiation (NIR) Committee has expressed concern on the PPS interlocking of the klystrons and protection from NIR. Design of this system is being reviewed.

WBS 1.2, 2.2 Injector System

Highlights:

- Substantial progress was made towards completion of the Injector phase one cable installation. Cable pulls over the laser bay must be completed to allow start of laser table and enclosure installation. Contracts were released to install a shielding plug, laser tables and table shrouds. Drive Laser Milestone 3, acceptance of laser at vendor site, was granted and the laser was shipped from THALES to SLAC. Installation will begin in July.
- The new X-band klystron was tested at higher-than-LCLS power, at 120 pps and 500 nanosecond pulse width. The XL-4 for LCLS operated at >50 MW with no problem either with the tube or with the RF load. The tube completed a heat-run and a complete set of test data was collected.
- Gun Solenoid magnetic measurements are in progress, as are DL1 dipole and Injector quadrupole magnetic measurements. A list of magnet arrival dates, quantities and installation dates was provided to Magnetic Measurements to verify that the staffing plan will meet Injector/Linac requirements.
- Machining of the BXG spectrometer magnet started at LBNL. Machining of the gun spectrometer magnet core and injector special vacuum chamber machining will also be performed at LBNL.
- Installation preparation meetings for the 2006 shutdown are underway. These meetings replace the Engineering status meetings for 2006 equipment. The Install Prep meeting focuses on tracking fabrication completion and staging of components for installation.

Assessment and Issues:

- The latest revision of the Injector-Linac 2006 installation schedule requires work over the expected SLAC Winter Holiday laboratory shutdown. Installation of beamline equipment interferes with the Linac PPS Validation. The downtime schedule is being adjusted to meet the PPS certification schedule.
- The Insertion/SAB support stand fabrication was placed with an outside fabricator. This is critical for installation and is being closely monitored.
- Brazing problems with the final assembly of the LOa dual feed accelerating structure were overcome, and assembly was completed. The structure has gone to vacuum processing. RF Gun fabrication is about two weeks late due to additional cold test time required prior to final machining and braze. This delay will not affect the installation schedule.

WBS 1.3, 2.3 Linac System

Highlights:

- Removal of equipment from FFTB for use in LCLS was completed and the FFTB housing was dismantled. Further work by CF will be required to provide lighting, power and water cooling for devices located in this region; the West extension of the BTH (BTH West).
- A list of magnet arrival dates, quantities and installation dates was provided to Magnetic Measurements to verify magnetic measurement staffing plan will meet Injector/Linac requirements. Job submittals were made to SLAC shops to refurbish magnets removed from the FFTB.
- An Installation Preparation Meeting for the 2006 down was held. The meeting replaces the Engineering status meeting for 2006 equipment. The Install Prep meeting focuses on tracking fabrication completion and staging of components for installation. In the meeting five items were identified as highest schedule risk in L1 through BC1 as: BC1 Two Jaw Collimator (jaws and actuator in fab, chamber in design), IMBC11 Toroid (on order), IMBC10 (on order), BL11 Pyroelectric bunch length monitor (in design, long lead parts on order), XYCM11 corrector pair (on order).
- The BC1 Articulation assembly arrived from the vendor. Final BC1 magnet design drawings were received from vendor, support modification started.
- The 21-2 klystron waveguide splitter and horizontal feed in the Klystron Gallery was removed to allow installation of the X-Band Klystron and Klystron Gallery X-Band waveguide run. The removal required a vent of Linac Sector 21.

