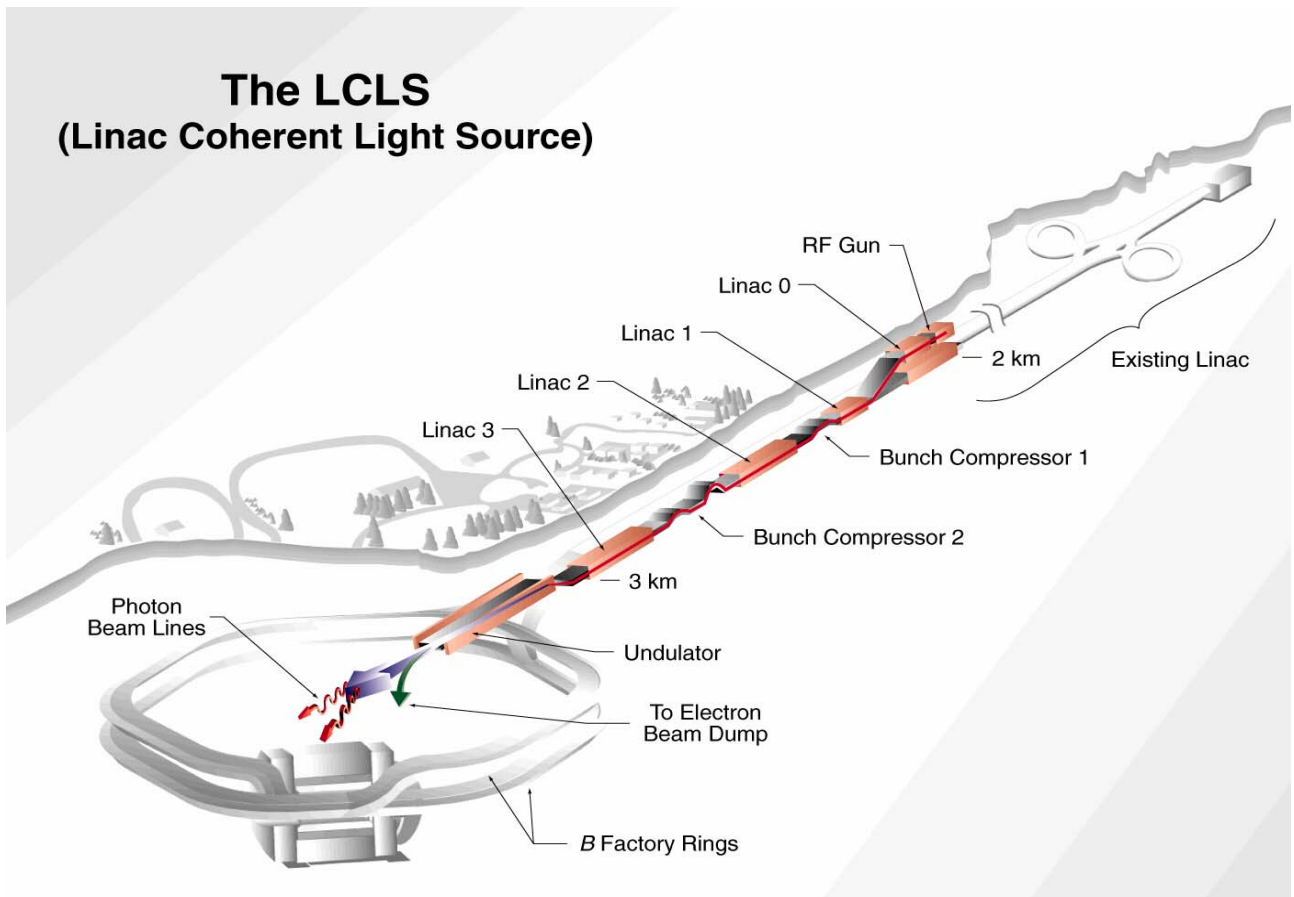


Linac Coherent Light Source Monthly Report

June 2004





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Project Overview and Assessment

Highlights:

- In March 2004, LCLS adopted an internal baseline for the project with a TEC of \$273M Actual-Year (AY) and a TPC of \$315M AY.
- The on-site LCLS External Independent Review (EIR) was held 7-10 June 2004 at SLAC. The committee was made up of project management and technical experts from Burns and Roe Enterprises Inc. (BREI), and contracted through DOE's Office of Engineering, Construction and Management (OECM) to independently validate the scope, cost, schedule, contingency and organization of the LCLS. BREI is also charged to assess the LCLS that the project is being managed in accordance with DOE Order 413.3 using the 13 specific elements approved by the DOE OECM.

