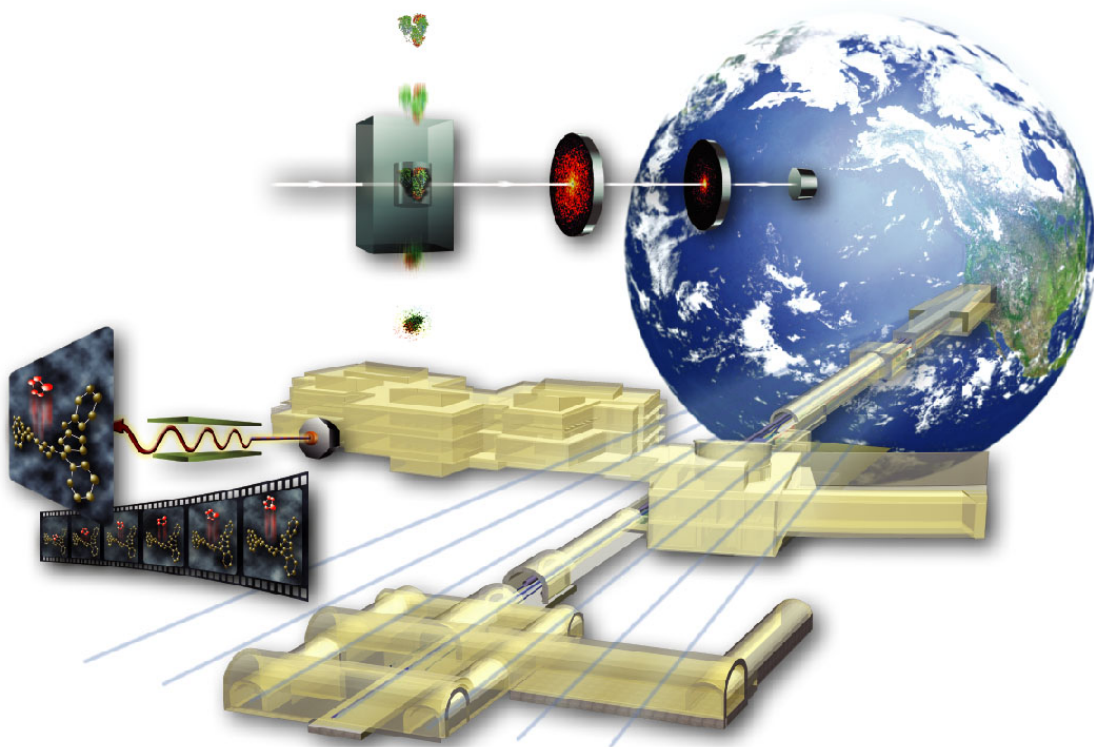


Monthly Report

April 2006



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Project Overview and Assessment

Highlights:

- The fifth meeting of the LCLS Facilities Advisory Committee was held on April 20-21, 2006. Good progress was noted by the committee. More information is available from the LCLS website at; <http://www-ssrl.slac.stanford.edu/lcls/>
- Undulator Magnets
 - The 1st article undulator from Hi-Tech passed inspection on the magnet measurement bench and we are giving Hi-Tech permission to proceed with the construction of the next 7 undulators.
 - The 1st article undulator from Metalex is being measured at ANL. Initial measurements and tuning look good. Once 1st article testing is accepted, Metalex will proceed with the construction of the next 7 undulators.
- 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 has a requisition in place and is actively recruiting for this position.
 - Engineering, LCLS has a requisition in place and is beginning to actively recruit for this position.
- The Final Focus Test Beam completed its last experiment on 10 April 2006. De-energizing and the removal process are underway to make way for the LCLS.
- The XTOD prototype gas attenuation cell has been operated successfully. Its performance exceeds specifications.

Assessment and Issues:

- The April 2006 Cost Performance Reports (CPR) is the 26th month of reporting earned-value on the LCLS TPC. For this month the LCLS cost and schedule indices are 0.99 and 0.92, respectively. Total obligations to date (actual costs + open commitments) are \$97,316K.
- 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. The CM/GC and project team will conduct a thorough analysis to understand the variances between the bids and the CM/GC estimates.
- The OECM EVMS validation review conducted by DCMA identified corrective actions to validate the LCLS EVMS. A Corrective Action Plan (CAP) has been generated and the plan for executing the CAP is underway.

