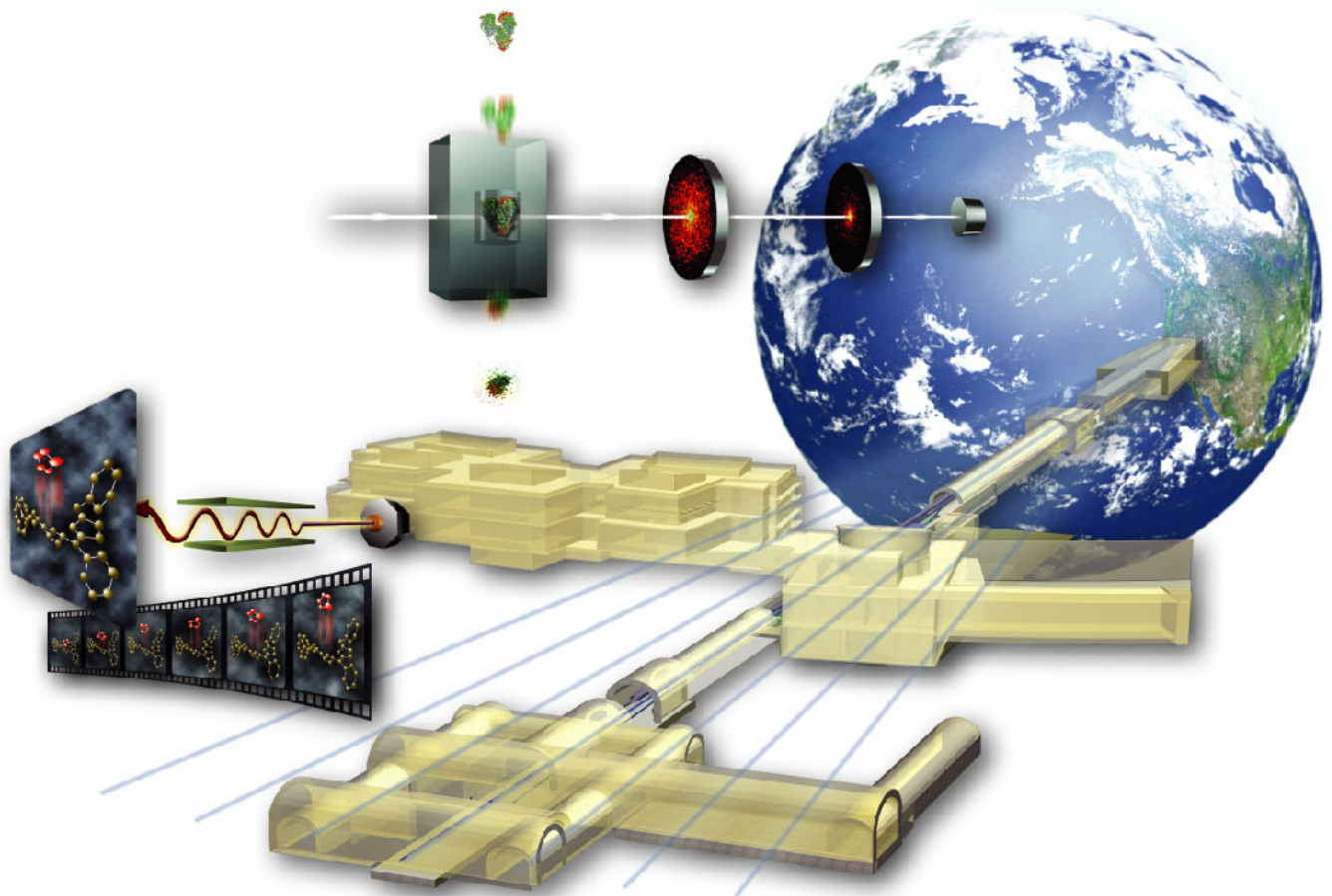


Linac Coherent Light Source (LCLS)
An X-Ray Free Electron Laser



Project Management Plan

PMD-1.1-001-r3 – October 2007

Prepared for the US Department of Energy under contract numbers:

SLAC	DE-AC02-76SF00515
ANL	W-31-109-ENG-38
LLNL	W-7405-ENG-48

Submission and Approval

This Project Management Plan (PMP) defines the plans, organization and systems for managing the Linac Coherent Light Source (LCLS) Project at the Stanford Linear Accelerator Center (SLAC). The LCLS PMP is in accordance with the Department of Energy (DOE) O 413.3A, *Program and Project Management for the Acquisition of Capital Assets*, and subject to the requirements specified for projects with a Total Project Cost (TPC) of less than \$750 million.

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Revision History

Rev #	Date	Revision
r-0	7 / 2004	<ul style="list-style-type: none"> • Original
r-1	5 / 2005	<ul style="list-style-type: none"> • Updated cost tables and schedule milestones for CD-2
r-2	2 / 2006	<ul style="list-style-type: none"> • Reflects the shutdown of PEP-II at end of FY08, and LCLS transition to ops • Reflects changes to LCLS project managers roles and responsibilities
r-3	10 / 2007	<ul style="list-style-type: none"> • Reflects DOE directed change to revise cost and schedule baseline due to 2007 Continuing Resolution • Reflects SLAC reorganization

Appendices

Appendix A	LCLS Level 3 Milestones
Appendix B	DOE Office of Science / Lab / LCLS
Appendix C	LCLS Partner Lab Organization and Advisory Function
Appendix D	SLAC Organization & LCLS Division
Appendix E	Technical Addendum to the SLAC-ANL/LLNL MOU

List of Acronyms

<u>Abbreviation</u>	<u>Definition</u>
ACWP	Actual Cost of Work Performed
AE	Acquisition Executive
ANL	Argonne National Laboratory
AY	Actual Year
BCE	Baseline Cost Estimate
BCR	Baseline Change Request
BCWP	Budgeted Cost of Work Performed
BCWS	Budgeted Cost of Work Scheduled
BES	DOE Basic Energy Sciences
CAM	Control Account Manager
CPR	Cost Performance Report
DOE	U.S. Department Of Energy
EAC	Estimate at Completion
ES&H	Environment, Safety, and Health
ESAAB	Energy Systems Acquisition Advisory Board
FAC	Facilities Advisory Committee
ILCC	Inter-Laboratory Coordinating Committee
ISMS	Integrated Safety Management System
IPS	Integrated Project Schedule
LCLS	Linac Coherent Light Source
LLNL	Lawrence Livermore National Laboratory
M&O	Managing and Operating
OPC	Other Project Cost
PMCS	Project Management Control System
PMP	Project Management Plan
QA	Quality Assurance
R&D	Research & Development
RMP	Risk Management Plan
SAC	Scientific Advisory Committee
SASE	Self-Amplified Spontaneous Emission
SLAC	Stanford Linear Accelerator Center
SSO	DOE Stanford Site Office
TEC	Total Estimated Cost
TPC	Total Project Cost
XFEL	X-Ray Free Electron Laser
WBS	Work Breakdown Structure

Section I – Introduction

Purpose of this Project Management Plan

This Project Management Plan (PMP) defines the plans, organization, responsibilities and systems for managing the Linac Coherent Light Source Project (hereafter referred to as LCLS) to be constructed at the Stanford Linear Accelerator Center (SLAC). The PMP is a field-level plan documenting agreements, roles and responsibilities, and management processes used in the execution of the LCLS project. The PMP supplements the DOE Project Execution Plan. Additional information on the LCLS may be found at:

<http://www-ssrl.slac.stanford.edu/lcls/>

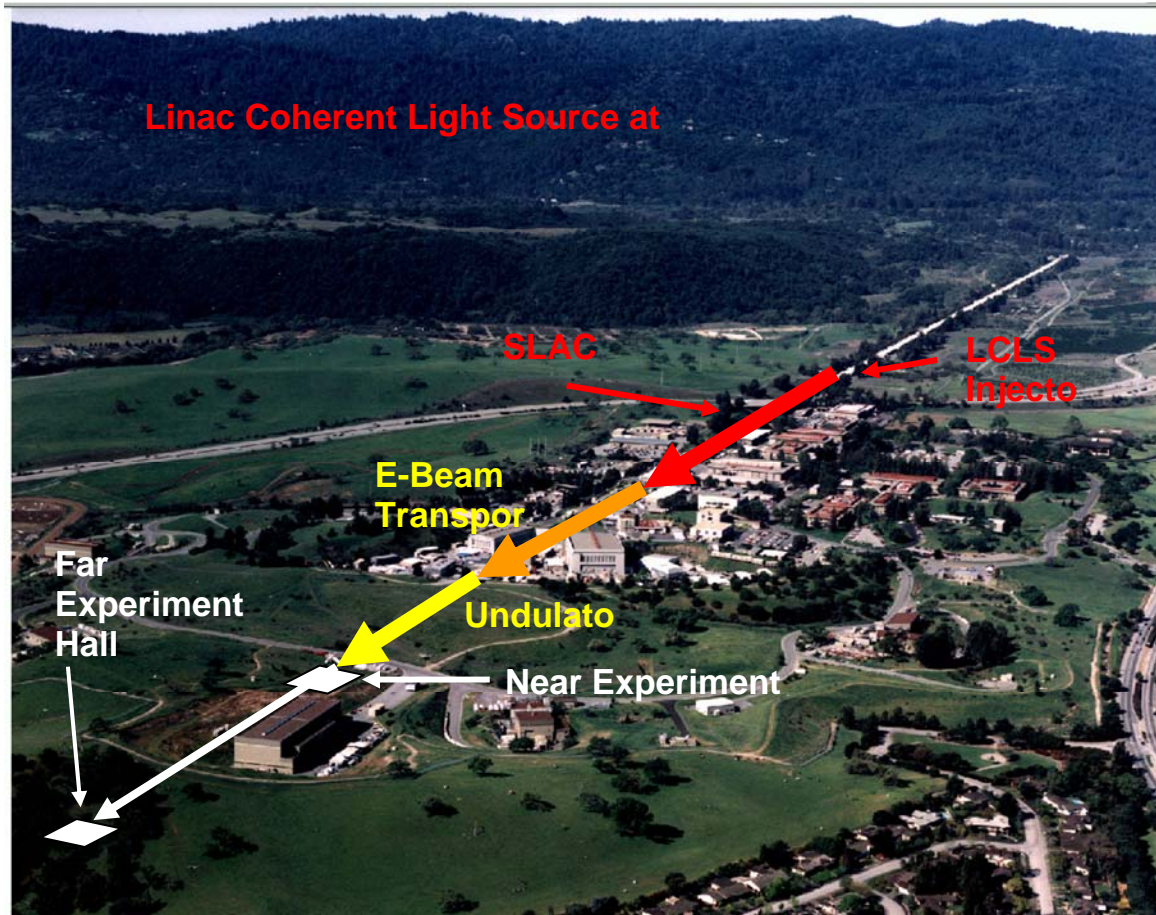
Purpose and Scope of the LCLS Project

The primary purpose of the LCLS Project is to create a world class research facility delivering coherent laser radiation in the x-ray region of the spectrum ten billion times greater in peak power and peak brightness than any existing x-ray light source. Utilizing the principles of Self-Amplified Spontaneous Emission (SASE), the LCLS will provide the world's first demonstration of an x-ray free-electron-laser (XFEL), operating in the 1.5–15 Angstrom (Å) range and utilize the extraordinary, high-brightness x-ray pulses as a powerful tool for research spanning such areas in the physical and life sciences as:

- Atomic physics
- Plasma physics
- Structural studies on single particles and bio-molecules
- Femtosecond chemistry
- Studies of nanoscale dynamics in condensed matter physics
- X-ray laser physics

The short duration of the LCLS pulse (230 femtosecond and shorter) will provide an opportunity to observe the ultra-fast processes of atomic transition, chemical bond formation and breaking, and transitions in condensed matter structures. With a sufficiently short pulse the LCLS can, in effect, function as a stroboscopic flash for freeze-frame photography of atomic, molecular and nanoscale structures as they evolve.