While the final report of the EIR is not due until July, BREI provided a general assessment of their major findings during a closeout of their on-site review;

- The LCLS technical scope was found to be reasonable and consistent with the cost and schedule baseline plan.
 - The integrated LCLS project team can complete the LCLS baseline scope by September 2008 and within the Total Project Cost (TPC) of \$315M AY.
 - Adequate contingency is reserved to address potential cost growth and/or schedule slippage and still construct the LCLS project within the baseline cost and schedule.
 - Some concerns with the readiness of the LCLS Earned-Value Management System (EVMS), which will require a follow-up validation in approximately three months.
 - Some issues regarding ES&H (project and site-wide) were noted but are not expected to require major corrective action.
- A DOE Office of Science (Lehman) Review of the LCLS Project has been scheduled for August 10-12, 2004. The charge to the committee is to assess the readiness of the LCLS project for CD-2b (Approve Project Baseline) and CD-3a (Approve Long-Lead Procurements).

Assessment and Issues:

- The June 2004 monthly report is the fourth month of reporting earned value on the LCLS "internally-baselined" TEC and TPC. All LCLS TEC and OPC actual costs for the project are captured in the LCLS Cost Performance Report (CPR). Overall, the cost and schedule indices for the LCLS are 0.94 and 0.94,

respectively, indicating that LCLS is tracking closely with its baseline plan and budget.

- LCLS has deferred the design effort on the LCLS Title II Design, and its internal hiring plans (controls, project engineering, and project office personnel until on or near the FY05 fiscal boundary to stay within its available budget authority.
- With the ramp-up of personnel at SLAC, co-located space is also an issue. Currently the LCLS team has filled its available space in B280B and is seeking another ~15 offices plus a dedicated meeting room. SLAC and LCLS are working to identify additional space for new staff.

Technical & Programmatic Progress

WBS 1.1, 2.1 Project Planning, Management and Administration

Highlights:

- During the 7-10 June 2004 LCLS Project EIR conducted by BREI, the Project Management and Administration (WBS 1.1) scope, cost estimate, schedule general management organization were examined. No discrepancies were found and in general the EIR team was satisfied with the Project Office baseline scope and plan.
- Physics Requirements Documents (PRDs) were completed for the LCLS Project. PRDs define the general physics requirements and specifications for the LCLS systems and generally serve as a basis for the Engineering Specifications Documents (ESDs). ESDs generally define the engineering specifications for the LCLS components. LCLS also started to defined its Interface Control Documents (ICDs) and established a numbering system. All of these documents are under configuration control and establish the technical scope of the LCLS.
- For the LCLS Global Controls;
 - Significant progress was made in compressing and consolidating the Global Controls WBS to facilitate reporting and tracking progress in the baseline file.
 - The LCLS Controls group also began prototyping the SLC aware IOC which is the key device that allows the EPICS environment to communicate with the SLAC Controls environment.
 - The LCLS Controls group also began design and creation of the PNET receiver which is required for integration of the SLC timing into EPICS.

Assessment and Issues:

- The LCLS Project Office is actively interviewing for an LCLS Financial Manager. It is hoped to identify and hire a candidate soon to allow sufficient time to acclimate to the LCLS financial system before FY05 funding becomes available.
- The LCLS Project Office is also actively seeking an LCLS Integration and Installation Manager to facilitate coordination of the LCLS Systems when components and deliverables become ready for installation/integration.

WBS 1.2, 2.2 Injector System

Highlights:

- During the 7-10 June 2004 LCLS Project EIR conducted by BREI, the Injector Laser scope, cost estimate, schedule general management organization were examined. No major discrepancies were found and in general the EIR team was satisfied with the Laser work baseline scope and plan.
- As proposed initially in the May04 Monthly Report, a Baseline Change Request (BCR# IJ-01) has been approved to modify the Injector laser from a SLAC-built interleaved flash-lamp system to a vendor integrated diode pumped system. This change provides an improved reliability of the diode system versus flash-lamp, which is made possible by the higher quantum efficiency. This change also resulted in a lower cost (~\$1M) than the original baseline.
 - To facilitate the vendor integrated system, a Request for Information (RFI) soliciting interest in potential laser vendors was released. Also, the Statement of Work (SOW) describing the work scope has begun.
 - With this change in procurement strategy, an Advanced Procurement Plan (APP), will be developed to describe the overall procurement process.
- A Technical Design Review was scheduled for 21 July 2004 for the LCLS Injector Laser System. The proposed vendor integrated diode pumped system will be presented to an external committee of experts to ensure that the Laser work plan and scope are reasonable. Additional topics to be covered are; Injector beam physics, photocathode requirements and issues, laser timing stability, future R&D plans, and the overall procurement plan.
- Design work on the 1KW Solid State Sub-Booster (SSSB) continues. The initial design of a unit using eight 160W transistors is complete and the PC board has been sent out for fabrication.
- A Low Noise Master Oscillator from Wenzel Associates has been installed and is currently running the SLAC Linac. Phase noise measurements will be done in the Linac starting in July.