Project Office and Support

WBS 1.1, 2.1 Project Planning, Management and Administration

Highlights:

- The Project continued to test a web based system (SharePoint) that can be used to deposit requirements documentation (SOWs, Specifications (ESDs), and Drawings) and track documents used for Purchase Orders in February. 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 – April 2006
 - Safety Work Performance – The project has worked 228 days without a recordable injury incident through the end of April. The LCLS project recordable incident rate is currently 0.38^[1]. This compares favorably to general industry rates of 6.8 for similar work and that of contracted work performed for the Department of Energy which is 2.1.
 - Safety Training Compliance – In response to LCLS Project Office directive for line managers to bring safety training into better training compliance has reached 96%. The project goal is 100%.
 - Project Safety Reviews – Project ESH group made presentations to the LCLS Facility Advisory Committee in April. The committee reviewed the Preliminary Safety Assessment Document and made minor editorial recommendations that focused on the Environmental section of the assessment.
 - Oversight Walkthroughs – Continue at the Sector 20, the MMF Utility Upgrade and the Final Focus Test Beam dismantling projects. LCLS management Safe Performance Observation training continued this month. Two sessions remain to complete the program.
 - Incidents and Opportunities for Improvement identified during April – None
- LCLS Procurement Status – April 2006;
 - LCLS procurement continued with heavy activity in April, primarily due to issues surrounding the CM/GC subcontract, which requires significant oversight and support to resolve contractual issues to prepare for, receive, and review the Group 1 Bid Packages.
 - Procurement support was stressed by the unexpected medical leave of two LCLS Project buyers (one in mid April followed by the other in late April. In light of these absences, BIS Head (Jerry Jobe) authorized temporary assistance from other SLAC resources on an as needed basis.

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

- A/E Design – In March and April Subcontract Modifications No. 12, 13, & 14 were prepared, signed by Jacobs, and fully executed.
- CM/GC – Weekly Owner/Architect/Contractor meetings continue and are very productive. Contractual issues are discussed at these meetings; however, additional meetings dedicated to contract issues (internal and between SLAC and TCCO) have continued into April and May. Negotiations to clarify and incorporate RFP Addenda 2 & 3 into the subcontract were successfully concluded and incorporated into Modification 2. SLAC is expecting TCCO signatures and full execution of the Mod in early to mid May.
- S20/K10B/MMF – The MMF and S20 commissioning tasks have been awarded and are planned to be complete in May.
- FFTB Equipment and Block Removal – IFB issued and a supplier was selected in March. PO was placed in April and work is scheduled to complete on July 1.
- Research Yard cleanout - APP approved with planned start of May 1 and complete by May 31. A job walk was performed in late March and Bids are due on April 12. The current start date is expected to be June 1 with an expected completion date of June 23.
- Linac BC1 Chicane Dipole Magnets – Subcontract awarded. Design review was completed on April 7, with a final review of drawings to be completed by SLAC by May 10, with a due date of July 7.
- BC1 Tweaker Quadrupole Magnets – Subcontract awarded. The design review was completed on April 10, with a final review of drawings to be completed by SLAC by May 10, with a due date of June 30.
- 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 is planned for early May.
- LTU Quadrupole 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 is planned for early May.
- Injector Quadrupole Magnets – Subcontract awarded. Quantity 14 received in March, 24 received in April, and quantity 1 due in May.
- CMM – Subcontract awarded. The Coordinate Measuring Machine has shipped and is currently due in the port of Oakland by May 12. The install is scheduled to begin May 22 and the building is currently ready for the installation.

Assessment and Issues:

- None

Electron Beam Systems

WBS 1.1, 1.x.2 Controls System

Highlights:

- Cable Plant – Phase I cable plant design was completed and a Final Design Review (FDR) was held, with only minor comments. A bid package was prepared for cable installation, and the contract was awarded. The installation team is on site and proceeding with the plans. Work continues on Phase II cable plant design for installation starting in August.
- Vacuum System – The final design review for injector vacuum hardware was conducted and received the committee's report. We are working on the response. We have submitted purchase reqs for most of the vacuum gauge controllers. Plans for intra-rack wiring and PLC hardware were developed.
- Personnel Protection Systems (PPS) – Detailed wiring diagrams for the LSS and PPS were done. Final Design Reviews for both the Injector LSS and PPS were completed. LSS laser shutters and control hardware, door interlock switches for the LSS, warning stack lights and buzzers were ordered. Delivery of the racks is still outstanding. JLAB experts (Kelly Mahoney) visited SLAC to discuss design solutions with the LTU/Undulator/Dump PPS.
- Injector MPS – The MPS ICD document was completed. The database definitions for injector MPS are ready. CPE has the list of all the necessary equipment for MPS and the power supplies for the PICs. They are also designing the PLIC system.
- Magnet Power Supply – All of the MCOR programming, bulk power supplies and power modules, intermediate power supplies for injector and BC1, and solenoids have been ordered and received. SLAC Ethernet PS Controllers have been built and tested. EPICS Software design was completed. For the Ethernet PSC, the Device support/driver/databases/EDM screen are all working on RTEMS and a test IOC.
- Timing – The timing test stand in SLAC's Building 34 is ready to evaluate the LCLS timing system performance against the existing linac timing. An order was placed for the required Event Receivers (EVR) needed for injector commissioning