The LCLS will be located within the SLAC complex as shown below:



The Linac Coherent Light Source (LCLS) at SLAC

The specific goal for the LCLS project is to produce a coherent x-ray pulse with a 0.15 nm wavelength and a subpicosecond pulse length. In order to achieve this goal, the project proposes to build an XFEL Facility on the SLAC site. This will require a new 135 MeV injector constructed at Sector 20 of the 30-sector SLAC Linac to create the high brightness electron beam required for the XFEL. The last one-third of the linac will be modified by adding two magnetic bunch compressors. Most of the linac, and its infrastructure, will not be changed. The existing components in the Final Focus Test Beam tunnel will be removed and replaced by a transfer line across the SLAC Research Yard. An undulator tunnel passing through the berm east of the research yard will house a 130-meter undulator and associated equipment. Two experimental halls will be constructed. A Near Hall will be constructed approximately forty meters downstream of the

undulator and a Far Hall will be constructed approximately two hundred fifty meters downstream of the Near Hall. Provisions will be made for x-ray endstation enclosures, as well as instrumentation and controls for identifying and characterizing the x-ray beam. Two existing SLAC buildings will be renovated to provide office space for operations staff when LCLS becomes operational. The LCLS project will fabricate the Atomic, Molecular and Optical (AMO) physics instrument.

The SLAC site has been selected for the LCLS because it makes use of the last kilometer of the SLAC linac as a source of a high-quality electron beam for the LCLS FEL. In addition, the experienced SLAC support staff and existing infrastructure provide the optimum location for LCLS construction and operations.

Participants/Contracts

The LCLS Collaboration consists of a team of scientists and engineers from the Brookhaven National Laboratory (BNL), Argonne National Laboratory (ANL), Los Alamos National Laboratory (LANL), Lawrence Livermore National Laboratory (LLNL), SLAC and the University of California at Los Angeles (UCLA).

During the design and construction phase, the LCLS project is organized as a three-laboratory partnership, led by SLAC in collaboration with ANL and LLNL. This partnership allows each laboratory to bring their unique technical strengths: SLAC – accelerators; ANL – undulators; and LLNL – x-ray beam transfer optics to the LCLS project thus reducing the need to duplicate core competencies and support staff. SLAC, as the Host Laboratory for the LCLS, will use existing personnel and proven systems and procedures to manage the project.

The LCLS project is sponsored by the DOE Office of Science. Work for the LCLS will be performed under the following DOE contracts:

SLAC	DE-AC02-76SF00515
ANL	W-31-109-ENG-38
LLNL	W-7405-ENG-48

Overall DOE management responsibilities for the LCLS are detailed in the *Project Execution Plan for the Linac Coherent Light Source* (hereafter referred to as the LCLS PEP). An update to the LCLS PEP will include the construction start-up phases of LCLS. In accordance with DOE O 413.3A, *Program and Project Management for the Acquisition of Capital Assets*, the Under Secretary for Science, US-SC is the Acquisition Executive (AE) for the LCLS project. The DOE's Stanford Site Office (SSO) reports to the Office of Science and administers the Managing and Operating (M&O) contract for SLAC with Stanford University, which includes the day-to-day oversight of SLAC. The SSO Director delegates responsibility and authority for execution of the LCLS project to the LCLS Federal Project Director. A complete description of the roles and responsibilities within the LCLS project as they apply to the DOE, SLAC and its partner labs, ANL and LLNL, is described in Section III.

Other Related Documents

Acquisition Execution Plan (AEP)

The Acquisition Execution Plan (October 2002) has been prepared by the DOE Stanford Site Office within the DOE Office of Science. The AEP describes the mission need and initial pre-planning strategies and key decisions for the LCLS project from the DOE perspective.

Conceptual Design Report (CDR)

The LCLS Conceptual Design Report (April 2002) provides the detailed overall systems requirements and defines the technical criteria for each of the major systems for the project.

DOE Project Execution Plan (PEP)

The DOE Project Execution Plan for the LCLS has been prepared by the DOE Stanford Site Office within the DOE's Office of Science. This Project Plan includes a Project Charter and describes LCLS management, organization, and roles and responsibilities of the LCLS Integrated Project Team (IPT).

LCLS Global Requirements Document

The LCLS Global Requirements Document specifies the performance requirements for the LCLS x-ray free-electron laser to be constructed at the Stanford Linear Accelerator Center (SLAC).

Risk Assessment and Management Plan

A Risk Assessment and Management Plan identifies and quantifies key risks to the LCLS project. This document provides early assessment of potential risks to the LCLS project and formulates strategies to address the risks.

Copies of all documents can be obtained in the LCLS Project Office. Additional Information on the LCLS project and its scientific program can be found on the LCLS website at <http://www-ssrl.slac.stanford.edu/lcls>.

Section II – Objectives

The primary objective of the LCLS project is to construct the world's first x-ray free electron laser (XFEL) that will serve as a facility for the application of XFEL radiation to experimental science and a research and development center for XFEL physics in the hard x-ray regime. This objective will be accomplished within the cost and schedule requirements accepted by the DOE and the LCLS Project.

As a result of six months of funding uncertainties and a reduction in FY07 funding, the LCLS project team has been directed to prepare a revised cost and schedule baseline. The revised cost and schedule baseline estimates are included in this revised PMP. There are no changes to the scope, capability or performance of the LCLS.

Technical Objectives for the LCLS

The primary technical objective of the LCLS is to provide coherent radiation of extraordinary brightness with greater than 10^{11} photons per pulse in a 0.2%-0.4% energy bandpass with pulse duration of 230 femtosecond or less. The LCLS facility will include two experimental halls, with associated office and laboratory space, where the x-ray beam will be utilized for research in physics, chemistry and biology. The Key Design Operating Parameters List for the LCLS are defined in the LCLS Global Requirement Document (GRD 1.1-001), which can be found on the LCLS website.

Project Schedule Objectives

The LCLS project formally began in Fiscal Year (FY) 2002 with DOE funding for Research & Development activities. Project Engineering and Design (PED) funds were available in FY2003 with completion of PED scheduled for the third quarter of FY2008. LCLS construction is planned to begin in the third quarter of FY2006 to be followed by a staggered commissioning phase. The LCLS Project Level 1 and Level 2 milestones, which form the basis of the LCLS schedule baseline, can be found in the LCLS PEP. LCLS Level 3 milestones are shown in Appendix A. For completion of the LCLS Project a revised CD-4 milestone is proposed as follows:

- CD-4 (July 2010 forecast) – All capital facilities installed and commissioned as necessary to demonstrate detection of X-rays in the Near and Far Experimental Halls (NEH and FEH), and demonstrate a single-pulse x-ray with minimum spectral flux density of 10^6 photons/(mm²*0.1%BW).

Project Cost Objectives

The Total Estimated Cost (TEC) for the LCLS project is \$352.0 Million Actual-Year (AY) dollars and the Total Project Cost (TPC) is 420.0 Million Actual-Year dollars. The LCLS TEC and OPC cost estimates (at WBS L2), and projections of DOE funding can be found in the LCLS PEP.

Section III – Management Organization and Responsibilities

Department of Energy

The roles, responsibilities, and authorities of the DOE Office of Science participants are described below. Appendix B depicts the relationships between the DOE, SLAC and the partner laboratories as they apply to the LCLS project.

Office of Science

The Under Secretary for Science, US-SC, is the Program Secretarial Officer Acquisition Executive (AE) for the LCLS project. US-SC has full responsibility for project planning and execution, and for establishing broad policies and requirements for achieving project goals. Specific responsibilities for the LCLS project include:

- Chair the ESAAB Equivalent Board.
- Approve Critical Decisions and Level 1 baseline changes.
- Approve the Project Execution Plan.
- Delegate approval authority for Level 2 baseline changes to the Federal Project Director.
- Conduct Quarterly Project Reviews.
- Ensure independent project reviews are conducted.

Office of Basic Energy Sciences

Under the Energy Policy Act of 1992, SC's Director for Basic Energy Sciences (SC-22) is responsible for planning, constructing, and operating user facilities to provide special scientific and research capabilities to serve the needs of U.S. universities, industry, and private and Federal laboratories. Within BES, the Scientific User Facilities Division (SC-22.3) has direct responsibility for providing funding, and programmatic guidance to the LCLS project. The LCLS Program Manager, in SC-22.3, is the primary point of contact with the following responsibilities:

- Oversees development of project definition, scope and budget.

- Prepares, defends, and provides project budget with support from the field organizations.
- Reviews and provides recommendations to the AE on Level 0 and 1 baseline changes.
- Monitors Level 1 and 2 technical, cost, and schedule milestones.
- Participates in Quarterly Reviews, ESAAB Equivalent Board meetings, and project reviews.
- Ensures ES&H requirements are implemented by the project.
- Coordinates with other SC Staff offices, HQ program offices and the OECM.

DOE Stanford Site Office (SSO)

The SSO reports to the Office of Science and administers the Management and Operations (M&O) contract for SLAC with Stanford University, which includes day-to-day oversight of SLAC. The SSO Director delegates responsibility and authority for execution of the LCLS project to the LCLS Federal Project Director whose specific responsibilities include:

- Day-to-day oversight of the project and provides direction to ensure its timely execution.
- Monitors, reviews, evaluates, and reports on the performance of the project against established technical, cost, and schedule performance baselines.
- Ensures environment, safety and health (ES&H) is integrated into the project.
- Leads the Integrated Project Team.
- Approves Level 2 change control proposals as delegated by the AE. Review and provide recommendations to the AE for Level 0 and 1 change control proposals.
- Authorizes use of project contingency in accordance with the levels described in this PEP.
- Participates in Quarterly Project Reviews, ESAAB Equivalent Board meetings, and project reviews conducted by the LCLS project and DOE HQ.
- Conducts management meetings to monitor and review status of project activities.
- Maintains project data in the DOE Project Assessment and Reporting System (PARS).

- Issues Project Directive Authorizations for disbursement of funds and work authorizations.
- Prepares project documents such as the Project Execution Plan, Acquisition Strategy (formerly the Acquisition Execution Plan) and Project Quarterly Reports.
- Coordinates matrix support from the SC Integrated Support Centers.
- Prepares and submits budget and funding documents to the BES program manager. (e.g. Construction Project Data Sheet)

SLAC, ANL and LLNL Project Management, and Advisory Committees

Appendix C provides an organizational chart illustrating the relationships (for the purposes of this project) between SLAC, ANL and LLNL laboratory management; LCLS Project Management; and various advisory committees. An explanation of the responsibilities of key managers, are provided below:

SLAC Director

The SLAC Director has the ultimate responsibility for designing and constructing the LCLS Project in keeping with the requirements of the SLAC DOE contract DE-AC02-76SF00515. The Director has delegated the authority to manage and execute the LCLS project to the LCLS Project Director, and will ensure that the LCLS Project Director has priority access to all of SLAC's resources for that purpose.