Assessment and Issues:

- The Injector group is working with the PMCS team to resolve its cost variances. It is anticipated that some cost transfers will be needed to reconcile actual costs and budgets.

WBS 1.3, 2.3 Linac System

Highlights:

- During the 7-10 June 2004 LCLS Project EIR conducted by BREI, the Linac Controls scope, cost estimate, schedule general management organization were examined. In general, the assessment was favorable. Costs were found to be reasonable and the schedule was considered conservative. There was some concern with the ramp-up of controls personnel resources in FY05.
- Installation dates for the LCLS Main Dump and the Linac-to-Undulator (LTU) beamline revealed an opportunity to advance the Linac System installation schedule by three months. The schedule has been modified and a Baseline Change Request (BCR) was issued to implement the changes.
- An Interface Control Document (ICD) for the Linac to Injector which describes the boundaries (physical, vacuum, controls, cabling, etc.) was drafted and proposed.
- Bunch Compressor 1 (BC1) actuator, vacuum, mechanical design and diagnostics progressed to the point where the required controls transducer and actuator hardware could be identified. Design work on the modifications required to the existing SLAC Linac beamline continued, which will allow the integration of the new components into the existing beamline. An advanced procurement package for the BC1 and BC2 bend magnets was initiated.
- A model of the beamline from the SLAC beam switchyard through to the Far Experimental Hall End Stations was started. The model will help integrate the Linac to the LCLS Undulator, X-TOD and Endstation systems.
- The Linac Systems magnet engineer assisted the Undulator System with a first look at an inter-undulator electromagnet quadrupole alternative.

Assessment and Issues:

- Diagnostics issues to be investigated for BC1 are OTR thin foil material, OTR imaging optics design, collimator actuation and jaw cooling and BPM electrode optimization.

WBS 1.4, 2.4 Undulator System

Highlights:

- During the 7-10 June 2004 LCLS Project EIR conducted by BREI, the Undulator Magnet scope, cost estimate, schedule general management organization were examined. Four members of the ANL LCLS team attended. One member of the SLAC LCLS team was present during detailed “drill downs” of the “Undulator Magnets” cost book. No discrepancies were found and in general the EIR team was satisfied with the Undulator work baseline scope and plan.
- A meeting was held at ANL to discuss some final fine-tuning of the specifications before we complete the request for procurements for the long-lead procurements. This meeting was attended by a number of members of the ANL LCLS team and by three key members of the SLAC LCLS team. Small modifications were agreed upon that will allow us to complete the FY05 Long-Lead Procurement (LLP) packages.

Assessments and Issues:

- A Baseline Change Request (BCR) was submitted to correct some errors of scope not spelled out in the Technical Addendum B to the Memorandum of Understanding between SLAC and ANL dated 22 April 2003. The value of this BCR was \$295,500.00. An Amendment to Technical Addendum B to the Memorandum of Understanding between SLAC and ANL dated 22 April 2003 was written and is in the process of being signed by both laboratories.

WBS 1.5, 2.5 X-ray Transport, Optics & Diagnostics System

Highlights:

- During the 7-10 June 2004 LCLS Project EIR conducted by BREI, the XTOD Optics scope, cost estimate, schedule general management organization were examined. There were some discrepancies identified in the XTOD baseline cost due to last minute changes to XTOD Basis of Estimate (BOE). Follow-up information and additional meetings in June helped clarify the issues. It is agreed that the LCLS team will exercise a Baseline Change Request (BCR) to reconcile the LCLS baseline with the BOE.
- Separate internal accounts at LLNL were created and opened for the work packets to be executed at LLNL in FY04 and FY05. This separation makes it easier to insert LLNL cost data into the LCLS Actual Cost database.
- The XTOD Mechanical and Vacuum team began examining the SLAC Vacuum Specifications document and the LCLS X-Ray beam transport Vacuum Specification in the XTOD PRD in preparation for developing Engineering Specifications for the XTOD Vacuum Systems.
- The baseline conceptual design for the XTOD gas attenuator is being evaluated in light of the changes to its geometry and position as well as the impact of the new combined gas/solid attenuator specification. The new geometry allows for a longer attenuator, reducing the pressure, and is 4x farther from the undulator, allowing the solids to run at lower photon energy without damage. A specification for the gas attenuator pressure settings and solid attenuator thicknesses satisfying the new requirements in the new geometry has been developed. The new gas attenuator concept will run with nitrogen or argon – instead of xenon, reducing the safety risks.