Assessments and Issues:

- Delivery of electronics racks is behind schedule and threatens the laser system installation and commissioning schedule. This is being expedited by purchasing.

WBS 1.2, 2.2 Injector System

Highlights:

- A vendor visit will be made to perform functional acceptance of the Injector Drive laser prior to shipment in support of Laser Milestone 3. The laser will then be disassembled, shipped, installed and tested at SLAC prior to final acceptance.
- SLAC's CEF Department continues to work on the modification of the Linac water system to supply the Injector vault cooling water circuits. The CEF group manages the maintenance and upgrades of the SLAC instrument water systems and has the expert knowledge on the installed systems. Continued support from CEF is required to achieve installation of the vault water system required for commissioning.
- LCLS Linac engineers visited a local vendor to review the design of the injector laser heater chicane dipoles. The design was well advanced but final detail drawings were not complete. Magnetic analysis had been performed. The solid models were complete to the point of producing final detailed drawings. The magnet design met the requirements. A final review of the detail drawings will be held via telephone conference prior to approval to fabricate.
- The balance of the Injector quadrupoles have been received and are currently being tested in SLAC's Magnetic Measurement group. Two Gun Solenoids have been received from the vendor and are in queue for testing.
- Installation of the cable tray, stub supports and vault floor was completed. Installation of the Injector cable plant has begun.

Assessment and Issues:

- Continued support from CEF is required to modify Linac water system and install new components for the Injector water demands to support commissioning start.
- Additional mechanical design CAD operators were contracted to meet peak demand in Injector and Linac design.

WBS 1.3, 2.3 Linac System

Highlights:

- A trip was made to the vendor to review the design of the Linac BC1 dipoles and corrector quadrupoles. The designs were well advanced but final detail drawings were not complete. Magnetic analysis had been performed. The solid models were complete to the point of producing final detailed drawings. The magnet designs met the requirements. A final review of the detail drawings will be held via telephone conference prior to approval to fabricate.

Assessment and Issues:

- Additional engineering resources were added to the BC1-Out diagnostics region which contains the BC1 bunch length monitor.

WBS 1.4, 2.4 Undulator System

Highlights:

- Undulator Magnets
 - The 1st article undulator from Hi-Tech passed inspection on the magnet measurement bench and we are giving Hi-Tech permission to proceed with the construction of the next 7 undulators.
 - The 1st article undulator from Metalex is being measured at ANL. Initial measurements and tuning look good. When/if the 1st article testing is completed and accepted, Metalex will proceed with the construction of the next 7 undulators.
- Undulator Assembly and Installation
 - The Coordinate Measuring Machine was shipped from Germany. Delivery is expected around May 19th.
 - Integration of WPM to Undulator Assembly progressed. A prototype WPM support bracket went to fabrication to support SUT completion.
 - ANL and SLAC staff spent time at ANL participating in the tuning of the 1st article undulator magnet from vendor A. A draft tuning procedure was outlined.
 - The LCLS Undulator Assembly and Installation Supervisor requisition was closed. Interviews were completed. An offer was extended.

Assessments and Issues:

- Single Undulator Test Setup – A programming error damaged an undulator translation stage (using a mockup undulator) during test. Although repairable and a small dollar, the accident highlighted some inadequacies in the way work was being planned. A number of procedural changes have been made to both improve the final product and to prevent such an event from happening again.
- RF Beam Position Monitor – A significant amount of work has been accomplished on the RF BPM system, however, the work is still behind the plan. Work will continue to be monitored to avoid suffering any significant delays.
- Vacuum Chamber – The Facility Advisory Committee expressed concern about the vacuum chamber design and its progress and recommended considering less complicated alternatives. A full scale prototype of the current design is scheduled to be constructed and tested by July 2006.
- Metrology – Clean up from the flood in the Sector 10 Metrology lab continues, but will take time. Several options for a new location for these tests are being investigated, so that the group may continue with the development of the ADS.

