# Facility Advisory Committee (FAC) Closeout – General Comments

LCLS Facility Advisory Committee

12 November 2008

# You're making hard to be a curmudgeon

- The project has fully transitioned into integrating phase
- Great results in commissioning
- Installation going smoothly
- Looking towards first lasing
- Organization is stablizing and preparing well for operations
- ARR approach looks good
- Commissioning strategy looks good
  (but a fluorescent screen?)
- No obvious pitfalls, but ...

(See Electron, Conventional Facilities, Controls, and X-ray for other specifics on charge)

# But not too hard

- A project in integrating phase has **everything** on the critical path
  - X-ray diagnostics
  - Undulator magnetic measurements
  - Conventional Facilities
  - ...
- Elleaume FEL theorem: There's never been an FEL built [that started out] with too much gain.
- Robinson FEL theorem: There's never been an FEL built [that started out] with enough diagnostics.

# Curmudgeon (cont.)

- At the micron level almost nothing is a rigid body
- Conventional facilities work will end sometime after the project completes
  - Turner may be going, going, gone, but ...
  - Still a lot of conventional facilities work under SLAC direction
  - Plenty of conventional facilities scope in X-ray area
  - Moving of SLI (a conventional facilities project) into LCLS

# Expectation management now required

- Everything's been going well
  - There's optimism that the FEL will turn on rapidly
  - Things have been going together relatively smoothly
- But ...
  - You're planning to start an FEL with a fluorescent screen and a fusible x-ray beam stop as your main diagnostics(?!?)
  - Early science users will want everything at once

# Contingency
# It's not often we tell you to spend $

- Contingency levels are high to comfortable
- LCLS may be in the position to "buy back" scope lost in previous budget exercises
- Examine and weigh choices carefully
  - Have you established a complete list of candidate items?
    - Items that are very appealing might be separately funded from DOE
    - Items that are less appealing and may not be funded by DOE might be a better choices
  - *"Why didn't you get that under the project?"*


Kem Robinson
KERobinson@lbl.gov

# A Few Lessons Learned

(gleaned from previous FAC meetings)

Extraction of lessons learned and reminiscing have *almost* nothing in common. Suggest root cause analysis – (keep asking why, why, why)

- Projects are viscous and inertial
  - They don't start as quickly as you want
  - You can't stop them as quickly as you want
- Integration is more than what you learn in first-year calculus
- Dan Lehman is right
- Very few items have *positive buoyancy* (true float)

# A Few Lessons Learned (2)

- Project sociology can be a real risk
  - Understanding team dynamics is critical
  - The tying of egos to technical solutions
  - Institutions impact the project considerably
- While looking out for the alligators, you'll get bit by mosquitoes
- *Congress is there to help us right?*
  - Continuing resolutions have become a fact of life
- Different pots of money don't mean that things shouldn't be managed as one


Kem Robinson
KERobinson@lbl.gov

# Lessons Learned (3)

- Understand the role and function of advisory bodies
- It always takes longer to get contracts in place than it should
- A *success-oriented* schedule won't be
- If Kem is on your review committee he will ask for more milestones, a better risk registry, and management

# *"Everything has an end and a sausage has two"* – German proverb

- Continue to plan work aggressively for the end of the LCLS project
  - The details can still get you and it's all details at this point
  - The FAC must continue to evolve or be dissolved
  - Dan Lehman is right, but so is Yogi Berra:
    - *"It ain't over 'till it's over."*
  - The end, though in sight, is still a ways away

# Thank you …

- Once again, it is our privilege to observe a dynamic motivated team, project, and laboratory
- A special thanks to Helen, Daphne Darlene, Siony and others who made this FAC meeting run so smoothly

# Linac Coherent Light Source Facility Advisory Committee

# Conventional Facilities Subcommittee

H. Carter, T. Chargin, A. Kugler, K. Schuh

# CF Subcommittee Summary

- **General**
- **Design, Construction, Installation and Commissioning**
- **Safety**
- **Turner Contract Closeout**
- **Lessons Learned**

# General

- **Construction is 98% complete**
- **Turner closeout is well progressed**
- **Formalization of lessons learned has begun**
- **Past recommendations have been addressed satisfactorily**
- **Safety: SLAC and LCLS are jointly addressing critical issues**

# Design, Construction, Installation and Commissioning

- Remaining CF designs are in progress for hutches
- Post construction contract award contingency experience has been 7.2% including 2.5% for client-driven changes
- Office space plans are under discussion
- Tunnel settlement appears not to be an issue after initial installation and alignment