Assessment and Issues:

- Work on the XTOD FY05 staffing plan was begun by matching known staff to the FY05 work packages. Thus far, existing staff has been identified for 53% of the FY05 allocations. This issue will be investigated further next month.

WBS 1.6, 2.6 X-Ray Endstations System

Highlights:

- During the 7-10 June 2004 LCLS Project EIR conducted by BREI, the X-Ray Endstations Detectors scope, cost estimate, schedule general management organization were examined. Discussions with the EIR team indicated no big problems in section WBS 1.6 (X-Ray Endstations). After the EIR visit, effort focused on preparing change requests to correct known small errors and discrepancies in the cost records for section 1.6 in the Primavera (P3) baseline.

Assessment and Issues:

- The overall LCLS X-Ray Endstations (XES) schedule must continue to be coordinated with X-Ray Transport, Optics and Diagnostics (XTOD) and Conventional Facilities Systems. A specific plan of coordination for XTOD-XES inter-group meetings will be set up after the EIR.
- The long-range staffing plan needs to continue to be developed, defining the transition to an appropriate staffing arrangement for facility operation.

WBS 1.9, 2.9 Conventional Facilities

Highlights:

- During the 7-10 June 2004 LCLS Project EIR conducted by BREI, the Conventional Facilities scope, cost estimate, schedule general management organization were examined. WBS 1.9.3 (Undulator Hall, Near Experimental Hall, Far Experimental Hall and Caverns) was examined for reasonableness. There were some discrepancies identified in the XTOD baseline cost due to last minute changes to XTOD Basis of Estimate (BOE). Follow-up information and additional meetings in June helped clarify the issues. It is agreed that the LCLS team will exercise a Baseline Change Request (BCR) to reconcile the LCLS baseline with the BOE.
- The LCLS Conventional Facility group conducted a review with in-house expert for HVAC design of Undulator Hall to ensure that the LCLS approach is reasonable. A follow-up meeting is scheduled to investigate the option of moving the HVAC units outside of the Undulator Hall, which would allow for regular access to the HCAL units.
- The S20 Laser Bay Title II has been approved for commencement. Scheduled completion of Title II documentation is end of September 04

Issues and Assessments:

- Title I is completed for major design effort while Title II is scheduled to commence Oct 1, 04. During the interim phase, various engineering services will be provided by Jacobs Engineering to provide AE support of engineering studies, analyses and support tasks. This effort will be performed on a time and material basis.
- MMF Title II design still placed on hold pending final decision by the LCLS Project Office for a change in scope and utility of the MMF.