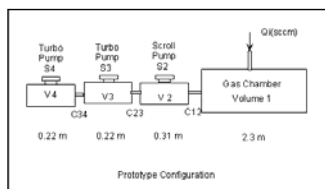
Photon Beam Systems

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

Highlights:

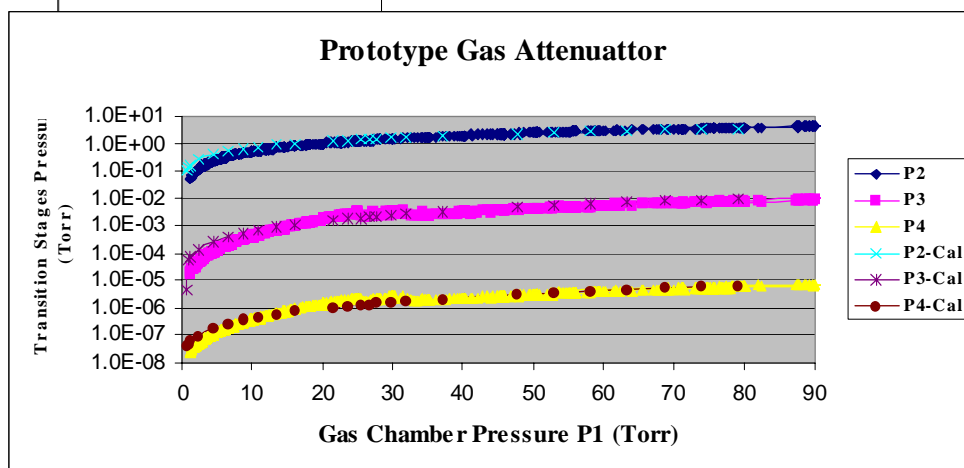
- Management and Safety – An Integrated Safety Management Worksheet has been prepared for the slit. Efforts continued to finalize the FEE layout.
- Mech/Vac Design – The LCLS Interface Control Document 1.1-504 between Linac and XTOD has been revised to reflect the relocation of XTOD instrumentation from the electron dump to the FEE. It has been signed and approved.
- Slit – The slit PRD has been approved. Modifications to the fixed mask and slit designs have been performed according to the PRD including changes to the apertures. The second slit SCR will be held on May 4.
- Attenuator – The System Concept Review (SCR) for the Attenuator was held on April 13. The committee’s report, dated April 18, stated that the SCR has been successfully completed.

Preliminary Test Results- N₂



Pump Arrangement

S2 3 - 10 L/s Scroll
S3 1 - 600 L/s Turbo
S4 1 - 300 L/s Turbo



- The prototype gas attenuator has produced excellent results (see plot above). It met the design goal of 20-Torr operation. Stable operation with boil-off nitrogen

up to a pressure of 60 Torr has been observed. The measured pressure distribution and required gas flow are in good agreement with calculation. The plot shows the pressures in the 3 transition stages as a function of the main chamber pressure. The solid lines are the measured data and the markers are the calculated values.

- FEL Offset Mirror System – Calculations of the predicted FEL characteristics after reflection from state-of-the-art x-ray mirrors, based on vendor-supplied smoothness data from recent SSRL mirrors, have been performed. The calculations predict some broadening of the FEL beam after reflection from mirrors of these types. These calculations were delivered to Peter Stefan for checking and for distribution to the LCLS users for comment. In parallel, a set of specifications consistent with this performance is being prepared for use in obtaining vendor quotes and developing physics requirements for the mirrors.
- Direct Imager – Jasek Krzywinski has joined the project and is calculating saturation effects in the scintillator. Jasek has experience with existing short-wavelength FELs and was the main organizer of the TTF damage experiment.
- Beam Simulation – An error was found in the value used for the transverse position of the undulator, leading to an error in the predicted spatial distribution of the spontaneous radiation. The spatial distributions are being recalculated along the beam line. No major impact is expected, but this may affect the details of the designs for the diagnostics.
- Total Energy – The Townsend Univ. group has succeeded in fabricating the CMR temperature sensor on a Si substrate with a SrTi buffer layer. The 60 nm thick sensor has the required insulator-metal transition at 150 degrees Kelvin. We will measure the noise characteristics of this sensor.
- Damage Experiment – The thermal stress tests at the B131 excimer laser facility were conducted. Samples of Si, SiC and B₄C have been exposed to single and multiple pulses of laser light with energy depositions similar to LCLS. Initial analyses of the exposed samples show changes in the materials after exposure to multiple pulses below the observed melt threshold. Further analysis of these samples with the Zygo and AFM probes will follow.