Assessment and Issues:

- None

WBS 1.4, 2.4 Undulator System

Highlights:

- Metalex (Serial #2) undulator magnet arrived at SLAC. The Hi-Tech (Serial #1) undulator is back on the bench for evaluation and possible repair after it was dropped during a rigging operation. Hi-Tech (Serial #3) undulator is completed, accepted, and awaiting permission to ship. Shipping is dependent on the ShockWatch results. Final acceptance will be done at SLAC on the ANL bench.
- Drawings and the SOW for brazing of the RF Beam Position Monitor (RFBPM) was sent to Altair. Altair has been asked to quote 3, 6,9, and 40 units for machining and brazing, they have indicated that the quotes will be in July.
- Electron beam testing of the RFBPM has begun. Precision is limited by beam jitter of the low energy beam of up to $\sim 100 \mu\text{m}$.
- Work progresses on the Single Undulator Test (SUT) setup. A review of SUT results is proposed for July.
- The ANL Magnetic Measurement Bench (at SLAC) has been re-assembled at the MMF. Crane certification is needed to complete re-commissioning and to perform the acceptance test on undulator magnet S/N 2.
- Commissioning of the Kugler magnetic measurement bench is ongoing.
- An Estimate to Complete that supports the working agreement of scope of work and global schedule agreed to in May with ANL is being generated.
- Assembly process and space planning continued. The use of B750 is nearly certain. Final approval of our plan by CEF is expected in early July. Draft travelers are in work. Material handling and assembly equipment is being specified/designed.

Assessments and Issues:

- Setup for tuning and assembly (1.4.3.6.1) are behind schedule about 2 months and estimated over budget by more than \$800k.
- Kugler Magnetic Measurement Bench must be commissioned and ready to make production measurements by July 28th to meet the level 3 milestone (the associated level 2 milestone is August 28th).

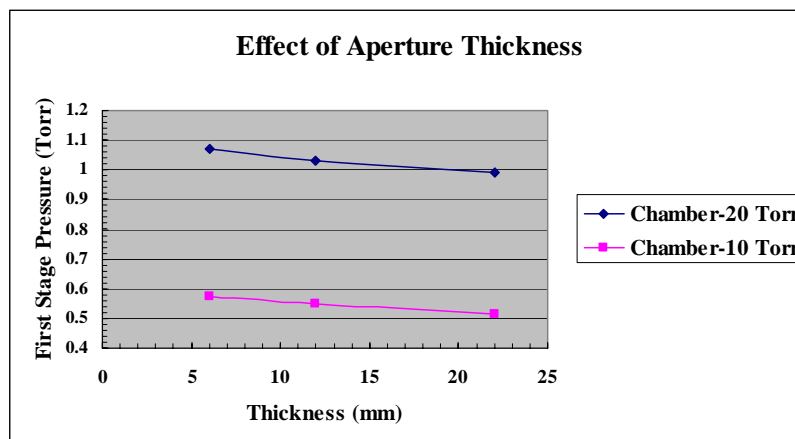
Photon Beam Systems

WBS 1.5, 2.5 X-ray Transport, Optics & Diagnostics (XTOD)

Highlights:

- Management and Safety – The following is a list of key PRD's (Physics Design Requirements), SCR's (System Concept Reviews), PDR's (Preliminary Design Reviews), and FDR's (Final Design Reviews) that have target dates in the June-August time period:
 - Gas Detector – PRD [June 2006] – completed.
 - Gas Detector – SCR [June 27, 2006] – completed.
 - Total Energy Monitor – PRD [June 2006] – draft completed.
 - Total Energy Monitor – SCR [July 2X, 2006]
 - FEL Offset Mirror – PRD [June 2006] – 1st draft completed
 - FEL Offset Mirror – SCR [Aug 2006] – waiting resolution of user comments
 - Fixed Mask and Slit – PRD [July 2X, 2006] – ready.
 - XVTS (Tunnel) – FDR [Aug 2006] – ready.

- Attenuator – The prototype gas attenuator continues to produce excellent results. As reported earlier, it met the design goal of 20-Torr operation for both nitrogen and argon gases. A study was made of the effect of aperture thickness (first stage) on the vacuum performance as shown on the plot below. As expected the increase of vacuum level is insignificant as the aperture thickness approaches 5 mm.



- Gas Detector – A System Concept Review of the Gas Detector was successfully held on June 27 @ SLAC. The concept uses the photo luminescence of the N2

gas to measure the energy deposited in the gas by the passing x-ray beam to determine the FEL pulse energy each shot. The major issues to be resolved before the Preliminary Design Review are the use of a small magnetic field to contain the photoelectrons and the shape of the detector (cylinder or sphere.)