# Safety

- Recommendations from the June 2008 report have been satisfactorily addressed
- We commend the positive actions being taken by the Integrated Program Management team to improve trend analysis practices and encourage lab management to fully support this effort
- LCLS and SLAC ES&H have teamed together to identify critical issues associated with work planning and control
- The addition of Craig Ferguson as the Laboratory ES&H Division Director will benefit the LCLS Project as well as SLAC
- Problems identified by FAC with the LCLS safety program over the last two years are now being addressed labwide by the ES&H Division

# Turner Contract Closeout

- Turner work is expected to be completed by November 17
- A demobilization plan has not been provided by Turner
- CF and the laboratory facilities group have a signoff sheet for incremental custody transfers to the lab
- CF has developed a Turner closeout checklist

# Lessons Learned

- **Formalization of lessons learned has begun**
  - **A team of seven stewards will be addressing six major categories**
- **ES&H Division is planning a root cause analysis class to be held at SLAC. We encourage the stewards to attend. Gus will pay.**
- **Care needs to be taken to identify the actual causes of problems when performing the lessons learned process to avoid miss-learning.**

# Electron Systems & Undulator Subgroup Closeout Comments

John Corlett
Max Cornacchia
John Lewellen
Joachim Pflueger
Kem Robinson

LCLS FAC, November 12, 2008

# Injector & Linac Commissioning

- Excellent progress
- New cathode working
  - Not well understood
    - Recommend to build an Injector Test Facility
    - Rebuild surface physics capabilities
    - Cathode quick-change capability required for high availability operations
- Low charge operations
  - 250 pC “standard”
  - ~20 pC very encouraging
    - Install new BPM electronics to resolve position at low charge
- COTR
  - Laser heater installation progressing
    - Install IR-mm spectrometer
    - Install X-TCAV

# Moving to FEL Commissioning

- Preparations for ARR appear well planned
  - $B_4C$ stopper may need attention
  - Installation “just in time” for review in early December

- High-level applications
  - New/modifications for FEL commissioning
    - Very productive

# Undulator Commissioning

- Beam loss monitors
  - Good detailed plan using ANL and salvaged PEP-II detectors
  - Also developing PLIC using fiber optic
    - Responsive to previous Committee comments
- Undulators sensitive to temperature changes
  - ±0.1°C
  - Measure temperature of each undulator and correct K
  - HVAC to fail safe (*off*)
- Developed very detailed checkout list and procedures for commissioning
    - Keep ANL expertise “on hand” through beam commissioning

# Report of the X-ray subgroup

Tom Rabedeau, Thomas Tschentscher

# General

- Very good progress in all areas reported/discussed
  - instrumentation FEE
  - commissioning instrumentation FEE
  - now six scientific instruments (LCLS/LUSI/external)
  - DAQ
  - planning of installation/commissioning very detailed

# Findings

- Transition of organizational structure reflecting construction to operation seems reasonable
  - scientists to engineers requires balance
  - step 2010 →2012 aggressive
- Contingency utilization
  - priority for instrumentation setup space and instrumentation over office space
- New instrumentation
  - procedure appropriate

# Findings (II)

- X-ray diagnostics crucial for FEL commissioning
  - instrumentation ready by end Feb ’09
  - current schedule foresees SASE optimization mid-Jul ’09
  - revisit schedule for FEE readiness in order to enable x-rays in FEE asap after start of FEL commissioning
    - Goal should be: beam readiness review immediately after SAD
  - foresee use of diagnostics for FEL commissioning asap after taking beam
- Total schedule for FEE commissioning/ optimization/ delivery beam to NEH is extremely tight and ambitious
  - defer HOMS commissioning in favour of soft X-ray FEL commissioning and early science

# Findings (III)

- New location of AMO in hutch 1 (NEH)
  - note close proximity of SXR-to-AMO in hutch 1: valves
  - schedule to get to initial user operation is extremely aggressive
  - scientific request is extremely good
  - provide means to have sufficient off-time
- New SXR instrument in hutch 2 (NEH)
  - very reasonable start
  - integration with AMO looks good
  - very cost effective use of XTOD & AMO designs
  - timescale aggressive: 14 month
- XPP instrument in hutch 3 (NEH)
  - general strategy for early procurement authorization for detector mover and goniometer is appropriate
  - idea to place temporarily conventional, low-cost DCM until large offset monochromator is available seems justified