Assessment and Issues:

- None

WBS 1.6, 2.6 X-Ray Endstation Systems

Highlights:

- The detailed schedule for the XES WBS continues to be developed. This is primarily due to further definition of user requirements. Resource, cost loading and integration are now expected to extend through May. The XES portion of the controls schedule is being developed with the LCLS Controls group.
- The XES Group and the LCLS Controls group are having weekly meetings to coordinate the controls effort in the x-ray areas and achieve a high degree of integration in the areas of networking, beam line controls and protection systems.
- LCLS streak camera needs are being explored and specifications established. A project plan will be discussed next month.
- A detailed schedule is being developed for the Cornell 2D detector project as this project is ramping up during its second year. The requirements of the bio-imaging experiment continue to be reviewed and incorporated into the project schedule.
- The Atomic Physics Instrument's integration with other soft x-ray experiments in the two first NEH hutches was discussed with the LUSI group. So far it appears that the 2nd hutch is most suitable for the AMO experiment, with two other soft x-ray experiments in first hutch. The experimental capabilities desired by the AMO group have been substantially defined: a chamber with a pulsed or continuous gas jet, with multiple electron time-of-flight spectrometers, ion spectrometer for charge state determination and ion imaging, and one or two x-ray fluorescence spectrometers. The conceptual design phase is now beginning.

Assessment and Issues:

- 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:

- Injector installation activities began immediately upon beneficial occupancy of the Sector 20 Injector Facility (S20) project. Commissioning, final acceptance and project close-out are to occur over the next two weeks.
- A reconciliation meeting was held between Jacobs Engineering and Turner Construction on the final 100% Issue for Bid (IFB) drawings. At the completion, the final comparison indicated a difference of 3%. Differences in the estimates were primarily due to differences in unit prices assumed by Jacobs and Turner; quantities and scope appeared to be aligned.
- Jacobs Engineering submitted a 100% complete Issue for Construction (IFC) set of drawings to SLAC. These drawings included an optional 2-floor CLOC and minor changes to the design.
- Several LCLS staff members (including the CF group), SLAC, DOE and Turner Construction personnel attending a two day on-site training session entitled “Controlling Construction Costs.”

Assessment and Issues:

- Bids were received for the first five major LCLS construction packages: surveying, site utilities, concrete, fire protection, and electrical. The lowest site utilities bid was less than the estimate; however the remaining packages are higher than the estimates. A thorough bid analysis will take place by the CM/GC and the project team to fully understand the variances between the bids and the CM/GC estimates.
- Bids have been received for the demolition activities in SLAC’s Research Yard which will precede the start of the LCLS construction. Managing this demolition effort was originally a Turner effort, but SLAC’s resources and familiarity with the Research Yard could potentially reduce cost and schedule in this effort. The final bids for demolition were 30% less than the CM/GC estimated cost.
- SLAC has taken beneficial occupancy of the Magnetic Measurement Facility (MMF); however the final acceptance for the MMF project is delayed due to the lack of permanent power. Permanent power is required for load testing and certification of the MMF cranes. Temporary power is currently being used as a result of the inclement weather, which has also delayed the main power feeder installation.