The SLAC Director has established a separate LCLS Division during the PED and construction phase of the LCLS project. This reorganization creates a separate LCLS Division and establishes the LCLS Project Director as an Associate Laboratory Director of SLAC reporting directly to the SLAC Director. (See Appendix D for additional details.) Key personnel for the LCLS Project will report to the LCLS Division establishing a direct line management organization to support the activities of the LCLS project. Other personnel will be matrixed from other SLAC divisions to provide support to the LCLS Project.

ANL/LLNL Directors

The ANL and LLNL Directors ensure that the appropriate resources for their laboratories are applied to support the project in keeping with their DOE

contracts. The Directors jointly review with the SLAC Director the findings of the Machine Advisory Committee, and initiate adjustments in program direction as needed. The ANL and LLNL Directors will appoint representatives to the Inter-Laboratory Coordinating Council (ILCC). The Directors will ensure that issues raised by the ILCC are addressed in a timely manner.

The ANL Director and LLNL Director have worked with the SLAC Director to approve Memoranda of Understanding (MOU's), which describe the terms of agreement with respect to their laboratories' participation in the LCLS project. Each year, a Technical Addendum to the MOU is written between SLAC and its partner laboratories to define the annual scope of work, resources and schedule requirements for the LCLS. An example of the Technical Addendum between SLAC and ANL/LLNL is shown in Appendix E.

Facility Advisory Committee

The Facility Advisory Committee (FAC) is a standing committee appointed by the LCLS Project Director, with concurrence from the SLAC, ANL and LLNL Directors, to provide advice on the progress of LCLS construction. Members of this group will be selected from the international scientific community with expertise in the project areas of interest. The FAC not only advises the three laboratory Directors, but has a primary role in providing guidance and feedback to the Project Director and his management team. The FAC meets and publishes a status report on the LCLS project biannually.

Scientific Advisory Committee

The Scientific Advisory Committee (SAC) is a standing committee appointed by the LCLS Project Director, with concurrence from the SLAC, ANL and LLNL Directors, to provide guidance on the LCLS scientific research program. Members of this group will be selected from throughout the scientific user community with expertise in atomic, plasma and laser physics, femtosecond chemistry and biology, and nanoscale physics and will provide advice and recommendations on the initial direction of LCLS programmatic research. The SAC meets and publishes a status report on the LCLS scientific program biannually.

Conventional Facilities Advisory Committee

The Conventional Facilities Advisory Committee (CFAC) is a standing committee appointed by the LCLS Project Director to provide guidance on the LCLS conventional facilities aspect of the project. The CFAC meets on an as needed basis depending on the progress of the conventional facilities. A report is published after meetings.

Inter-Laboratory Coordinating Committee

The purpose of the Inter-Laboratory Coordinating Committee (ILCC) is to address issues affecting resource allocation to the LCLS project at the partner laboratories, optimization of LCLS Project resources with other laboratory activities, and coordination of partner laboratories' LCLS activities. Each Laboratory Director shall appoint a representative to the ILCC with line responsibility for resource allocation to the LCLS Project. The ILCC is chaired by the LCLS Project Director and will meet on regular intervals or spontaneously should an immediate need arise. The Federal Project Director will be invited to attend ILCC meetings.

Project Management Oversight Group

A Project Management Oversight Group (PMOG), exercises management oversight of the LCLS Project and reports to the SLAC Director. The PMOG will meet monthly or more often as necessary to provide routine interactions with the LCLS project management. The PMOG will identify actions and initiatives to be undertaken to achieve the goals of the project including the allocation of both financial and human resources. The PMOG will also receive and review the monthly performance reports, change control, milestone performance, and critical issues of importance to the success of the LCLS Project. As necessary, the PMOG can be used as a review board to assess critical areas of the LCLS project.

LCLS Management

The roles and responsibilities of the LCLS Project Management organization are described below:

LCLS Project Director

The LCLS Project Director reports to the SLAC Director and is responsible for the direction of LCLS design and construction activities and the research and development program to support the LCLS, including coordination of SLAC, ANL, and LLNL personnel assigned to the project. The LCLS Project Director is responsible for approving the selection of staff for the design, construction, commissioning, and initial operation of the LCLS facility. Specific responsibilities include:

- Day-to-day management and overall direction of the LCLS project.
- Ensuring that ES&H responsibilities and requirements are integrated into the project, providing an Integrated Safety Management System (ISMS) for the LCLS.
- Establishing technical and administrative controls to ensure project is executed within approved cost, schedule and technical scope.
- Directing and coordinating supporting R&D and commissioning activities with construction activities
- Representing the project in interactions with the DOE and other laboratories. Participating in management meetings with DOE and communicates project status and issues.
- Chairing the Configuration Control Board
- Chairing the Inter-Laboratory Coordinating Council
- Chairing the Change Control Board.
- Approving Level 3 change control proposals. Preparing and providing recommendations to the Federal Project Director for Level 0, 1, and 2 change control proposals, as required.
- Identifying and managing project risks.
- Member of the Integrated Project Team.

LCLS Deputy Project Director

The LCLS Deputy Project Director reports to the Project Director and has the following responsibilities:

- Carrying out the LCLS Project Director functions when the LCLS Project Director is unavailable.

- Providing support for all the functions performed by the LCLS Project Director.
- Facilitating and overseeing interlaboratory coordination.
- Serving as the Configuration Manager of the Configuration Control Board.
- Directing project planning, scheduling, and budgeting and overseeing the Project Office and Support function.
- Defining estimating rules, practices, and procedures and managing periodic project re-estimates.
- Establishing, maintaining, documenting, and enforcing sound management and configuration control standards.
- Member of Integrated Project Team.

LCLS Associate Project Director for Civil Construction

The LCLS Associate Project Director for Civil Construction reports to the Project Director and has the following responsibilities:

- Providing oversight and guidance to the LCLS Conventional Facilities organization.
- Serving as the Point of Contact for communications and negotiations with the LCLS Construction Manager/General Contractor.
- Providing direction to LCLS Procurement activities regarding conventional construction contracts
- Strategic and tactical planning of conventional facilities activities to meet LCLS Project needs.
- Acting as the Point of Contact interface to SLAC organizational elements affected by LCLS civil construction.
- Management of business relations with construction contractors working on LCLS.
- Coordinating LCLS safety oversight activities with SLAC safety oversight personnel.

LCLS Associate Project Director for Engineering

The LCLS Associate Project Director for Engineering reports to the Project Director and has the following responsibilities:

- Overseeing engineering activities of the Linac Coherent Light Source Project at SLAC, ANL and LLNL, including technical design reviews and evaluating and developing the performance of engineers working on the LCLS Project at SLAC.
- Advising the LCLS Systems Managers and Project Director as to status and opportunities for improvement and implementing human resource sharing and transfer across LCLS and LUSI Projects
- Setting and implementing standards for engineering design, documentation, fabrication, installation and handover to operations.
- Evaluating the performance of the design process supporting the LCLS Project at SLAC, and, in cooperation with the LCLS Design Group manager and SLAC Design Group manager, implement best practices.
- Improving the quality of LCLS engineering and system integration activities in measures of technical, cost, schedule and safety performance.
- Implementing systems integration functions with LCLS resources at hand, to assure the best overall performance of the Project and facility
- Setting and enforcing best safety practices in all phases of LCLS engineering activities.

System Managers (Electron Beam, Photon Beam and Conventional Facilities)

The LCLS Electron-Beam, Photon-Beam and Conventional Facilities System Managers report to the LCLS Project Director and have the following responsibilities:

- Directing and coordinating the integrated effort of their respective LCLS WBS systems.
 - “Electron-Beam” includes the Injector, Linac, Undulator and Global Controls WBS systems.
 - “Photon-Beam” includes the XTOD, XES and Global Laser WBS systems.
- Conducting Conceptual, Preliminary and Final Design Reviews as necessary to ensure a high-quality design that meets the technical performance specifications of the LCLS.
- Critical review of project planning, scheduling and cost estimating for their LCLS system.
- Approving all Level 4 change control proposals.

- Ensuring that all work in their integrated LCLS system is planned and executed in accordance with SLAC and LCLS ES&H policy and ISMS procedures.
- Serving as members of the Configuration Control Board.

The LCLS Project Organization chart indicates the line authorities and responsibilities of the Electron Beam Systems Manager, Photon Beam Systems Manager and Conventional Facilities Manager.

Control Account Managers (*Injector, Linac, Undulator, etc.*)

The LCLS Control Account Managers (CAM's) report to their respective LCLS System Managers and have the following responsibilities:

- Serving as the Control Account Managers for all cost accounts in their LCLS system.
- Planning and managing the design, construction, installation, and commissioning of their respective control accounts.
- Participating in project planning, scheduling and cost estimating for their LCLS system.
- Ensuring that work in their respective LCLS system is planned and executed in accordance with SLAC ES&H policy and ISMS procedures
- Serving as members of the Configuration Control Board.

Accelerator Team Leader and Physicist Liaisons (*Injector, Linac, Undulator, etc.*)

The LCLS Accelerator Team Leader, the X-Ray Endstation Systems Liaison Physicist and the X-Ray Transport/Optics/Diagnostics Liaison Physicist report to the Project Director.

The LCLS Accelerator Team Leader has the following responsibilities:

- Directing the physics liaisons responsible for the Injector, Linac, Undulator, Conventional Facilities, and Controls.
- Directing the development and documentation of physics specifications for LCLS technical systems.
- Directing the development of commissioning plans for the LCLS electron beam systems.

- Directing the commissioning team and commissioning process for the LCLS electron beam systems to meet the LCLS FEL goals.
- Coordinating activities listed above with LCLS groups working on x-ray diagnostics and experiments.

The LCLS Accelerator Physics Liaisons report to the LCLS Accelerator Team Leader as indicated in the LCLS Organization Chart.

All Physicist Liaisons have the following responsibilities:

- Acting as a liaison for their respective LCLS WBS scope with SLAC operational infrastructure and personnel.
- Ensuring the physics performance of their respective WBS scope will meet the operational requirements of the LCLS and the SLAC Linac.
- Establishing and documenting performance specifications and physics parameters of their respective LCLS WBS scope.
- Establishing and documenting specifications for operational and controls parameters of their respective LCLS WBS scope.
- Developing commissioning goals and procedures and optimize the physics performance of the LCLS.

LCLS ES&H Officer

The LCLS ES&H Officer reports to the LCLS Project Director and is responsible for:

- Under the direction of the LCLS Project Directorate, and in conformance of SLAC's Integrated Safety Management System (ISMS), maintaining the LCLS ISMS to ensure a safe working environment for the LCLS.
- Providing all levels of LCLS management with advice, information and other resources appropriate to the LCLS project safety oversight.
- Assisting line management in writing environment, safety, and health documents, or authoring these documents as assigned by the LCLS Project Director.
- Reviewing proposed designs, procedures, and practices for environment, safety, and health considerations.
- Acting as a liaison for the LCLS Project with the SLAC Environment, Safety, and Health (ES&H) Division and the SLAC Safety Oversight

- Committee (SOC) to ensure that laboratory-wide environment, safety, and health policies are followed.
- Coordinating with the SLAC ES&H Division on training requirements for LCLS Project members.
 - Acting as LCLS Project liaison in environment, safety, and health audits conducted by the DOE or the ES&H Division.
 - Supporting of line management's activities to determine if environment, safety, and health requirements are being followed.
 - Advising LCLS management on progress toward completion or monitoring of project schedules of environment-, safety-, and health-sensitive milestones.
 - Recommending to the LCLS Project Director corrective action for situations where environment, safety, or health conditions pose an imminent danger or significant environmental harm.
 - Serving as a member of the Configuration Control Board.