LCLS Cost and Schedule Performance

LCLS Cost Performance Report - Work Breakdown Structure													30-Jun-04				
WBS	Current Period (\$K)					Cumulative to Date (\$K)							At Completion (\$K)				
	Budgeted Cost		Actual Cost Work Performe	Variance		Budgeted Cost		Actual Cost Work Performe	Variance		Performance Indices		Budgeted	Latest Revised Estimate	Variance		
	Work Scheduled	Work Performed		Schedule	Cost	Work Scheduled	Work Performe		Schedule	Cost	SPI	CPI					
1.1 Project Management	162	140	115	-21	25	3,380	3,355	3,622	-25	-268	0.99	0.93	19,015				
1.2 Injector	124	80	227	-45	-148	1,796	1,637	2,098	-160	-461	0.91	0.78	19,629				
1.3 Linac	150	85	129	-65	-44	999	934	1,031	-64	-96	0.94	0.91	25,882				
1.4 Undulator	112	152	211	40	-58	1,837	1,894	2,074	57	-181	1.03	0.91	45,526				
1.5 X-ray Transport	30	55	68	25	-13	1,365	1,412	1,447	46	-36	1.03	0.98	23,877				
1.6 X-ray Endstations	67	67	21	0	46	267	267	148	0	118	1.00	1.80	16,593				
1.9 Conventional Facilities	87	19	311	-68	-292	1,280	1,184	1,323	-97	-140	0.92	0.89	62,679				
1 LCLS Total Base Cost	732	598	1,082	-134	-484	10,924	10,681	11,744	-243	-1,063	0.978	0.909	213,201				
													LCLS Total Estimated Cost		273,000		
													Avail. Contingency		59,799		
													% Contingency / Rem. Work		29.5%		
													% Complete LCLS Base Cost		5.5%		
2.1 LCLS Project Mgmt, Planning & Admn (OPC)	116	106	218	-10	-112	1,836	1,825	1,752	-11	73	0.99	1.04	20,404				
2.2 Injector (OPC)	44	46	0	1	46	214	149	0	-65	149	0.70		6,481				
2.3 Linac (OPC)	0	0	0	0	0	0	0	0	0	0			1,992				
2.4 Undulator (OPC)	0	0	0	0	0	6	2	0	-4	2	0.27		5,844				
2.5 X-ray Transport (OPC)	160	44	39	-116	6	526	84	39	-442	46	0.16		4,781				
2.6 X-ray Endstations (OPC)	0	0	0	0	0	0	0	0	0	0			2,498				
2 LCLS Total Other Project Cost	320	196	257	-124	-61	2,582	2,059	1,790	-522	269	0.798	1.150	42,000				
LCLS Total Project Cost	1,053	794	1,339	-259	-545	13,506	12,741	13,535	-765	-794	0.943	0.941	315,000				
													% Complete LCLS TPC		4.0%		

Cost and Schedule Narrative

The LCLS Project established a performance baseline for the LCLS project that includes all costs, scheduled activities and resources to complete the LCLS project in March 2004. The LCLS baseline is consistent with a CD-4 milestone of September 30, 2008 and with a Total Estimated Cost (TEC) of \$273M and a Total Project Cost (TPC) of \$315M. 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 2004 Cost Performance Report (CPR) is the fourth month of reporting earned value on the LCLS performance baseline. All LCLS TEC and OPC actual costs for the project are captured in the LCLS CPR. Overall, the cost and schedule indices for the LCLS are 0.94 and 0.94, respectively, indicating that LCLS is tracking closely with its baseline plan and budget.

At the system-level there are larger diversions from the baseline, particularly on the cost performance side. The cost variances (CV's) are primarily driven by incorrect charges to the new cost accounts just recently established. The LCLS is working with SLAC Business Services to reconcile the cost accounts. It is expected that in a few months this deviation will be resolved as the LCLS teams becomes acquainted with the new cost account structure.

For schedule variances (SVs), the large schedule variances (SV's) in the Injector TEC and XTOD OPC efforts are due to EIR preparation by the Injector and XTOD teams. This SV should begin to improve in September 2004.

Change Control Activity*

WBS #	BCR #	BCR Level	Approval Date	BCR Description	Originator	WBS System Base Cost Estimate			Contingency		New LCLS Project Base Cost Estimate
						Previous Estimate	Increase (Decrease)	New Estimate	Increase (Decrease)	Balance	
1.03	LN-03	4	Jun-04	WBS Description Title Change Only	T. Montagne	\$25,930,516	\$0	\$25,930,516		\$60,353,980	\$212,646,020
1.01	PM-03	2	Jun-04	Level 2 Milestone Additions	H. Lee	\$0	\$0	\$0		\$60,353,980	\$212,646,020
1.02	IJ-01	2	Jun-04	Injector Drive Laser Mod	S. Gilevich	\$20,566,900	(\$963,714)	\$19,603,186	\$963,714	\$61,317,694	\$211,682,306
1.02	IJ-02	4	Jun-04	Video Cameras for OTRs	R. Carr	\$19,603,186	\$3,451	\$19,606,637	(\$3,451)	\$61,314,243	\$211,685,757
1.02	IJ-04	4	Jun-04	Rollup Controls Activities within the Injector System	B. Dalesio	\$19,606,637	\$22,617	\$19,629,254	(\$22,617)	\$61,291,626	\$211,708,374
1.09	CF-03	2	Jun-04	JE Cost Adjs (BTH, FEE, Dump, XRTDH, by-pass rd)	D. Saenz	\$61,667,900	\$1,010,798	\$62,678,698	(\$1,010,798)	\$60,280,828	\$212,719,172
1.03	LN-05	4	Jun-04	Dump Installation Resequence	E. Bong	\$25,930,500	(\$48,335)	\$25,882,165	\$48,335	\$60,329,163	\$212,670,837
1.03	LN-04	4	Jun-04	Rollup Controls Activities within the LINAC System	B. Dalesio	\$25,882,181	\$0	\$25,882,181	\$0	\$60,329,163	\$212,670,837
1.06	XE-01	3	Jun-04	Revise baseline to match current estimates	J. Arthur	\$16,286,300	\$306,393	\$16,592,693	(\$306,393)	\$60,022,770	\$212,977,230
1.05	XT-01	3	Jun-04	Revise baseline to match current estimates	R. Bionta	\$24,039,200	(\$161,985)	\$23,877,215	\$161,985	\$60,184,755	\$212,815,245
1.04	UN-01	4	Jun-04	Installation schedule improvements	S. Milton	\$45,140,800	\$385,628	\$45,526,428	(\$385,628)	\$59,799,127	\$213,200,873