LCLS Cost and Schedule Performance – April 2006

LCLS Cost/Schedule Status Report - Work Breakdown Structure										30-Apr-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	14,521	14,207	15,992	-314	-1,784	0.98	0.89	27,741	32,189	4,448	
1.2 Injector	15,331	12,876	12,902	-2,455	-26	0.84	1.00	21,028	22,156	1,128	
1.3 Linac	8,094	6,136	5,147	-1,958	989	0.76	1.19	24,248	23,517	-731	
1.4 Undulator	15,706	14,409	14,568	-1,298	-159	0.92	0.99	41,095	42,516	1,421	
1.5 X-ray Transport	8,063	7,677	7,433	-386	244	0.95	1.03	24,149	26,960	2,811	
1.6 X-ray Endstations	1,321	1,067	995	-254	73	0.81	1.07	14,220	16,021	1,801	
1.9 Conventional Facilities	17,247	16,787	16,855	-461	-68	0.97	1.00	107,689	117,224	9,535	
1 LCLS Total Base Cost	80,284	73,159	73,890	-7,125	-731	0.91	0.99	260,169	280,583	20,414	
LCLS Total Estimated Cost								315,000	315,000		
Avail. Contingency								54,831	34,417		
% Contingency / ETC								29.3%	16.6%		
% Complete LCLS Base Cost								28.1%	26.1%		
2.1 LCLS Project Mgmt, Planning & Admn (OPC)	5,327	5,392	5,397	65	-5	1.01	1.00	33,425	33,540	115	
2.2 Injector (OPC)	779	709	731	-70	-22	0.91	0.97	5,754	5,807	52	
2.3 Linac (OPC)	1	1	31	0	-30	1.00	0.04	2,545	2,575	30	
2.4 Undulator (OPC)	798	747	794	-51	-47	0.94	0.94	4,623	4,574	-49	
2.5 X-ray Transport (OPC)	489	489	427	0	62	1.00	1.14	4,930	4,878	-52	
2.6 X-ray Endstations (OPC)	494	498	175	4	322	1.01	2.84	5,246	4,932	-314	
2.9 Conventional Facilities (OPC)	0	0	0	0	0			621	621	0	
2 LCLS Total Other Project Cost	7,889	7,836	7,556	-53	280	0.99	1.04	57,145	56,928	-217	
LCLS Other Project Cost								64,000	64,000		
Avail. Management Reserve								6,855	7,072		
% Management Reserve / ETC								13.9%	14.4%		
% Comp LCLS Other Project Cost								13.7%	13.8%		
LCLS Total Project Cost	88,173	80,995	81,446	-7,177	-451	0.92	0.99	379,000	379,000		
% Complete LCLS TPC								25.5%	24.0%		

*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 April 2006 Cost Performance Reports (CPR) is the 26th month of reporting earned-value on the LCLS TPC. For this month the LCLS cost and schedule indices are 0.99 and 0.92, respectively. Total obligations to date (actual costs + open commitments) are \$97,316K. 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. An updated schedule is under review which intentionally delays the award of the CLOC to mitigate cost risk related to civil construction. The LCLS Project Office is working closely with Turner to optimize the award of the CLOC while maintaining adequate float on the project critical path. 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 213 working days. LCLS management will aggressively work to maintain or improve this beam commissioning period.

Significant Cost/Schedule Variances

Injector System: SPI = 0.84, CPI = 1.00

The major driver of the schedule variance in the Injector System continues to be the laser system. Thales milestone #3, the final acceptance test at Thales, was successfully completed. The schedule variance caused by the Drive Laser should be remedied next month. Other devices, magnets, vacuum chambers, and diagnostics associated with the laser system, are on order. These will be delivered later than scheduled, and so contribute to the schedule variance. These orders are being monitored closely to assure that they do not pose a threat to the installation schedule.

Linac System: SPI = 0.76, CPI = 1.19

Hardware procurements in the Controls Systems for both Linac and Injector hardware for the upcoming installation are now behind schedule but catching up. Linac Controls work for future installations 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.



XES System: SPI: = 0.81, CPI – 1.07

The schedule variance for the XES (SPI = 0.81) 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, which has deferred the XES effort. The XES Controls work needs to be replanned so that it can be properly tracked. This new plan is now being prepared.

All schedule variances are being addressed at this time, and as none of this planned work is on the project’s critical path or shutdown schedules, these variances are seen as low risk. For the LCLS Other Project Costs (OPC), cost and schedule variances are negligible.

Change Control Activity*

April 2006

BCR #	WBS #	Signature Level	Approval Month	BCR Description	Originator	TEC Base Cost Estimate		
						Previous Estimate	Increase (Decrease)	New Estimate
IJ-29	1.02.17	3	01-Apr-06	INJECTOR INSTALLATION - Revised Estimate to Complete based 2005 Shut Down and Current Shut Down Schedule	Schultz/Bong	28,008,025	436,708	28,444,733
LN-34	1.03.07	3	01-Apr-06	LINAC INSTALLATION - Revised Estimate to Complete based 2005 Shut Down and Current Shut Down Schedule	Schultz/Bong	28,444,733	(965,808)	27,478,925
CF-51	1.09	4	01-Apr-06	Change budget profile for Turner CMGC Option Phase 2	Saenz	27,478,925	-	27,478,925
CF-53	1.09	3	01-Apr-06	CF Level 3 BO RSY through CLOC	Saenz	27,478,925	-	27,478,925
Previous Month Total Base Cost Estimate						260,698,163		
Total Delta Base Cost Change			1-Apr-06				(529,100)	
Current Month Total Base Cost Estimate								260,169,063

