

LERF/LCLS-II Cryomodule Commissioning Transition to Operations Review - Closeout

Review Committee:

- Matt Bickley – Jlab, Accel Ops
- Amber Boehnlein – Jlab, IT Division
- Jonathan Creel – Jlab, Cryogenics
- Harry Fanning – Jlab, Accel DSO
- Steven Hartman – SNS (remote)
- Bob May – Jlab, EHS&Q Division
- Will Oren – Jlab (Chair), Eng. Division
- Steve Suhring – Jlab, Accel Ops
- Paul Vasilauskis – Jlab, Accel Ops
- Karen White – SNS (remote)



Tuesday, November 06, 2018

Executive Summary-Slide 1

The Director of Accelerator Operations called a transition to operations review of the LCLS-II cryomodule commissioning in the LERF. The review was held Mon. Nov. 12 to Tue. Nov. 13 at Jefferson Lab. The committee members are listed on the first slide of this “report”, the charge is found on slides 30,31,32 and the agenda is on slide 33. The presentations, pre-brief material, agenda, charge and this report are available at <https://www.jlab.org/indico/event/295/>.

The committee has very serious concerns about remote write access to JLab hosted control computers and the interpretation of the LCLS-II BCR scope of work. The committee feels strongly that the presented write access controls are not adequate and recommend that the cryomodule commissioning (CM) take place with “local only” write access to the control system. The committee feels strongly that work beyond cryomodule commissioning places an unacceptable risk to the LCLS-II cryomodule commissioning schedule and CEBAF operations. These concerns and recommendations are collected on Slide 11, “LCLS-II BCR Scope of Work”.

The committee heard presentations from Cryogenics and Operations Controls that describe the present state of the JLab cryogenic and control systems. The remaining presentations were by the LCLS-II/LERF CM collaboration comprised of both JLab and SLAC staff. The review generated a vigorous discussion (committee<->proponents, and committee<->committee) . The committee thanks the proponents for the pre-brief materials, presentations and the constructive engagement throughout the review.

The committee followed the “findings, comments and recommendations” format that is used for DOE-NP reviews. The recommendations are tagged as C<n>-R<n>, where C<n> refers to the charge number and R<n> is the recommendation within that charge. The full findings/comments/recommendations can be found in the slides for each charge element. Additionally, the recommendations have been culled, in some cases expanded, and classified into three categories: documents, hardware and controls. These short form recommendation lists are found on slides 8,9,10.

Executive Summary-Slide 2

With the scope of work restricted to cryomodule commissioning, enforcement of local-only write access and completion of the recommendations in this report, LCLS-II/LERF cryomodule commissioning *may* have an acceptable risk to the CEBAF NP program.

In order to assess the risk, a risk assessment was performed on each individual recommendation. The methodology for this risk assessment is found on slides 5,6,7. The derived unmitigated risk codes are listed in the individual recommendations as well as on the table in the next slide. There is one risk code 4 assessment, assigned to C1-R2. Mitigated risk will be assessed when the recommendations are closed.

The LCLS-II cryomodule commissioning in the LERF is unique. The LERF Operations Directives (LOD), which serve as the Conduct of Operations for the LERF, is targeted for beam operations, not prolonged SRF commissioning activities. The authorization process for the LCLS-II activity is not clear. The LCLS-II BCR workscope has been approved by the Lab Director and the committee recommends that authorization to proceed with cooldown/RFon remain at the Directorate level.

C0-R0: The committee recommends that the authorization to proceed with cryomodule cooldown and RFon activities come from the Lab director. To facilitate this, the Director of Accelerator Operations or designee shall document completion of the relevant recommendations from this review and submit a request for authorization to the Lab director. The Lab director may of course request additional briefings/documentation at anytime.

Risk Levels

Recommendation	Unmitigated			Mitigated		
	Consequence Level	Probability Level	Risk	Consequence Level	Probability Level	Risk
C1-R1	M	M	3			
C1-R2	H	M	4			
C1-R3	L	M	2			
C1-R4	L	H	3			
C1-R5	M	M	3			
C2-R1	L	H	3			
C2-R1A	L	H	3			
C2-R1B	L	H	3			
C2-R2	M	M	3			
C3-R1	L	M	2			
C4-R1	L	M	2			
C5-R1	L	H	3			
C6-R1	L	M	2			
C6-R2	M	M	3			
C6-R3	L	L	1			
C6-R4	L	L	1			
C6-R5	M	L	2			
C6-R6	M	M	3			
C7-R1	L	M	2			
C7-R2	L	H	2			

Methodology

The review committee was asked to specifically answer all charge questions and present review results in the standard “findings”, “comments” and “recommendations” format. Major areas of focus included local/remote operations and effect on safe/effective CEBAF operations.