- Direct Imager – New, broadband measurements at LLNL of the scintillation yield of a small sample of synthetic diamond show intense emission at ~600 nm giving a much higher yield than previous measurements by the group which looked for emission below 500 nm only. Diamond is a good candidate for one of the scintillators in the direct imager. A larger sample is on order for further tests at LLNL, SSRL, and the FEL at DESY Hamburg.
- Beam Simulation – The beam simulation work in June mainly supported the Gas Detector SCR and included calculations of the energy deposited in the gas as well as the windows by the spontaneous and FEL radiation.

Assessment and Issues:

- Controls –The controls for the pumping and associated motion and electronics for Gas Detector and Gas Attenuator subsystems were combined as the Gas Detector is now integrated into the Gas Attenuator. The standards for the VME crates were changed to eliminate problems with Dawn models. The FEE diagnostics were completely reconfigured to support the K spectrometer, the Total Energy Measurement System, and the Direct Imagers. It is now clear that all of the above control electronics no longer fits in the small racks under the beamline. An over/under approach will be pursued.
- FEL Offset Mirror System – The predicted FEL characteristics, after reflection by a 1 micro radian Mirror System, was circulated to the end-users. The end-users expressed concern over the increase in both size and divergence that results from the proposed mirrors and an evaluation of other performance parameters is under way.
 - Mirrors with figure errors of order 0.1 micro radian are specified to prevent noticeable degradation on the post-reflection beam characteristics. This figure requirement, however, is beyond the state-of-the-art currently achievable by mirror vendors for full-length mirrors. The XTOD group has requested information from vendors on what level of figure error can be achieved and how it varies as a function of length.
 - The highest XTOD priority is to finalize the Physics Requirements Document for mirror specifications and submit a formal specification for the four mirror elements that will comprise the first generation Offset Mirror System (OMS). Time is of the essence, as engineering needs to begin immediately on how to fixture, align and maintain the stability of the OMS—and these tasks can only begin once the physical dimensions of the mirrors are precisely known.

WBS 1.6, 2.6 X-Ray Endstation Systems

Highlights:

- XES group is preparing for the upcoming Estimate to Complete (ETC) review in August. As reported previously, this coincides with developing a detailed schedule in all of the XES areas, including an updated installation and commissioning schedule.
- Specification of the Personnel Protection System in the Photon areas is now beginning. A scope estimate of the Beam Containment System (BCS) for these areas is underway.
- XES has added scope and a new WBS section for a k-parameter measurement spectrometer. This instrument will be used for the undulator diagnostics. This change was approved via the BCR process.
- The 3rd LCLS Detector Advisory Committee Meeting (LDAC) is scheduled for July 19-20 at SLAC. The Cornell and Brookhaven projects will be reviewed and streak camera needs for LCLS will be discussed. The agenda will be available on the LCLS website.

Assessment and Issues:

- Start of the design effort on the Atomic Physics Station was delayed by lack of availability of personnel. This has been resolved and does not impact the schedule. The conceptual design engineering is now scheduled to start in July. Beam line and instrument layout in the hutches have been discussed with the LUSI group and its impact on the focusing optics.
- The long-range staffing plan is continuing to be developed, particularly the necessary increase to a staffing level adequate for operating the LCLS.

Conventional Facilities (CF)

WBS 1.9, 2.9 Conventional Facilities (CF)

Highlights:

- Effort continues on the review of Bid Group #1 bids by the LCLS team, the CMGC (Turner Construction) and the Architect/Engineer (Jacobs Engineering). The review is to determine the issues that are considered to be potential reasons for the unanticipated costs. A final analysis will be provided by Turner Construction.
- A Value Engineering session was conducted at the SLAC site with Jacobs Engineering, Turner Construction and LCLS CF staff. See issues and assessments.
- A job walk was held for the FFTB Excavation project. Four contractors were represented at the job walk. Final bids are scheduled to be received during the month of July.
- The construction for the Research Yard demolition activities (including the SLC Gas Pad) has commenced well and is currently on schedule. Estimated completion of this project is scheduled for July of 06.
- A tunnel fire safety presentation was provided by Mr. Mitch Baclasky from the University of Reno Nevada Fire Science Academy.