***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.**



DOE (Level 1 - 2) Milestones

System	Level?	P3 ID	Milestone	Baseline	Updated	Variance	2002		2003		2004		2005		2006		2007		2008		2009	
							Apr	Oct	Apr	Oct	Apr	Oct	Apr	Oct	Apr	Oct	Apr	Oct	Apr	Oct	Apr	Oct
1			☐ Level 1 DOE (SC1) Milestones	8/29/08	3/31/09	140 days																
2	DOE	ML1	MS1_PM000	CD0 - Approve Mission Need	6/17/01	6/17/01	0 days															
3	DOE	ML1	MS1_PM005	CD1 - Approve Preliminary Baseline Range	10/16/02	10/16/02	0 days	●														
4	DOE	ML1	MS1_PM015	CD2a - Approve Long-Lead Procurement Budget	7/30/04	7/30/04	0 days															
5	DOE	ML1	MS1_PM025	CD3a - Approve Start of Long Lead Procurement	10/29/04	10/29/04	0 days															
6	DOE	ML1	MS1_PM020	CD2b - Approve Performance Baseline	3/31/05	3/31/05	0 days															
7	DOE	ML1	MS1_PM030	CD3b - Approve Start of Construction	2/28/06	3/21/06	15 days															
8	DOE	ML1	MS1_PM035	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	MS2_PM045	Prelim Safety Assessment (PSAD) Doc Complete	4/30/04	4/30/04	0 days															
11	PM	ML2	MS2_PM035	DOE External Independent Review (EIR) Complete	6/15/04	6/15/04	0 days															
12	PM	ML2	MS2_PM040	Fire Hazard Analysis Approved	6/30/05	8/31/05	44 days															
13	PM	ML2	MS2_PM055	Prelim Safety Assessment (PSAD) Doc Approved	2/28/06	1/26/06	-23 days															
14	UN	ML2	MS2_UN010	Delivery of Undulator 1st Articles to MMF	7/3/06	7/3/06	0 days															
15	CF	ML2	MS2BO_005	Sector 20/Alcove Beneficial Occupancy	7/21/06	4/14/06	-70 days															
16	UN	ML2	MS2_UN005	MMF Qualified & Ready to Measure Prod Undulators	8/28/06	8/28/06	0 days															
17	CF	ML2	MS2BO_025	Research Yards Mods Beneficial Occupancy	10/20/06	10/20/06	0 days															
18	IJ	ML2	MS2_IJ0010	Start Injector Commissioning (Drive Laser)	11/20/06	11/20/06	0 days															
19	IJ	ML2	MS2_IJ0027	Injector Laser Commissioning Review Complete	1/16/07	1/16/07	0 days															
20	CF	ML2	MS2BO_035	Undulator Facility Beneficial Occupancy	6/4/07	6/4/07	0 days															
21	CF	ML2	MS2BO_050	Near Experimental Hall Beneficial Occupancy	6/18/07	6/18/07	0 days															
22	CF	ML2	MS2BO_020	Linac Facility Beneficial Occupancy	7/11/07	7/11/07	0 days															
23	IJ	ML2	MS2_IJ0020	Start Injector Commissioning(UV Beam to Cathode)	7/20/07	7/20/07	0 days															
24	CF	ML2	MS2BO_060	Far Experimental Hall Beneficial Occupancy	9/4/07	9/4/07	0 days															
25	IJ	ML2	MS2_IJ0030	Injector Accelerator Readiness Review (ARR) Comp	9/20/07	9/20/07	0 days															
26	CF	ML2	MS2BO_040	Front End Enclosure Beneficial Occupancy	10/5/07	10/5/07	0 days															
27	CF	ML2	MS2BO_055	X-Ray Transport Beneficial Occupancy	10/12/07	10/12/07	0 days															
28	CF	ML2	MS2BO_030	Beam Transport Hall Beneficial Occupancy	1/3/08	1/3/08	0 days															
29	XE	ML2	MS2_XE015	2-D Pixel Detector Production Start	1/3/08	1/3/08	0 days															
30	LN	ML2	MS2_LN020	Linac ARR (Li20-Li30) Complete	3/7/08	3/7/08	0 days															
31	PM	ML2	MS2_PM005	Final Safety Analysis Document (FSAD) Approved	3/31/08	3/31/08	0 days															
32	LN	ML2	MS2_LN025	Start Linac (Li20-Li30) Commissioning	5/8/08	5/8/08	0 days															
33	PM	ML2	MS2_PM030	LCLS ARR Complete (BTH thru FEH)	6/9/08	6/9/08	0 days															
34	LN	ML2	MS2_LN015	Start Linac-to-Undulator (LTU) Commissioning	6/12/08	6/12/08	0 days															
35	UN	ML2	MS2_UN025	Start Undulator Commissioning (1st Light)	8/18/08	8/18/08	0 days															
38	XE	ML2	MS2_XE005	Start XES Commissioning	8/18/08	8/18/08	0 days															
36	XTOD	ML2	MS2_XT005	Start XTOD Commissioning	8/18/08	8/18/08	0 days															
37	CF	ML2	MS2BO_065	Central Lab Office Ctr Beneficial Occupancy	11/10/08	11/10/08	0 days															