# Findings (IV)

- XCS in hutch 4 (FEH)
  - plan to move large offset mono close to FEH is appropriate provided that enough longitudinal space can be provided for CXI
  - concept of a low cost DCM is appropriate, too
    - notion that the same monochromator can be used at XPP, CXI and XCS might be imcompatible with desired commissioning and operation of the these instruments
- CXI in hutch 5 (FEH)
  - 2 strip design of mirror is appropriate
  - new proposed optical layout seems a good approach
    - use of direct beam possible at 0.1 µm focus position
    - reduces risk associated with early implementation short focal length setup
  - 45 deg geometry for KB mirrors
    - reward for asking suppliers to develop new geometry versus more complex detector arm seems not high
- MEE in hutch 6 (FEH)
  - still in early phase

# Findings (V)

- Diagnostics/Common optics design
  - seems a lot of detailed design is still ahead
- New timing concept to using phasing cavity
  - outside area of expertise → controls group ?
- DAQ concept has made a lot of progress and looks reasonable

# Response to ‘Charge to FAC/Photon beams’

- Review/assess
  - installation and commissioning strategy
    → make FEE x-ray instrumentation available asap
  - approach to achievement of early science with AMO
    → effective, but ambitious timescale
    → provide  sufficient support during early operation
- Review/assess
  - LUSI instruments, scope & schedule
    → schedule and scope are good; preparation seems on track;
  - Physics requirements
    → new designs for XCS and CXI are appropriate
  - Engineering design
    → detailed design has still hard work ahead
  - Plans to validate design (reviews, prototypes, etc.) not discussed
  - Plans for acquisition (vendor selection and oversight)
    → XPP case: appropriate

# Recommendations

- Commissioning
  - x-ray instrumentation for FEL commissioning might become more important than currently anticipated

  $\Rightarrow$ revisit planning and try to push readiness FEE forward
- Operation
  - there will be failures and you want to recover extremely fast in order to use the available time for experiments very efficient

  $\Rightarrow$ plan availability of personnel for early operation and full operation of instruments: scientists & support personnel
- Proposal review
  - avoid too high pressure and expectations during early operation

  $\Rightarrow$ make sure reviewers assess ‘feasibility during early operation’ and assign beam access accordingly

# Recommendations (II)

- Further infrastructure for instruments
  - Mezzanine in far hall seems the most sensible way to provide additional space (e.g. for optical laser)

  $\Rightarrow$ put into planning
  - basically there is no laboratory space for sample preparation in the near and far halls

  $\Rightarrow$ consider basic needs in space planning NEH and FEH
- Prioritization for contingency utilization
  - instruments have suffered most from the budget troubles over the last years; they are now late and come in stages

  $\Rightarrow$ reinject resources into them: rescoping instrumentation items or even advanced procurement

# Controls

Karen White, John Maclean

11/12/08

# Control Progress

- Great progress has been made since the last FAC
- Nearing end of electron controls installation
- Nearly all cabling complete
- Major procurements complete
- End (of the tunnel) is in sight

# MPS

- Overall architecture is good
- It has been demonstrated to work
- Use of config. from DB is a model to follow for future applications
- Schedule is very tight
- Next installation milestone 12/08/08
- ADC production hardware not yet here
- ADC firmware/FPGA not yet complete

# PPS

- Significant progress in the last year
- A well documented, rigorous configuration control process has been implemented
- A culture change has occurred within the team - great work

# Software

- Configuration control is getting more rigorous
- Test plans now routinely used for software installation
- Software installations now planned with stakeholder involvement
- Many good ideas still to implement
- Controls Program Deputy in MCC is a good thing

# LINAC Controls Upgrade

- Planning is well underway, should continue - more detail
- Phased scheme described is a sensible approach
- Minimum disruption to ops
- Roll back capability
- Main risk is availability of effort - need to decide priority and staff accordingly

# Feedback

- Planning started to meet Jan 09 120Hz Feedback capability - keep going, more detail
- A large task, will need dedicated resources
- Commercial solutions for fast data passing will help alleviate schedule pressure
- Doable, hurdles are not technical

# RDB

- Currently on SCCS network
- Essential for control system
- Plans exist to move it inside LCLS network
- Go for it!
- A dedicated controls DBA would be an advantage

# Future Upgrades

- Good to be thinking ahead
- Much work to do
- Replacement of legacy hardware should enhance operation of LCLS
- Prioritize, prioritize, prioritize

# HLAs

- Availability of Matlab apps has been critical for the success of machine commissioning
- Plans in place to convert these to Java apps
- Identify those apps that benefit most from the conversion, do those first, invest time to get them right, collaborate with ops & physicists (hand hold)

# Photon DAQ & Controls

- Appears to be well in hand
- Setting standards for supported experimental equipment controls a very good move
- On-line systems seem well thought out
- Transfer of experimental data a big problem
- Start planning off-line systems ASAP