Issues and Assessments

- An early assessment of Bid Group #2 bids are consistent with the trending previously identified in Bid Group #1. In some areas (non-critical to immediate schedule), one or zero bids were received. Turner Construction is reviewing the bids and will provide a bid analysis with recommendations.
- A continued effort is being made to Value Engineer the LCLS CF scope while avoiding significantly impacting the LCLS FEL or science program. Initial recommendations have identified items that can provide cost savings. Some items will require approval by the LCLS Architect/Engineer (Jacobs Engineering).



LCLS Cost and Schedule Performance – June 2006

LCLS Cost/Schedule Status Report - Work Breakdown Structure								30-Jun-06			
WBS	Cumulative to Date (\$K)							At Completion (\$K)			
	Budgeted Cost		Actual Cost Work Performed	Variance		Performance Indices		Budgeted	Management Estimate at Complete*	Variance	
	Work Scheduled	Work Performed		Schedule	Cost	SPI	CPI				
1.1 Project Management	16,032	15,808	17,777	-224	-1,969	0.99	0.89	24,961	28,668	3,707	
1.2 Injector	15,304	14,881	15,762	-423	-881	0.97	0.94	20,846	21,544	698	
1.3 Linac	10,067	7,287	6,697	-2,780	591	0.72	1.09	24,248	24,557	309	
1.4 Undulator	18,658	15,592	17,398	-3,067	-1,806	0.84	0.90	41,095	43,851	2,756	
1.5 X-ray Transport	9,302	8,594	8,385	-708	209	0.92	1.02	24,149	26,874	2,725	
1.6 X-ray Endstations	1,642	1,186	1,104	-455	83	0.72	1.07	14,425	15,751	1,326	
1.9 Conventional Facilities	19,616	18,345	18,791	-1,271	-447	0.94	0.98	107,711	123,266	15,555	
1 LCLS Total Base Cost	90,619	81,692	85,912	-8,927	-4,220	0.90	0.95	257,435	284,511	27,076	
								LCLS Total Estimated Cost		315,000	315,000
								Avail. Contingency		57,565	30,489
								% Contingency / ETC		32.8%	15.0%
								% Complete LCLS Base Cost		31.7%	28.7%
2.1 LCLS Project Mgmt, Planning & Admn (OPC)	5,827	5,847	5,743	20	104	1.00	1.02	32,055	32,057	2	
2.2 Injector (OPC)	866	789	814	-77	-25	0.91	0.97	7,307	7,320	14	
2.3 Linac (OPC)	1	1	31	0	-30	1.00	0.04	2,555	2,573	19	
2.4 Undulator (OPC)	798	1,035	825	236	209	1.30	1.25	4,634	4,414	-221	
2.5 X-ray Transport (OPC)	489	489	427	0	62	1.00	1.15	4,971	4,878	-93	
2.6 X-ray Endstations (OPC)	591	591	216	0	374	1.00	2.73	5,415	5,039	-376	
2.9 Conventional Facilities (OPC)	5	0	0	0	0			621	621	0	
2 LCLS Total Other Project Cost	8,578	8,752	8,057	179	695	1.02	1.09	57,559	56,903	-656	
LCLS Total Obligations = \$106,483.6K								LCLS Other Project Cost		64,000	64,000
								Avail. Management Reserve		6,441	7,097
								% Management Reserve / ETC		13.2%	14.7%
								% Comp LCLS Other Project Cost		15.2%	15.4%
LCLS Total Project Cost	99,198	90,444	93,969	-8,748	-3,525	0.91	0.96	379,000	379,000		
								% Complete LCLS TPC		28.7%	26.5%

*Management Estimate at Complete includes the Budget at Complete, a weighted CPI and SPI, proposed Baseline Change Requests and known risk contingencies.