*Copies of Baseline Change Requests (BCRs) are available through the LCLS Project Office.

DOE (Level 1 - 2) Milestones

#	Milestone Level	Milestone Description	Scheduled Date
1	1	CD-0 Approve Mission Need	June-01 (A)
2	1	CD-1 Approve Preliminary Baseline Range	October-02 (A)
3	1	CD-2a Approve Long-Lead Procurement Budget	July-03 (A)
4	1	CD-2b Approve Performance Baseline	July-04
5	1	CD-3a Approve Start of Long-Lead Procurement	September-04
6	1	CD-3b Approve Start of Construction	September-05
7	1	CD-4 Approve Start of Operations	October-08
8	2	DOE External Independent Review (EIR) Complete	June-04 (A)
9	2	Fire Hazard Analysis Approved	December-04
10	2	Sector 20 Alcove Beneficial Occupancy	July-05
11	2	Preliminary Safety Assessment (PSAD) Document Approved	August-05
12	2	Magnetic Measurement Facility (MMF) Qualified & Ready to Measure Production Undulators	September-05
13	2	Start Drive Laser Commissioning	December-05
14	2	Injector Accelerator Readiness Review (ARR) Complete	April-06
15	2	Start Injector Commissioning	May-06
16	2	Shutdown of Final Focus Test Beam (FFTB) Operations	June-06
17	2	Research Yard Modifications Beneficial Occupancy	June-06
18	2	Near Experimental Hall (NEH) Beneficial Occupancy	September-06
19	2	Delivery of Undulator 1st Article to MMF	October-06
20	2	Dog-Leg-1 (DL1) Installation Completed	October-06
21	2	Drive Laser: UV Beam to Cathode	November-06
22	2	Undulator Facility Beneficial Occupancy	December-06
23	2	Front-End Enclosure Beneficial Occupancy	April-07
24	2	Linac Facility Beneficial Occupancy	April-07
25	2	Linac Accelerator Readiness Review (ARR) Complete	May-07
26	2	First Beam on Linac Axis	June-07
27	2	Undulator Production Units Received	June-07
28	2	Beam Transport Hall Beneficial Occupancy	July-07
29	2	X-Ray Transport Beneficial Occupancy	July-07
30	2	Far Experimental Hall Beneficial Occupancy	August-07
31	2	Start Bunch Compressor-1 (BC1) Commissioning	September-07
32	2	Start Bunch Compressor-2 (BC2) Commissioning	January-08
33	2	Final Safety Analysis Document (FSAD) Approved	March-08
34	2	Central Lab Office (CLO) Complex Beneficial Occupancy	March-08
35	2	Undulator to Far Experimental Hall Readiness Review (ARR) Complete	April-08
36	2	Undulator System Installation Complete	April-08
37	2	Start Undulator Commissioning	April-08
38	2	Start Linac-to-Undulator (LTU) Commissioning	May-08
39	2	Start X-Ray Transport, Optics and Diagnostics Commissioning	June-08
40	2	Final LCLS Readiness Review Report and Corrective Action Plan (CAP) Complete	September-08
41	2	LCLS Start Operations	October-08

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 funds 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 – Funds 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 at Completion (EAC) – Forecast of the final cost for a specific WBS#, subproject, or project based on the current ACWP plus a management assessment (ETC) of the cost to complete the remaining scope of work.

Estimate to Complete (ETC) – A realistic appraisal 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. $\% \text{ Complete} = BCWP/BAC$.

Percent Contingency Remaining – The ratio of available contingency dollars ($TPC - EAC$) to remaining work ($EAC - BCWP$).

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 funds 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 funds 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.