LCLS Quality Assurance Officer

The LCLS Quality Assurance (QA) Officer reports to the LCLS Deputy Project Director and is responsible for:

- Representing the LCLS Project on all matters of Quality Assurance and Quality Control at its three partner laboratories; ANL, LLNL and SLAC.
- In consultation with the LCLS Directorate and System Managers, establishing quality-related goals, milestones, directions, practices and policies, and implement quality-related activities.
- Developing and maintaining a project-wide technical specification system that captures all LCLS technical specifications (GRD, PRD's, ESD's, ICD's and RSD's).
- Developing as necessary, vendor surveillance procedures and reports, acceptance criteria documents, non-conformance reports, "traveler" documentation, inspection plans, vendor control programs, metrics and testing procedures.
- Providing or coordinating project-specific QA training for LCLS Project members.
- Performing QA audits as requested by the LCLS Project Directorate.
- Serving as a member of the Configuration Control Board.
- Conducting own activities in accordance with all environmental, health and safety regulations and practices pertinent to this position.

LCLS Procurement Manager

The LCLS Procurement Manager heads the LCLS Procurement Group, consisting of senior buyers for the LCLS technical and construction procurements. The LCLS Procurement Manager has delegated signature authority from the SLAC Director to solicit and award contracts for the project and to enter into agreements, and approve transactions related to subcontracts, purchase orders, and consulting agreements on behalf of LCLS. The LCLS Procurement Manager reports on project-related matters to the LCLS Deputy Project Director and administratively to SLAC's Associate Director for Business Services. In addition, the LCLS Procurement Manager is responsible for;

- Acting as the primary office of communication between LCLS and other Procurement/Purchasing offices at SLAC, ANL and LLNL, which includes a collaborative relationship with SLAC's Purchasing Department.
- Managing LCLS procurements and the procurement staff in compliance with SLAC's managing contract with Stanford University, and DOE, commercial and government contract and procurement principles, policies, and procedures as defined in the Federal Acquisition Regulations, and the Department of Energy Acquisition Regulations.
- Setting priorities for the project's major procurements and ensuring that procurement milestones meet the LCLS technical, quality, cost and schedule goals.
- Administering subcontracts from award through close-out, including the development and maintenance of file documentation, vendor performance, issuance of change orders, negotiation of subcontract modifications, review and approval of invoices for payment, and review of documentation for subcontract close-out.
- Administering procurements and requisitions, preparing requests for proposal, selecting appropriate subcontract form, identifying prospective bidders, and preparing and issuing solicitations, conducting proposal evaluations, negotiating price and delivery terms, awarding subcontracts within their assigned signature authority and preparing subcontract for signature by appropriate signature level.
- Applying cost and price analysis techniques to determine best value assessments and awards.

- Assisting project personnel in developing scope-of-work documents, program and acquisition strategies, and other required procurement documentation.
- Conducting own activities in accordance with all environmental, health and safety regulations and practices pertinent to this position.

LCLS Project Budget Officer

The LCLS Project Budget Officer reports to the LCLS Deputy Project Director and is responsible for:

- Acting as the primary office of communication between LCLS and other financial offices of SLAC, ANL and LLNL including Accounting, the Business Office, and the Budget Office.
- Acting as the primary contact in tracking requisitions and purchase orders and expediting issues related to purchase orders.
- Providing monthly summaries of budgets, costs, open commitments and obligations in a format useful to the LCLS management team.
- Maintaining original and electronic copies of MOU's and SOW's for the LCLS project.
- Providing gate-keeping oversight to the requisition process. Approve requisitions on-line for off-line signatories. Supervise administrative staff in work related to requisition preparation.
- Tracking the overhead on individual requisitions and ensuring that adequate funds are set aside for indirect costs.
- Tracking labor effort on the LCLS project and providing reports to management indicating time and cost charged as compared to labor profile estimates.
- Tracking costs against SLAC credit cards used for LCLS business and ensure that transfers are being made to the appropriate cost account. Conducting own activities in accordance with all environmental, health and safety regulations and practices pertinent to this position.

LCLS Project Controls Manager

The LCLS Project Controls Manager heads the Project Management and Control System (PMCS) Group, consisting of coordinators for the major LCLS systems. The LCLS Project Controls Manager reports to the LCLS Deputy Project Director and is responsible for:

- Maintaining the baseline cost estimate and baseline schedule.
- Establishing and maintaining the Project Management and Control System (PMCS).
- Establishing, coordinating and updating all reporting of project earned values measurements, including costs and schedule variances.
- Maintaining the WBS and WBS Dictionary.
- Maintaining the Level 2 and Level 3 Milestones and Milestone Dictionary.
- Maintaining the Baseline Change Request (BCR) process to track changes to the LCLS baseline.
- Collecting monthly all actual costs for the LCLS project.
- Producing the monthly LCLS Cost and Schedule Performance Report.
- Analyzing actual cost reports from the participating laboratories for correctness of charges.
- Assisting the Project Director, Deputy Project Director, System Managers and CAM's in forecasting budgets.
- Training and supervising the project's technical and administrative staff in the use of the costs and schedule system.
- Conducting own activities in accordance with all environmental, health and safety regulations and practices pertinent to this position.

LCLS Integration & Installation Manager

The LCLS Integration & Installation Manager reports to the LCLS Associate Project Director for Engineering and will be responsible for global facilitation and coordination of integration and installation activities including:

- Acting as an interface with each System Manager, CAM or responsible engineer having integration or installation activities to ensure they are defined and executed in a smooth and well-organized process.
- Developing and coordinating, based upon input from a System Manager, CAM or responsible engineer, global LCLS shutdown schedules and planning.
- Developing and coordinating, based upon input from a System Manager, CAM or responsible engineer, the integration and installation of technical equipment with the beneficial occupancies of conventional facilities.

- Developing and interpreting applicable labor type and standard agreements (i.e., Davis-Bacon) such that LCLS integration and installation activities can obtain the necessary DOE approval.
- Develop estimates on staging space and infrastructure support.
- Conducting own activities in accordance with all environmental, health and safety regulations and practices pertinent to this position.

LCLS Information Technology Manager

The LCLS Information Technology Manager reports to the LCLS Deputy Project Director and is responsible for designing, developing, maintaining, and qualifying the major databases that support the project including:

- Providing definitions of the appropriate hardware and software for administrative and machine design purposes.
- Maintaining Oracle and Windows-based cost, schedule, drawing, and configuration control systems for the LCLS Project.
- Maintaining a system to track purchase order progress against MOU's and SOW's.
- Establishing and maintaining an LCLS document control system that can be utilized as the central repository to ensure that all relevant documents are maintained in an accurate and logical hierarchical system.
- Installation of the appropriate hardware and implementing software, including the parameter list, to support the LCLS Project.
- Conducting own activities in accordance with all environmental, health and safety regulations and practices pertinent to this position.

Section IV – Work Plan

To build the LCLS at SLAC, the project will construct the following main elements:

- a) A photoinjector and a short linac, at Sector 20 of the 30-sector SLAC Linac, where a bright electron beam is generated and accelerated to 135 MeV,
- b) Modification to the last kilometer of the 3-kilometer SLAC Linac, where the electron bunch is compressed and accelerated to 14.3 GeV,
- c) Removal of the Final Focus Test Beam tunnel and construction of a transport system to the undulator,
- d) An undulator, ~130m in length, where the electrons emit FEL and spontaneous radiation,
- e) The undulator-to-experimental area transport line,
- f) A Near Experimental Hall, ~40 meters downstream of the undulator, will include three enclosures for x-ray diagnostics equipment,
- g) A photon beam transport line connecting the Near Experimental Hall to the Far Experimental Hall.
- h) A Far Experimental Hall, ~250 meters downstream of the Near Experimental Hall and constructed as an underground cavern, will include three enclosures for x-ray diagnostics equipment,
- i) Two existing SLAC buildings will be renovated to provide office space for operations staff when LCLS becomes operational.
- j) An Atomic, Molecular and Optical (AMO) physics instrument.

Work Breakdown Structure

The detailed activities to design, fabricate, construct, install and commission the LCLS project are described in its Work Breakdown Structure (WBS). Each element (activity) of the WBS has cost, manpower, and schedule associated with it and is the key element (activity) for planning and controlling cost and schedule.

Organization of the WBS

The levels of the WBS reflect a logical breakdown of the work by major system. Each lower level breaks down the previous level by subsystem and task. Level 1 defines the total LCLS project as follows:

1	LCLS Total Estimated Cost (TEC)	Includes all Project Engineering and Design (PED), Long-Lead Procurements and Construction activities for this project, including contingency.
2	LCLS Other Project Cost (OPC)	Includes all Research and Development (R&D), Commissioning (Pre-Operations) and Spares for this project, including Management Reserve.

The LCLS Total Project Cost is defined as the sum of the TEC and OPC. WBS Level 2 defines the major LCLS systems organized according to geography. Each LCLS system's WBS captures their respective TEC and OPC as follows:

WBS#	LCLS System
1.1, 2.1	Project Management, Administration & Integration
1.2, 2.2	Injector System
1.3, 2.3	Linac (Accelerator) System
1.4, 2.4	Undulator System
1.5, 2.5	X-Ray Transport, Optics & Diagnostics System
1.6, 2.6	X-Ray Endstations System
1.9, 2.9	Conventional Facilities

Each system includes related common tasks and activities such as controls, alignment and installation, such that it is a fully integrated system that captures all costs, resources, tasks and activities necessary to complete each LCLS system. Each system contains progressively lower levels to further define the sub-elements down to the lowest WBS.

The WBS Dictionary

A WBS Dictionary has been established to define the WBS scope. A copy of the complete WBS and the WBS Dictionary is available in the LCLS Project Office.

The LCLS Project Controls Manager is responsible for maintaining the current WBS and WBS Dictionary and the records of all changes. All changes must be approved by the Project Director prior to implementation.

When specified by this management plan, such changes will be forwarded to the Federal Project Director for approval after review by the Configuration Control Board. Once approved, the changes will be implemented in the WBS. A record of such changes will be maintained.

Work Execution

Engineering, Design, and Drawings

Each partner laboratory participating on LCLS agrees to furnish complete documentation of the quality control and performance checks on deliverables supplied to the LCLS project. Documentation will include all engineering drawings of equipment, full schematics of electronics, operating and maintenance specifications, 'as-built' dimensions of all deliverables, magnetic measurements, and documentation of all software. All drawings, specifications, operating and maintenance documentation will be stored on the LCLS Database at SLAC.

Make-vs-Buy Policy

The LCLS Associate Project Director for Engineering will review, on a case-by-case basis, fabrication requirements and recommend whether to use in-house capabilities or buy the item from an outside supplier. The program applies to the fabrication of hardware and services. The goals of this program are;

- a) Meet the LCLS Project mission, cost, design, and schedule requirements effectively.
- b) Comply with obligations to support small, small disadvantaged, and minority-owned business enterprises.
- c) Efficiently use and maintain the participating laboratories' capabilities according to their mission and DOE objectives.

R&D and Commissioning Activities

R&D and commissioning activities that support the construction project will be carried out primarily by employees of the participating laboratories using the facilities and resources of the laboratories. Management of the R&D work

and coordination of R&D with the construction project is the responsibility of the LCLS Project Director.

Commissioning functions and activities are to be integrated into SLAC operations and are subject to all SLAC ES&H and operations policies and procedures. Should there be any conflict between SLAC ES&H and/or SLAC Operations and the LCLS PMP, SLAC's ES&H policies will take precedent.