KEY: CD-2B Baseline Date (Blue Circle) – Established in April 2005
 Updated Date (Red Diamond – Current Projection
 Actual Date (Green Diamond) – Actual Date Accomplished



Milestone Report

Milestone ID/Name	MS2_BO005 – Sector 20 Beneficial Occupancy
Milestone Level	ML2
Baseline Date	07/21/06
New Projected Date	04/14/06
Completed	Yes
Impacts:	Cost: No, L1 Schedule: No, Other: No
Comments (Reason for Change):	This milestone is complete

Milestone ID/Name	MS3_BO005 – Sector 20 Beneficial Occupancy
Milestone Level	ML3
Baseline Date	03/31/06
New Projected Date	04/14/06
Completed	Yes
Impacts:	Cost: No, L1 Schedule: No, Other: No
Comments (Reason for Change):	This milestone is complete

Milestone ID/Name	MSBS_090 – Shutdown of FFTB Complete
Milestone Level	ML3
Baseline Date	06/01/06
New Projected Date	04/10/06
Completed	Yes
Impacts:	Cost: No, L1 Schedule: No, Other: No
Comments (Reason for Change):	This milestone is complete

Milestone ID/Name	MS3BO_030, Beam Transport Hall Beneficial Occupancy
Milestone Level	ML3
Baseline Date	12/03/07
New Projected Date	08/27/07
Completed	No
Impacts:	Cost: No, L1 Schedule: No, Other: No
Comments (Reason for Change):	Change to Turner’s approved Construction Schedule.

Milestone ID/Name	MS3BO_035, Undulator Facility Beneficial Occupancy
Milestone Level	ML3
Baseline Date	05/03/07
New Projected Date	08/27/07
Completed	No
Impacts:	Cost: No, L1 Schedule: No, Other: No
Comments (Reason for Change):	Change to Turner’s approved Construction Schedule.



Milestone Report (continued)

Milestone ID/Name	MS3BO_040, Front End Enclosure Beneficial Occupancy
Milestone Level	ML3
Baseline Date	09/05/07
New Projected Date	08/27/07
Completed	No
Impacts:	Cost: No, L1 Schedule: No, Other: No
Comments (Reason for Change): Change to Turner's approved Construction Schedule.	

Milestone ID/Name	MS3BO_050, Near Experimental Hall Beneficial Occupancy
Milestone Level	ML3
Baseline Date	05/18/07
New Projected Date	08/27/07
Completed	No
Impacts:	Cost: No, L1 Schedule: No, Other: No
Comments (Reason for Change): Change to Turner's approved Construction Schedule.	

Milestone ID/Name	MSBO_045, Beam Dump Beneficial Occupancy
Milestone Level	ML3
Baseline Date	10/09/07
New Projected Date	08/27/07
Completed	No
Impacts:	Cost: No, L1 Schedule: No, Other: No
Comments (Reason for Change): Change to Turner's approved Construction Schedule.	

Milestone ID/Name	MS3BO_055, X-Ray Transport Beneficial Occupancy
Milestone Level	ML3
Baseline Date	09/13/07
New Projected Date	10/18/07
Completed	No
Impacts:	Cost: No, L1 Schedule: No, Other: No
Comments (Reason for Change): Change to Turner's approved Construction Schedule.	

Milestone ID/Name	MS3BO_060, Far Experimental Hall Beneficial Occupancy
Milestone Level	ML3
Baseline Date	08/03/07
New Projected Date	11/12/07
Completed	No
Impacts:	Cost: No, L1 Schedule: No, Other: No
Comments (Reason for Change): Change to Turner's approved Construction Schedule.	



Milestone Report (continued)

Milestone ID/Name	MS3BO_065, Central Lab Office Center Beneficial Occupancy
Milestone Level	ML3
Baseline Date	10/10/08
New Projected Date	11/24/08
Completed	No
Impacts:	Cost: No, L1 Schedule: No, Other: No
Comments (Reason for Change): Change to Turner's approved Construction Schedule.	

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.