Cost and Schedule Narrative

The LCLS cost and schedule estimate is consistent with a CD-4 milestone of March 31, 2009 and with a Total Estimated Cost (TEC) of \$315M and a Total Project Cost (TPC) of \$379M. All costs are in actual-year dollars and out-year costs are escalated using guidance provided by the Department of Energy's Office of Engineering and Construction Management (OECM).

The June 2006 Cost Performance Reports (CPR) is the 28th month of reporting earned-value on the LCLS TPC. For this month the LCLS cost and schedule indices are 0.96 and 0.91, respectively. Total obligations to date (actual costs + open commitments) are \$106,484K. Approved Baseline Change Requests (BCR's) are shown in the table below. The project critical path runs through the beneficial occupancy of the Central Lab Office Complex (CLOC) and has a total float of 111 working days with respect to CD-4. The LCLS schedule intentionally delays the award of the CLOC to mitigate cost risk related to civil construction. Early beam commissioning is critical to achieving the CD-4 goals of the LCLS. The controlling path for the LCLS beam commissioning runs through the Undulator Facility Beneficial Occupancy followed by the installation of the undulators followed by FEL beam commissioning. The total commissioning period with respect to CD-4 is 214 working days. LCLS management will aggressively work to maintain or improve this beam commissioning period.

Significant Cost/Schedule Variances

Linac System: SPI = 0.72, CPI = 1.09

The Controls Systems for both Linac and Injector is behind on hardware procurement for the upcoming installation. This work is behind schedule but is recovering. The Controls effort has been focused on preparations for the upcoming installation and commissioning period. Linac Controls work, RF waveguides and vacuum hardware for 2007 installation is now scheduled to begin, but is being deferred to support immediate needs. This future installation work needs to be replanned, and this plan is now being prepared as part of the Linac ETC.

Undulator System: SPI = 0.85, CPI = 0.92

Schedule variances for undulator system development at ANL have been hurt by delays in the Single Undulator Test, which developed into a larger test than had been anticipated. Completion of the SUT is necessary for beginning procurement of Undulator support and motion hardware. The SUT is nearing completion, the support FDR is scheduled for next month. The impact of these delays on Undulator stand assembly and the installation schedule are being closely monitored. Also, the undulator work at SLAC's Magnetic



Measurement Facility (MMF) is not yet prepared to perform undulator segment tuning. The Undulator alignment monitoring HLS is scheduled to begin purchasing hardware, and while this has not yet started, it is very close. Oversight of these activities has been escalated at SLAC to recover schedule.

XES Controls System: SPI = 0.72, CPI = 1.07

The schedule variance for the XES is driven entirely by the Controls Systems, 1.6.2. As stated above, the Controls effort has been focused on preparations for the upcoming Injector installation and commissioning period. The XES Controls work needs to be replanned so that it can be properly tracked. This new plan is now being prepared.

Change Control Activity (June 2006)*

BCR #	WBS #	Signature Level	Approval Month	BCR Description	Originator	TEC Base Cost Estimate		
						Previous Estimate	Increase (Decrease)	New Estimate
PM-31	All	3	01-Jun-06	PM Revised Estimate to Complete	M. Reichanadter	27,682,324	(2,926,332)	24,755,992
IJ-38	1.02/2.02	3	01-Jun-06	LCLS PROJECT - Revision of FY2006 Indirect Rate	PMCS	24,755,992	(11,502)	24,744,490
Previous Month Total Base Cost Estimate						260,372,462		
Total Delta Base Cost Change			1-Jun-06				(2,937,834)	
Current Month Total Base Cost Estimate								257,434,628

***All changes to the baseline are approved by the LCLS Change Control Board as per the approval thresholds defined in the LCLS Project Management Plan. Copies of Baseline Change Requests (BCRs) are available through the LCLS Project Office.**

Milestone Report (June 2006)

No milestone changes were reported for June 2006.