Section V – Cost and Labor Estimates

Cost Estimates

As described previously, the LCLS cost estimate is a detailed "bottoms-up" estimate with resources loaded at the lowest activity developed by the responsible Control Account Manager (CAM) using appropriate standard estimating methodologies, and integrated with the work scope definition. Resources defined in the detailed estimate are applied to the tasks established in the schedule to generate a time-phased budget. All estimates are assessed in dollars in the actual year (AY) spent.

Labor Estimates

The labor required for the project has been estimated by labor type and distributed by the responsible CAM to support the scope of work. Labor rates for each labor type have been developed using approved laboratory indirect rates and appropriate escalation rates. These labor estimates sum up to the total project labor estimate.

Section VI – Funding and Cost Management

Funding Management

Funds will be available to the DOE in support of the LCLS Project on an annual basis following the passage of legislation by the U.S. Congress. Funds for LCLS PED and construction costs shall be directed to SLAC via congressional budget line item, with LCLS R&D and commissioning funds as a modification to SLAC's M&O contract with DOE.

The financial resources required to perform the work scope at ANL and LLNL will be determined by SLAC's LCLS Project Management organization. To assure these resources are transferred in a timely manner to meet future expenditures and procurements, LCLS Project Management will prepare annual Technical Addenda to the ANL and LLNL Memoranda of Understanding (MOU) for work scope and necessary funding by August 1 of the preceding fiscal year. The Technical Addenda (see Appendix E) authorize an annual funds transfer via subcontracting agreement between SLAC and its partner labs. At mid-year and at the beginning of the fourth quarter, LCLS may request adjustments to the obligations to ANL and LLNL if necessary.

The ANL and LLNL annual addenda authorize a defined scope of work and the necessary resources at the lowest level of the WBS for each Lab. Laboratory labor resources, if necessary to accomplish the work scope, will be identified explicitly in the addendum. Each partner lab will make every effort to carry out their institutional responsibilities consistent with the LCLS project schedule, which may have to be changed as the project progresses. To optimize available resources, LCLS management may transfer, modify or redefine future work scope, through modification of the addenda, to achieve the LCLS technical, cost and schedule requirements.

Cost Management

Control Account Managers (CAM's) are assigned control accounts for specific systems and activities and are responsible for ensuring that only work budgeted will be authorized and for controlling expenditures against their accounts. The costs and commitments incurred in these accounts will be transmitted to the LCLS

Project Office monthly and reported in the monthly LCLS Cost Performance Report.

In addition, each laboratory has a signature authority procedure to assure that only authorized personnel can approve requisitions. Signature authority is delegated by the LCLS Project Director to LCLS Control Account Managers as follows:

LCLS Manager	Signature Authority
LCLS Project Director (SLAC)	\$100,000
LCLS Deputy Project Director (SLAC)	\$50,000
LCLS ANL, LLNL Project Directors	\$100,000 for approved work at partner laboratory
LCLS System Managers (SLAC)	\$15,000
LCLS Control Account Managers (SLAC)	\$5,000

Procurement and item purchases exceeding the delegated limit will be authorized by the LCLS Project Director in advance of obligation by the partner laboratory's Procurement Department.

Section VII – Configuration Management

The essential elements of configuration control are a well defined baseline, and an effective method of communicating, evaluating, and documenting changes to that baseline. The LCLS project management will control and evaluate changes to its approved cost, schedule and technical scope through a configuration control process designed to promote an orderly evolution from the initial design, and ensure that the effect of changes on cost, schedule, and performance are properly evaluated and documented.

Configuration Control Board

A Configuration Control Board (CCB) consisting of the key members of the LCLS Project will be established to advise (not approve) changes to the LCLS technical, cost and schedule baseline. The board will consist of a standing committee consisting of a chairman, a configuration manager, and board members. Their roles are described below:

CCB Chairman

The LCLS Project Director is the CCB Chairman. The Chairman reviews and may approve changes that come before the CCB. The Chairman will coordinate DOE approval if the impact of a change to cost, schedule, or technical performance requires DOE approval.

Configuration Manager

The Deputy Project Director is the Configuration Manager, and is responsible for managing change control activities, maintaining and enforcing control procedures, organizing the agenda for change control meetings, and ensuring changes are properly evaluated and documented.

Board Members

In addition to the CCB Chairman and the Configuration Manager, the Project Controls Manager, the System Managers, and representatives from QA and ES&H constitute the Configuration Control Board.

In addition to the standing CCB committee, the LCLS Federal Project Director will attend all CCB reviews requiring DOE approval, and is invited to sit in on CCB reviews below DOE approval threshold. The CCB members review the technical, cost, and schedule implications of changes and advise the Chairman. Although any member of the LCLS project can propose a change to the LCLS approved work, it must be sponsored by a CAM. All System Managers must review and approve all changes to the baseline to assess impact and ensure that system interfaces have been properly considered.

Performance Baseline

Critical Decision (CD) 2b, *Approve Performance Baseline* was approved by the Director of the DOE's Office of Science on April 11, 2005 and formalizes the initial technical cost, and schedule performance baseline. The CD-2b is accompanied by an initial cost and schedule performance baseline, contingency, forecasted funding profiles, and the approved LCLS technical performance requirements. The LCLS Quality Assurance Officer is responsible for maintaining and documenting the technical baseline (GRD, PRDs, ESDs, etc.) through the configuration control process. The LCLS Project Controls Manager is responsible for incorporating approved changes into the project's WBS Dictionary and Performance Measurement Baseline (PMB). The Project Controls Manager will maintain a record of approved changes that affect cost and schedule.

The initial CD-2b PMB provides the reference point from which to begin configuration control. The PMB will evolve through the configuration control process. At any time, the current performance baseline will be traceable to the original performance baseline through the records of approved changes. Approved changes may affect the LCLS technical requirements, and the project WBS Dictionary, cost and schedule.

Configuration Change Thresholds

The thresholds for Configuration Change Control approval are documented in the LCLS PEP. All changes for Level 1, 2 or 3 must be reviewed by the Configuration Control Board and approved by the LCLS Project Director prior to being submitted to the DOE for additional approval.

Configuration Control Process

The configuration control process will be applied to all proposed changes, including those initiated by subcontractors and suppliers, which affect technical performance, cost, or schedule of the LCLS performance baseline. The process proceeds as follows:

- Any member of the project can request a change proposal by informing the responsible Control Account Manager. The technical merits and cost/schedule impact are evaluated under the direction of the System Manager.
- If the System Manager submits a Baseline Change Request (BCR) to the Deputy Project Director (Configuration Manager), complete with a concise impact statement of the technical, cost, and schedule changes related to the BCR, the proposal is added to the agenda of a future change control meeting. The BCR must be signed by the System Manager(s) proposing the change.
- The Configuration Manager convenes the Configuration Control Board to discuss new change proposals. Each change is discussed, and each System Manager signs the change proposals. The CCB process is designed to ensure that the technical, cost and schedule impact of changes that may affect more than one LCLS system are correctly evaluated. There is a standing meeting of the CCB scheduled monthly, which can be cancelled if no BCR's are proposed.
- As chairman of the Configuration Control Board, the Project Director approves, disapproves the proposal, or requests further information concerning each proposal.
- Approved changes are transmitted to the DOE Federal Project Director.

Section VIII – Risk and Contingency Management

Risk Management

Managing risk is a key element of the project management process for both planning and performance phases of the LCLS. As such, the LCLS management has developed a Risk Management Plan (RMP) which identifies and quantifies risks to the LCLS Project, determines their impact and exposure to risk and develops mitigation and correction strategies to employ when risks become reality. Risks to the LCLS project are identified to be in the following categories;

- Technical
 - Design and Equipment Complexity
 - Environment, Safety & Health
 - Procurements
 - Programmatic (Scientific Mission)
 - Resources (Funding and Staffing)
- Cost (includes currency and inflation)
- Schedule

The RMP assesses and quantifies risks to the LCLS project and documents the high risk areas in the LCLS Risk Registry. The LCLS Risk Registry is a living document used throughout the life of the LCLS project and, like contingency management, is under configuration control. The LCLS RMP and Risk Registry are reviewed and updated monthly to reflect any reassessment of risks to the LCLS project. A copy of the LCLS RMP and the current Risk Registry are available in the LCLS Project Office.

Contingency Management

Contingency funds are utilized during the LCLS project for corrective actions to technical risks realized during the project, recovering from schedule delays, and providing resources for errors and omissions in the baseline cost estimate. Contingency requirements are estimated, at the lowest WBS, based on a risk assessment of; (1) design maturity of the component(s) and/or cost estimate, and (2) judgment factors, which considers environmental factors such as beyond the

state of the art technology, single vendor procurements, currency and pricing variations, etc.

All contingency for the project will be held at SLAC under the control of the LCLS Project Director and the Federal Project Director as governed by the Baseline Change Control process. Increases in the WBS L2 Budget-at-Complete (BAC) above the Level 3 cost threshold require submitting a Baseline Change Request (BCR) to the LCLS Configuration Control Board (CCB). The BCR will include the basis for the change and the implications for cost, schedule, and system interfaces.

The CCB will review the request and make a recommendation to the LCLS Project Director. If the Project Director concurs, the BCR is approved unless the change thresholds require the approval of higher levels of authority. An approved cost-related BCR results in the increase of the baseline estimate for that WBS element, and unless there are offsets, will reduce the available contingency by an equal amount. The LCLS Project Director will make every effort to find offsets within the project, without impacting the technical performance baseline, to mitigate draws on contingency. A change control log will be maintained by the LCLS Project Controls Manager to document all approved BCR's.

The principals of contingency management for the LCLS project are as follows:

- The actual allocations of contingency at any level of the WBS will be reflected in a new EAC to be updated monthly.
- The sum of these contingency allocations may not exceed the amount in the LCLS contingency amount.
- All changes from baseline costs shall be traceable to the revised Performance Measurement Baseline approved by the Deputy Secretary.

Section IX – Project Management Control System

The LCLS Project has established a Project Management Control System (PMCS) using Primavera Project Planner (P3) as a schedule planner and COBRA as a cost processor to derive earned value progress on the project. Modeled after past DOE projects at SLAC, namely the B-Factory Project (PEP-II and BaBar), GLAST-LAT Project and the SPEAR-3 Project, the LCLS PMCS is the integration for the schedule and cost baselines and provides the necessary tools to monitor cost, schedule, and technical performance on a monthly basis. The LCLS PMCS satisfies all requirements of DOE Order 413.3A.

The LCLS cost and schedule baseline consists of a Baseline Cost Estimate (BCE) and the Integrated Project Schedule (IPS), which uses a project-wide logic network, resource-loaded tasks, and a hierarchy of schedule milestones. Both the BCE and IPS are maintained by the LCLS Project's PMCS Group and are subject to change control under Configuration Management.

The policies and procedures for maintaining and changing the BCE and the IPS and those for reporting schedule status are set forth in Section VIII – Configuration Management of this PMP and/or the supporting PMCS documentation written and distributed by the LCLS PMCS Group. The LCLS PMCS Group is managed and operated by the LCLS Project Controls Manager and reports to the LCLS Deputy Project Director.

Monthly performance measurement figures will be based on three quantities: schedule status submitted by the LCLS Control Account Managers each month, actual financial status (costs and commitments) for the month, and the cost and schedule baseline.

A Cost Performance Report (CPR) will be prepared and issued monthly by the Cost and Schedule Group. Reporting will be by WBS element to the lowest element. For each element, the following data will be reported: actual cost of work performed (ACWP), budgeted cost of work performed (BCWP), and budgeted cost of work scheduled (BCWS). Cost and schedule variances, and cost and schedule performance indices, will be documented in the CPR.

A monthly report on the LCLS Project progress will be issued by the LCLS Project Office and distributed to appropriate DOE offices and other organizations outside

the project. This report will provide information at WBS level 2 and higher and will discuss the overall status of the LCLS Project. A “Highlights” section will address the total project schedule overview and any significant project accomplishments. An “Assessment and Issues” section will cite any areas of concern to the project management. The LCLS monthly report will also document monthly and cumulative project cost and schedule performance at WBS level 2 and progress against DOE level 2 milestones.

Section X – Supporting Functions

Each partner laboratory participating in the LCLS project, agrees to furnish indirect support to the project from its support departments, which may include:

- Accounting and Budgeting
- Environment, Safety and Health
- Facilities Management
- Information and Business Services
- Human Resources
- Legal
- Quality Assurance
- Procurement and Purchasing (if separate from Business Services)

All support functions will be provided through the partner laboratory's organizational lines of authority and responsibility. LCLS will direct questions of priority needs for support through normal lines of authority within the organization.

Section XI – Information and Reporting

Documents and Reports Prepared by DOE

- Accelerator Readiness Review
- Environmental Assessment and Finding of No Significant Impact (FONSI)
- Annual Project Validation Report
- Construction Project Data Sheet
- Justification of Mission Need Statement
- Project Execution Plan
- Quarterly Project Director's Progress Report

Documents and Reports Prepared by the LCLS Project

- Advance Procurement Management Plan
- Conceptual Design Report
- Construction Project Data Sheet
- Preliminary and Final Safety Assessment Document
- Fire Hazards Analysis
- Hazards Analysis Report
- Monthly Project Report (includes Cost and Schedule Performance)
- Project Management Plan
- Quality Implementation Plan
- Risk Management Plan
- Start-Up and Commissioning Plan

Project Meetings and Reviews

Meetings and Reviews with DOE

The following meetings will be held between the DOE and the LCLS Project:

- DOE/LCLS Management Meeting (weekly). A meeting held between the DOE Federal Project Director, the LCLS Project Director and relevant LCLS staff to discuss current business and management issues.

- DOE/LCLS Status Meeting (weekly). A meeting held between the DOE BES Director, DOE LCLS Program Manager, DOE Federal Project Director, LCLS Project Director and relevant LCLS staff to review the current status of project work and to discuss outstanding issues.
- DOE/LCLS Quarterly Review (quarterly). A meeting held between the Office of Science Acquisition Executive, DOE-BES Director, DOE-LCLS Program Manager, DOE Federal Project Director, and an Office of Engineering and Construction Management representative to review the current status of project work and to discuss outstanding issues.
- DOE Independent Project Review (semiannual). A review held by the DOE's Office of Science on the LCLS project's technical cost, schedule and management performance. Presentations by key project personnel will address issues on an agenda agreed to in advance by DOE and the LCLS Project Director. A report is issued with findings, comments, and recommendations.

Additional LCLS Project Meetings

Project reviews will be held whenever relevant to execute key decisions in the R&D and construction phases of the LCLS project. In addition, the following regular meetings will be conducted within the LCLS project:

- Inter-Laboratory Coordination Committee (ILCC) meetings (quarterly), chaired by the LCLS Project Director. This meeting includes the DOE Federal Project Director, LCLS Project Director, Deputy Project Director, and System Manager(s) with work scope at the partner lab, and a representative from each partner lab with line authority for resource allocation to the LCLS project. This meeting will primarily focus on issues affecting resource allocation to the LCLS project at the partner laboratories and optimization and coordination of LCLS resources with all three laboratory activities. Meeting minutes will be recorded.
- LCLS Risk Management Meeting (monthly), chaired by the LCLS Deputy Project Director. This meeting includes the DOE Federal Project Director, LCLS Project Director, Deputy Project Director, the

System Managers, the Integration Managers (Controls, Alignment, and Installation), the Project Controls Manager, the PMCS Group, ES&H and QA officers, and a representative of the SLAC Purchasing Department. This meeting will focus on identifying risks and developing risk avoidance/mitigation strategies for the LCLS project and across functional groups within the partner laboratories. Meeting minutes will be recorded.

- LCLS Management Meeting (weekly), chaired by the LCLS Project Director. This meeting will involve the LCLS Project Director, Deputy Project Director, the System Managers, the Control Account Managers, the Integration Managers, the Project Controls Manager, the PMCS Group, and will focus on the day-to-day management issues within the LCLS project. Meeting minutes will be recorded.
- LCLS Physics Coordination Meeting (weekly), chaired by the LCLS Project Director. This meeting will involve the Project Director, Deputy Project Director, Institutional Liaisons, and System Managers, and provide the highest level of physics support and coordination for the LCLS project. This meeting will primarily focus on the R&D, liaison and commissioning support during the construction phase of the project.
- LCLS Change Control Board Meetings (twice weekly or as required), chaired by the LCLS Project Director. This meeting will involve the DOE Federal Project Director, LCLS Project Director, Deputy Project Director, the System Managers, the Integration Managers (Controls, Alignment, and Installation), the Project Controls Manager, the PMCS Group, ES&H and QA officers, and a representative of the SLAC Procurement Department.
- LCLS Facilities Advisory Committee (FAC) Meetings (semiannual), appointed by the LCLS Project Director. The FAC is a standing committee made up of leading physicists in the scientific community charged to provide advice on the progress of LCLS construction, and to ensure that the LCLS project meets or exceeds its technical performance goals.

- LCLS Scientific Advisory Committee (SAC) Meetings (semiannual), appointed by the LCLS Project Director. The SAC is a standing committee made up of leading physicists in the scientific user community charged to provide advice on the progress of LCLS scientific program, to provide guidance on the initial LCLS scientific research program.
- LCLS Collaboration Meetings (at least semiannual), called by the LCLS Project Director. These meetings bring together the entire LCLS management organization and most of the physicists and engineers working on the Project. The meetings promote communication and coordination of activities across the laboratories, and provide an opportunity for cross-organization communication and identification of unresolved interface issues.
- LCLS Conventional Facilities Advisory Committee (CFAC) Meetings, appointed by the LCLS Project Director. The CFAC is a standing committee to provide guidance on the LCLS conventional facilities aspect of the project. The CFAC meets on an as needed basis depending on the progress of the conventional facilities. A report is published after meetings.
- Project Management Oversight Group Meetings, appointed by the SLAC Director. A PMOG is a standing committee to provide management oversight of the LCLS Project. The PMOG will meet monthly or more often as necessary to provide routine interactions with the LCLS project management. The PMOG will identify actions and initiatives to be undertaken to achieve the goals of the project including the allocation of both financial and human resources. The PMOG will also receive and review the monthly performance reports, change control, milestone performance, and critical issues of importance to the success of the LCLS Project. As necessary, the PMOG can be used as a review board to assess critical areas of the LCLS project.

Section XII – Project Management Plan Review and Modifications

After its adoption, this Project Management Plan shall be periodically reviewed by the DOE Federal Project Director and the LCLS Project Director. Proposals for its modification may be initiated by the DOE Federal Project Director, the LCLS Project Director, SLAC, ANL and LLNL Directors, or any other member of the Integrated Project Team. Significant changes to the PMP require an amended PMP and the approval of Director of the DOE's Stanford Site Office, DOE Federal Project Director, LCLS Project Director, and the Laboratory Director's at SLAC, ANL and LLNL.

Appendix A – LCLS Level 3 Milestones (Oct06)

Level 3 SLAC (LCLS PO) Milestones	Scheduled Date	Completion Date
Project Management (WBS 1.01)		
Advanced Procurement Management Plan Complete	Feb-04	Feb-04
Resource Loaded Cost & Schedule (Final) Complete	Apr-04	Apr-04
1st Monthly Report (with Earned Value) Submitted	Apr-04	Apr-04
Risk Management Plan Complete	Apr-04	Apr-04
Prelim Safety Assessment Doc (PSAD) Submitted	Apr-04	Apr-04
Project Mgmt Control Syst (PMCS) Review Complete	Apr-04	Apr-04
Project Mgmt Plan Complete	Apr-04	Apr-04
CRIT: Start Procurement Package - PMCS Support	Oct-04	Oct-04
Fire Hazard Analysis Review @ SLAC	Jul-05	Jun-05
FY05 Shutdown: HW Req'd for Installation	Oct-05	Oct-05
FY05 Shutdown Over	Oct-05	Oct-05
FY06 Shutdown: HW Req'd for Installation	Aug-06	Aug-06
FY06 Shutdown Over	Jan-07	Jan-07
FY07 Shutdown: HW Req'd for Installation	Sep-07	
FY07 Shutdown Over	Dec-07	
Safety Analysis Document (SAD) Approved	Jul-08	
Start FY08 Shutdown	Oct-08	
FY08 Shutdown Over	Nov-08	
LCLS ARR Complete (BTH thru FEH)	Mar-09	
Injector System (WBS 1.02)		
Award of Drive Laser Contract Complete	Jun-05	Jun-05
Wall Region Installation Complete	Dec-05	Dec-05
Laser Tables & Optical Paths Installation Comp	Aug-06	Aug-06
Drive Laser Available for Integration	Oct-06	Nov-06
Heater Region Installation Complete	Dec-06	Dec-06
Start Injector Commissioning (Drive Laser)	Jan-07	Dec-06
Injector Laser Commissioning Review Complete	Nov-06	Dec-06
Injector Accelerator Readiness Review (ARR) Comp	Mar-07	Dec-06
Injector Controls Installation Complete	Mar-07	Jan-07
Accelerator Region Installation Complete	Dec-06	Jan-07
Gun Region Installation Complete	Mar-07	Jan-07
Injector RF Subsystem Installation Complete	Mar-07	Jan-07
Spectrometer Installation Complete	Mar-07	Feb-07
Insertion Region Installation Complete	Dec-06	Feb-07
RF Gun Ready for Installation	Dec-06	Feb-07
Start Injector Commissioning(UV Beam to Cathode)	Apr-07	Mar-07
Injector Commissioning Complete	Oct-07	Oct-07
Laser Heater Installation Complete	Nov-08	
Linac System (WBS 1.03)		
CRIT: Release RFP X-Band Klystron	Feb-05	Feb-05
Shutdown of FFTB Operations	Apr-06	Jun-06
BC1 Bend Magnet Ready for Installation	Sep-06	Nov-06
X-Band Klystron Ready for Installation	Aug-06	Nov-06
BC1 Installation Complete	Jan-07	Jan-07
Linac Controls Ready for BC1 Installation	Mar-07	Jan-07
Start BC1 Commissioning	Mar-07	Feb-07
Linac Commissioning Review Complete - S20-30	Jan-08	
BC2 Installation Complete	Jan-08	
Start Linac (Li20-Li30) Commissioning	Mar-08	
E-Dump Component Installation Complete	Aug-08	
BC2 Commissioning Complete	Aug-08	
LTU Component Installation Complete	Oct-08	
Linac Commissioning Complete	Oct-08	
Start Installation of Beam Transport Hall	Jan-09	
Linac Commissioning Review Complete - LTU	Mar-09	
Start Linac-to-Undulator (LTU) Commissioning	Mar-09	