DOE (Level 1 - 2) Milestones

	System	Level?	Milestone	Baseline	Updated	Variance	2001		2002		2003		2004		2005		2006		2007		2008		2009	
							Oct	Apr	Oct	Apr	Oct	Apr	Oct	Apr	Oct	Apr	Oct	Apr	Oct	Apr	Oct	Apr	Oct	Apr
1			☐ Level 1 DOE (SC1) Milestones	8/29/08	3/31/09	140 days																		
2	DOE	ML1	CD0 - Approve Mission Need	6/17/01	6/17/01	0 days	●																	
3	DOE	ML1	CD1 - Approve Preliminary Baseline Range	10/16/02	10/16/02	0 days		●																
4	DOE	ML1	CD2a - Approve Long-Lead Procurement Budget	7/30/04	7/30/04	0 days				●														
5	DOE	ML1	CD3a - Approve Start of Long Lead Procurement	10/29/04	10/29/04	0 days					●													
6	DOE	ML1	CD2b - Approve Performance Baseline	3/31/05	3/31/05	0 days						●												
7	DOE	ML1	CD3b - Approve Start of Construction	2/28/06	3/21/06	15 days							●											
8	DOE	ML1	CD4 - Approve Start of Operations	3/31/09	3/31/09	0 days																	●	
9			☐ Level 2 DOE (SSO) Milestones	8/29/08	11/10/08	51 days																		
10	PM	ML2	Prelim Safety Assessment (PSAD) Doc Complete	4/30/04	4/30/04	0 days						●												
11	PM	ML2	DOE External Independent Review (EIR) Complete	6/15/04	6/15/04	0 days						●												
12	PM	ML2	Fire Hazard Analysis Approved	6/30/05	8/31/05	44 days							●											
13	PM	ML2	Prelim Safety Assessment (PSAD) Doc Approved	2/28/06	1/26/06	-23 days								●										
14	UN	ML2	Delivery of Undulator 1st Articles to MMF	7/3/06	7/3/06	0 days									●									
15	CF	ML2	Sector 20/Alcove Beneficial Occupancy	7/21/06	4/14/06	-70 days										●								
16	UN	ML2	MMF Qualified & Ready to Measure Prod Undulators	8/28/06	8/28/06	0 days											●							
17	CF	ML2	Research Yards Mods Beneficial Occupancy	10/20/06	10/20/06	0 days												●						
18	IJ	ML2	Start Injector Commissioning (Drive Laser)	11/20/06	11/20/06	0 days													●					
19	IJ	ML2	Injector Laser Commissioning Review Complete	1/16/07	1/16/07	0 days														●				
20	CF	ML2	Undulator Facility Beneficial Occupancy	6/4/07	6/4/07	0 days															●			
21	CF	ML2	Near Experimental Hall Beneficial Occupancy	6/18/07	6/18/07	0 days																●		
22	CF	ML2	Linac Facility Beneficial Occupancy	7/11/07	7/11/07	0 days																	●	
23	IJ	ML2	Start Injector Commissioning (UV Beam to Cathode)	7/20/07	7/20/07	0 days																	●	
24	IJ	ML2	Injector Accelerator Readiness Review (ARR) Comp	9/20/07	9/20/07	0 days																	●	
25	CF	ML2	Far Experimental Hall Beneficial Occupancy	9/4/07	9/4/07	0 days																	●	
26	CF	ML2	Front End Enclosure Beneficial Occupancy	10/5/07	10/5/07	0 days																	●	
27	CF	ML2	X-Ray Transport Beneficial Occupancy	10/12/07	10/12/07	0 days																	●	
28	CF	ML2	Beam Transport Hall Beneficial Occupancy	1/3/08	1/3/08	0 days																	●	
29	XE	ML2	2-D Pixel Detector Production Start	1/3/08	1/3/08	0 days																	●	
30	LN	ML2	Linac ARR (L120-L130) Complete	3/7/08	3/7/08	0 days																	●	
31	PM	ML2	Final Safety Analysis Document (FSAD) Approved	3/31/08	3/31/08	0 days																	●	
32	LN	ML2	Start Linac (L120-L130) Commissioning	5/8/08	5/8/08	0 days																	●	
34	LN	ML2	Start Linac-to-Undulator (LTU) Commissioning	6/12/08	6/12/08	0 days																	●	
33	PM	ML2	LCLS ARR Complete (BTH thru FEH)	6/9/08	6/9/08	0 days																	●	
35	UN	ML2	Start Undulator Commissioning (1st Light)	8/18/08	8/18/08	0 days																	●	
38	XE	ML2	Start XES Commissioning	8/18/08	8/18/08	0 days																	●	
36	XTOD	ML2	Start XTOD Commissioning	8/18/08	8/18/08	0 days																	●	
37	CF	ML2	Central Lab Office Ctr Beneficial Occupancy	11/10/08	11/10/08	0 days																	●	