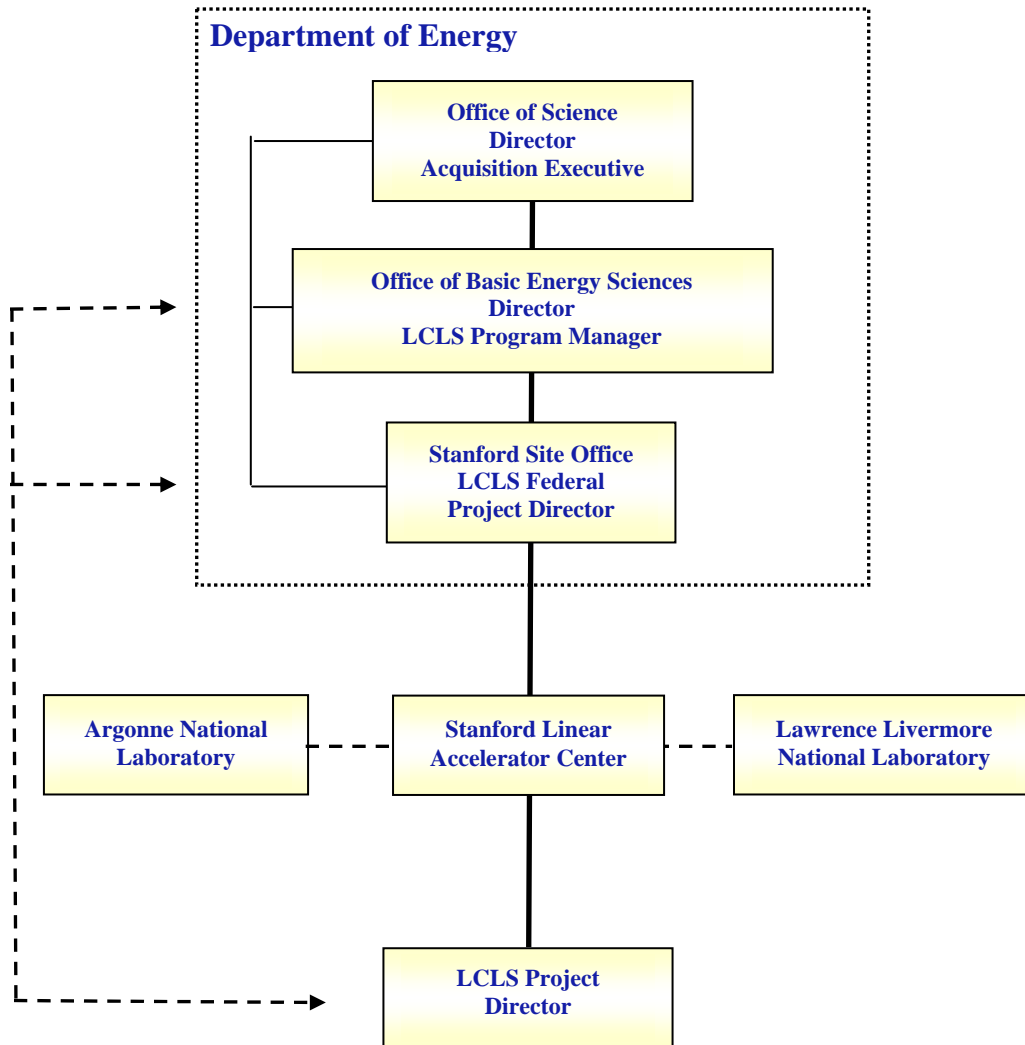
Appendix A – LCLS Level 3 Milestones (Oct06)

Level 3 SLAC (LCLS PO) Milestones	Scheduled Date	Completion Date
Undulator System (WBS 1.04)		
CRIT: Release RFP Ti Strongback	Jan-05	Jan-05
CRIT: Release RFP Magnet Poles	Feb-05	Feb-05
CRIT: Release RFP Magnet Blocks	Mar-05	Mar-05
CRIT: Release RFP Magnet Assemblies - 1st Art	Jun-05	Jun-05
Award of 1st Articles Mag Assy to Vendors Comp	Oct-05	Oct-05
CRIT: Release RFP - Quadrupoles	Apr-06	Jun-06
Undulator SUT Completed	Apr-06	Jul-06
CRIT: Release RFP - Fixed Supports	May-06	May-06
1st Article Vendor A Undulator 1 Rcvd @ SLAC	Jun-06	Mar-06
1st Article Vendor B Undulator 2 Rcvd @ SLAC	Jun-06	Jun-06
MMF Qualified & Ready to Measure Prod Undulators	Oct-06	Aug-06
25% production undulators received	Jan-07	Aug-06
50% production undulators received	Mar-07	Dec-06
75% production undulators received	Jun-07	Jan-07
Undulator Production Units (33) Received	Jul-07	Apr-07
1st Two Quadrupoles Rcvd at SLAC	Nov-07	
1st Production Undulator RFBPM Delivered to SLAC	Dec-07	
Support/Mover & Fixed Support #01-17 Rcvd @ SLAC	Dec-07	
1st Production BFW Delivered to SLAC	Jan-08	
Start Installation of Undulator Facility	Jan-08	
Quadrupoles #3-17 Rcvd at SLAC	Jan-08	
Support/Mover & Fixed Support #18-33 Rcvd @ SLAC	Feb-08	
1st Production Vacuum Chamber Delivered to SLAC	Feb-08	
Vac Chmbr/BPM #01 Rcvd at SLAC	Feb-08	
Quadrupole #18-33 Rcvd at SLAC	Mar-08	
Long Diagnostic Break Assembly Rcvd at SLAC	Mar-08	
Vac Chmbr/BPM #02-16 Rcvd at SLAC	Apr-08	
Short Diagnostic Break Assembly Rcvd at SLAC	Apr-08	
Vac Chmbr/BPM #17-33 Rcvd at SLAC	May-08	
Hydrostatic Level System Complete	Nov-08	
Wire Monitoring System Complete	Nov-08	
Undulator Controls Ready for Commissioning	Nov-08	
Undulator System Installation Complete	Nov-08	
Beam Loss Monitoring Rcvd at SLAC (34+2)	Feb-09	
Start Undulator Commissioning (1st Light)	Jun-09	
X-Ray Transport & Diagnostics (WBS 1.05)		
Tunnel Mech/Vac Design Review Complete	Nov-06	Nov-06
Gas Attenuator Design Review Complete	May-07	Mar-07
AWARD: LE Mirror Substrate	Jun-07	Jun-07
AWARD: HE Mirror Substrate	Dec-07	
Fixed Mask Ready to Ship to SLAC	Mar-08	
Gas/Solid Attenuator Ready to Ship to SLAC	Apr-08	
XT Start Phase 1 FEE Installation	Jul-08	
XT Start Phase 2 FEE Installation	Aug-08	
XT Start NEH Installation	Mar-09	
XT Start Phase 3 FEE Installation	Mar-09	
XT Start Phase 4 FEE Installation	Mar-09	
XT Start Tunnel Installation	Apr-09	
FEE Install/Check Complete	May-09	
Start FEE Commissioning with Beam	Jun-09	
XT Start FEH Installation	Aug-09	
TUN/FEH Install/Check Complete	Nov-09	
First X-Rays into FEH	Feb-10	

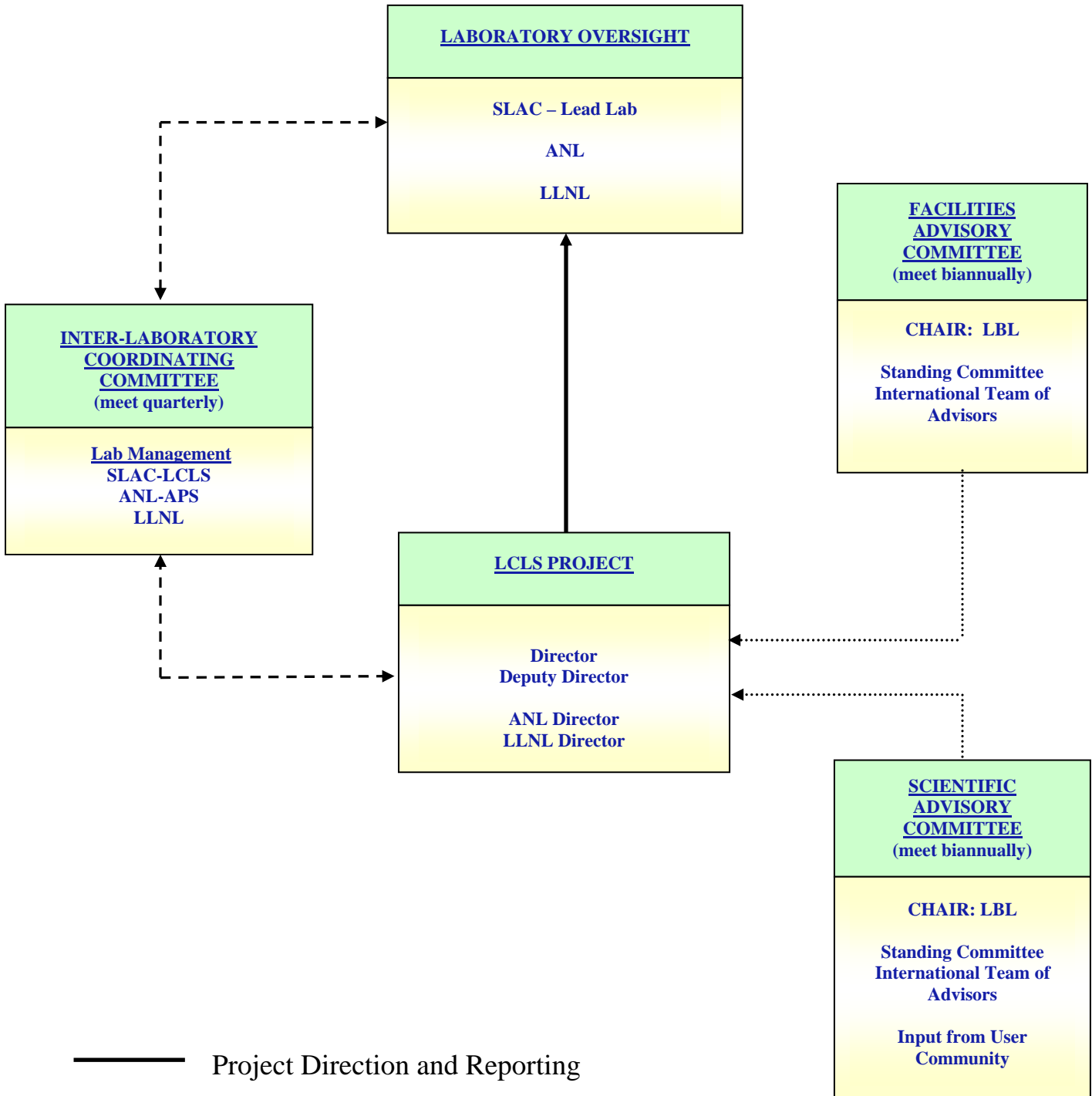
Appendix A – LCLS Level 3 Milestones (Oct06)

Level 3 SLAC (LCLS PO) Milestones	Scheduled Date	Completion Date
X-Ray Endstations (WBS 1.06)		
Complete 2-D X-Ray Detector Statement of Work	May-05	Jul-05
Award Initial Funding for 2-D X-Ray Detector	Jul-05	Jul-05
Hire Atomic Physicist	Jan-06	Mar-06
Hire Detector Physicist	Jan-06	Apr-06
COMP: AMO PDR Meeting	Nov-07	
LDAC Mid-Project Review - 2-D X-Ray Detector	Nov-07	
Award XES Laser System	Nov-08	
Electron Dump Stoppers Certified	Nov-08	
XE Start Installation in NEH	Jan-09	
2-D Detector Shipped to SLAC	Apr-09	
XES Laser Operating in Near Hall	Apr-09	
FEE/NEH PPS Certified	Jun-09	
Photon flux density measurement in FEE achieved	Jul-09	
XE Start Installation in FEH	Aug-09	
First X-Rays into NEH	Aug-09	
Initiate Early Experimental Operations	Aug-09	
AMO Ready for Basic Expmnts (Phase 1)	Aug-09	
TUN/FEH PPS Certified	Nov-09	
Conventional Facilities (WBS 1.09)		
A&E Serv (S20, MMF, MCC not incl) Title 1 Comp	Apr-04	Apr-04
A&E Serv Sector 20 Title 1 Complete	Apr-04	Apr-04
A&E Services MMF Title 1 Complete	Apr-04	Apr-04
A&E Services Sector 20 Title 2 Complete	Mar-05	Mar-05
CRIT: Rel RFP T3 Const. Pkg. RF Hut & S20/Alcove	Apr-05	Apr-05
CRIT: Release RFP T3 Construction Contract (MMF)	Apr-05	Apr-05
A&E Services MMF Title 2 Complete	May-05	May-05
CRIT: Release RFP Constrctrion Mgmt Pkg (CM)	Jul-05	Jul-05
Award of Sector 20 Title 3 Complete	Jul-05	Aug-05
Award of Magnetic Msmt Facility Title 3 Complete	Jul-05	Aug-05
Award of Construction Management Package - Ph.1	Oct-05	Sep-05
RF Hut Beneficial Occupancy	Mar-06	Dec-05
A&E Serv (S20, MMF, MCC not incl) Title 2 Comp	Feb-06	Jan-06
CRIT: Release RFP T3 Construct (RY-CLOC)	Mar-06	Jan-06
Magnetic Msmt Facility(MMF) Beneficial Occupancy	Mar-06	Apr-06
Sector 20 Alcove Beneficial Occupancy	Apr-06	Jun-06
CRIT: Release RFP T3 Construction Pkg (Linac)	Jul-06	Jul-06
Research Yards Mods Beneficial Occupancy	Aug-06	Sep-06
Linac Power/Water Available	Mar-07	Jun-07
Front End Enclosure Co-Occupancy	Dec-07	
Beam Transport Hall Co-Occupancy	Dec-07	
Undulator Facility Co-Occupancy	Dec-07	
Beam Dump Co-Occupancy	Dec-07	
Central Utility Plant Co-Occupancy	Dec-07	
Near Experimental Hall Co-Occupancy	Dec-07	
X-Ray Transport Co-Occupancy	Jan-08	
Undulator Facility Beneficial Occupancy	Mar-08	
Near Experimental Hall Beneficial Occupancy	Mar-08	
Front End Enclosure Beneficial Occupancy	Mar-08	
Beam Dump Beneficial Occupancy	Mar-08	
Central Utility Plant Beneficial Occupancy	Mar-08	
Beam Transport Hall Beneficial Occupancy	Mar-08	
Far Experimental Hall Co-Occupancy	Mar-08	
Far Experimental Hall Beneficial Occupancy	Jun-08	
X-Ray Transport Beneficial Occupancy	Jun-08	
Beam Path Project Close Out	Aug-08	
FEH Hutches Beneficial Occupancy	Jul-09	
CEH Office Beneficial Occupancy	Sep-09	
B028 Office Beneficial Occupancy	Sep-09	

Appendix B – DOE Office of Science & LCLS Project Organization

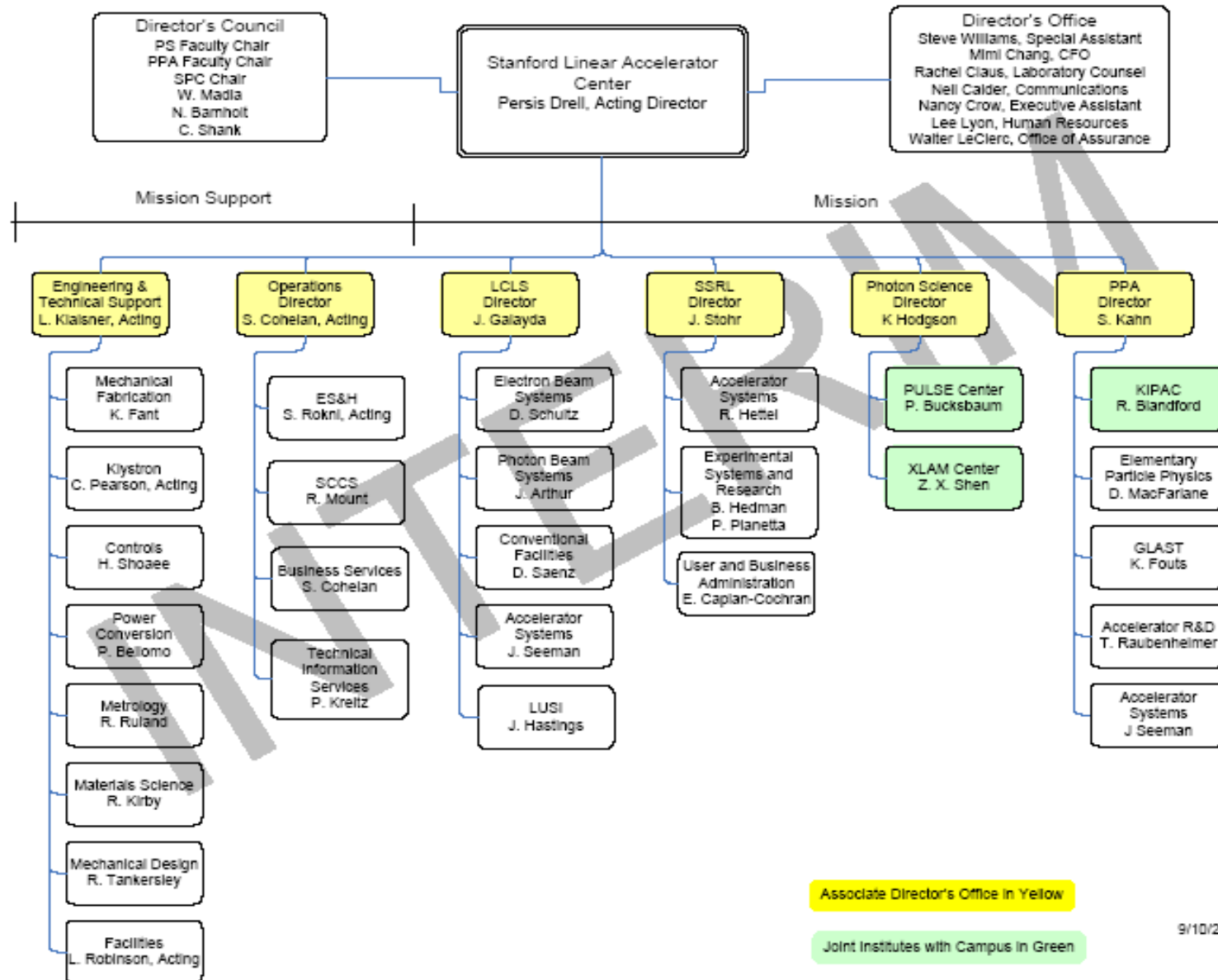


Appendix C – LCLS Partner Lab Organization and Advisory Function



- Project Direction and Reporting
- - - - - Communication and Coordination
- Project/Programmatic Advice and Recommendation

Appendix D – SLAC Organization



Appendix E – Technical Addendum to the LCLS MOU

TECHNICAL ADDENDUM <X>

to the

MEMORANDUM OF UNDERSTANDING

between the

STANFORD LINEAR ACCELERATOR CENTER

and the

LAWRENCE LIVERMORE NATIONAL LABORATORY

for the period

<insert period>

<insert date>

I. Introduction

This Technical Addendum C constitutes the Statement of Work to be performed by the Lawrence Livermore National Laboratory (LLNL) on behalf of the Linac Coherent Light Source (LCLS) Project. The Stanford Linear Accelerator Center (SLAC) is a signatory as part of its role in LCLS management oversight. This Statement of Work may be amended as required by the written agreement of both parties.

The work to be performed detailed in this document falls within the scope of the Memorandum of Understanding (MOU) between SLAC and LLNL dated August 10, 2002. The terms of agreement under which the work will be carried out are found within the MOU and continue to be in force.

The Appendix to this document contains (i) a detailed description of work, and (ii) total estimated cost for the current period organized by Work Breakdown Structure (WBS) for each area in which LLNL is involved. When manpower resources are required, every effort will be made to identify specific individuals assigned to the LCLS project.

Budgeted funds for the current period covered in this Technical Addendum include \$XXX.XK (R&D Effort) and \$XXX.XK (PED Effort) for a total of \$XXX.XK.

II. Approval

The undersigned concur with this Technical Addendum C to the SLAC / LLNL Memorandum of Understanding dated August 10, 2002.:

John Galayda / Date
SLAC LCLS Project Director

Richard Bionta / Date
LLNL LCLS Project Head

W. Goldstein/ Date
PAT Associate Director, LLNL

Jonathan Dorfan / Date
Director, SLAC

M. Anastasio / Date
Director, LLNL

III. Appendix

This Appendix consists of the detailed Statement of Work (SOW) and associate budget and milestones for the work agreed to between the Stanford Linear Accelerator Center and the Lawrence Livermore National Laboratory with regard to the Linac Coherent Light Source (LCLS) Project.

LCLS WBS, Estimated Cost and Deliverable

WBS	Task – Deliverable	Fund Type	Budget this Period (AYK\$)*	EDIA*	M&S**
TOTAL					

* EDIA (Engineering, Design, Inspection & Administration.

** M&S (Materials & Services). Includes project-related travel.

PED Effort to be Performed this Period

R&D Effort to be Performed this Period

List of Scientific, Engineering, Technical and Administrative Personnel

As a planning tool, an estimate of LLNL personnel necessary to accomplish the work scope for the performance period, are shown below.

Staff Type	FTEs	Cost (K\$)
Total		

The following LLNL personnel are identified as participating in the LCLS Program during this period of performance;

Name	Areas of Responsibility

* indicates that individuals will be assigned by the LCLS LLNL Project Director on an as needed basis.

Reporting and Procurement Authorization

The person responsible for the LCLS effort at LLNL is the LCLS X-Ray Transport, Optics and Diagnostics System Manager and LCLS LLNL Project Head, Dr. Richard Bionta. The LCLS group at LLNL agrees to furnish complete documentation for all deliverables supplied to the LCLS project as well as quality control, design and performance checks carried out in the performance of this work

The LCLS Group at LLNL will report monthly on or before the tenth working day of the following calendar month to the LCLS Project Office. All LCLS-related materials and services, travel and labor charges will be reported according to Work Breakdown Structure (WBS) category at the lowest WBS level. Major procurements (currently >\$100k) must, in addition, have the written authorization of the LCLS Project Director. During this period of performance the LCLS Group at LLNL agrees to supply the above deliverables at a cost not to exceed the estimated base cost given in the LCLS WBS.

A high-level monthly report will also be generated by the LCLS LLNL Project Director and provided to the LCLS Chief Engineer by the tenth working day of the subsequent month. This report will describe major highlights on technical progress, an overall assessment of the project’s status and should emphasize any problems or issues that require attention.

Schedule and Milestones

The LCLS group at LLNL will make every effort to carry out their institutional responsibilities consistent with the overall LCLS schedule. In this Statement of Work the project milestones for this period of performance relevant to the LCLS group at LLNL are shown in the table below:



Milestone ID	Milestone	Milestone Date