LCLS Glossary

Actual Cost of Work Performed (ACWP) – Actual cost as reported through the LCLS cost accounting systems, plus any accruals, for a specific WBS#, subproject, or project.

Actual Year Dollars (AY\$) – Actual dollars in the year spent. Budgeted funds also reported in AY\$ to estimate of out-year expenditures and inflation. LCLS uses the escalation rate guidance as recommended by the Department of Energy for Energy Research projects.

Budget Authority (BA) – Cumulative budget currently allocated and authorized by the Department of Energy that may be committed and spent by LCLS for project-related activities.

Budget at Completion (BAC) – The total budgeted cost of the project at completion for a given subproject, or project. BAC is the budgeted cost of the project excluding contingency.

Budgeted Cost of Work Performed (BCWP) – Budgeted value of planned work for a specific WBS#, subproject, or project physically accomplished to date.

Budgeted Cost of Work Scheduled (BCWS) – Budgeted value of planned work time-phased to the schedule for a specific WBS#, subproject, or project.

Commitments – Budget allocated for approved work.

Cost Performance Index (CPI) – The ratio of the value of the work performed to actual cost; $CPI = BCWP/ACWP$. Values less than 1.0 represent “cost overrun” condition, and values greater than 1.0 represent “cost underrun” condition.

Cost Variance (CV) – Difference between the estimated value of the physical work performed and the actual cost expended for a specific WBS#, subproject, or project. $CV = BCWP - ACWP$. A negative result is unfavorable and indicates the potential for a cost overrun.

Estimate to Complete (ETC) – A realistic appraisal of the cost to complete the remaining scope of work.

Management Estimate at Completion – Forecast of the final cost for a specific WBS#, subproject, or project based on the current BAC plus management’s assessment of the cost to complete the remaining scope of work.

Other Project Cost (OPC) – LCLS “supporting” costs not directly contributing to the construction project. OPC costs generally include research and development and pre-operation (start-up) activities.

Percent Complete – The ratio of the work accomplished (earned-value) to the Budget at Completion for any WBS#, subproject, or project. $\% \text{ Complete} = BCWP/BAC$.

Project Engineering and Design (PED) – Funding used to support the engineering and design effort for the LCLS.

Schedule Performance Index (SPI) – The ratio of the value of work performed to work scheduled, $SPI = BCWP/BCWS$. Values less than 1.0 represent a “behind schedule” condition, and values greater than 1.0 represent “ahead of schedule” condition.

Schedule Variance (SV) – Difference between the value of the physical work performed and the value of the work planned (scheduled). $SV = BCWP - BCWS$. A negative result is unfavorable and indicates a behind schedule condition.



Total Estimated Cost (TEC) – The total capital budget authorized for the LCLS project for the construction phase of the project. TEC includes contingency but does not include OPC.

Total Project Cost (TPC) – The total capital budget authorized for the LCLS project, including TEC and OPC.

WBS (Work Breakdown Structure) – A method of hierarchically numbering tasks in a traditional outline numbering format. The WBS provides a basis for the LCLS work plan which is used to track all resources, schedules, and costs.