The Chairperson asked the committee to assign levels of risk for areas where *unmitigated or insufficiently mitigated* risks were identified. Three risk Consequence Level tables were defined:

- Network Impact
- CEBAF Operations
- General

These were combined with the standard Probability of Incident table used at Jlab for evaluating risk to produce a Risk Code Assignment matrix. Resultant risk codes can range from “0”=> negligible to “4”=> high.

Risk Methodology

Consequence Levels – Network Impact

Consequence Level	Severity
High (H)	Serious impact with site-wide implications that extend beyond the compromised enclave requiring Jefferson Lab to disconnect from the internet due to loss integrity or availability and/or due to a prolonged service outage exceeding 24 hours. Report incident to TJSO and JC3 and Office of Science.
Medium (M)	More than five machines within the compromised enclave and/or data exfiltration and/or loss of confidentiality, integrity or availability of the data, system or service causing, for example, CEBAF downtime or IT central system downtime. Report incident to TJSO and JC3
Low (L)	Minor impact within the enclave, with less than five machines compromised and no data exfiltration. Minor loss of confidentiality or availability of data or services. No loss of integrity.
Extremely Low (EL)	Insignificant compromise affecting only one end point within one enclave. No loss of confidentiality, integrity or availability of data or services.

Consequence Levels – CEBAF Operations

Consequence Level	Severity
High (H)	4 or more down days of CEBAF planned operations (whiteboard schedule)
Medium (M)	2-4 down days of CEBAF planned operations (whiteboard schedule)
Low (L)	1-2 down days of CEBAF planned operations (whiteboard schedule)
Extremely Low (EL)	No effect on CEBAF operations

Consequence Levels – General

Consequence Level	Severity	Property Loss
High (H)	Serious impact on-site. May cause death or loss of facility operation. Major impact on the environment.	> \$100,000
Medium (M)	Significant impact on-site. May cause severe injury, severe occupational illness to personnel, major damage to the facility operation, or impact on the environment.	> \$50,000
Low (L)	Minor impact on-site. May cause minor injury, minor occupational illness, or minor impact on the environment.	> \$500
Extremely Low (EL)	Insignificant injury, occupational illness, or impact on the environment.	< \$500

Risk Methodology

Probability of Incident

<u>Probability Level</u>	Description*
High (H)	An incident is likely to occur several times during LCLS-II CM testing operations.
Medium (M)	An incident is likely to occur during LCLS-II CM testing operations.
Low (L)	An incident is likely to occur during the life of the LERF LCLS-II CM facility or operation.
Extremely Low (EL)	Occurrence is unlikely or the incident is not expected to occur during the life of the facility or operation.

Table 3: Risk Code Assignment

<u>Consequence Level</u>	H	1	3	4	4
	M	1	2	3	4
	L	0	1	2	3
	EL	0	0	1	1
		EL	L	M	H
<u>Probability Level</u> (Estimated likelihood during LCLS-II CM testing operations)					

Path to Authorization for CM Commissioning-Documentation

The following list must be completed prior to the request for authorization to cooldown and RFon operations in the LERF for LCLS-II cryomodule commissioning.

Complete all documentation by Dec. 19th

1. With input from the Director of Accelerator Operations develop a comprehensive list of documents that must be completed and signed prior to the request for authorization:
 - a. **C2-1A**: Develop a list required for Cooldown authorization
 - b. **C2-1B**: Develop a list required for RFon authorization
2. **C4-R1/C6-R4**: OSP
 - a. **C1-R4**: Cryogenic Operator roles and responsibility, and list of qualified Cryo Operators
 - b. **C6-R2**: RF Operator roles and responsibility, and a list of qualified RF Operators.
 - c. **C6-R1**: Scheduling Process (short and long term)
 - d. **C6-R5**: Daily decision process
 - e. **C6-R2**: Identify appropriate JLAB/LCLS-II Planning and Approval authority
 - f. **C7-R1**: A configuration change management process, including identification of responsible staff
 - g. **C7-R2**: Identification of LCLS-II representative for ensuring adherence to JLab change control process by SLAC employees
3. **C3-R1**: Hazard Analysis (HA)
4. **C2-R2**: Roles and responsibilities high level view, integrated with JLab/LCLS-II roles (Lab Director, LCLS-II Senior Team Leader (STL), Director of Accelerator Operations, CEBAF Program deputy, ...)
5. Procedures
 - a. **C1-R1**: 40 K bump procedures
 - b. **C1-R5**: Document intended operation of heaters.
 - c. Finalize the 4.5 K cool down procedure
 - d. 2K pumpdown procedure
6. **C5-R1**: Develop the list of local personnel who need Channel Access write capability and transmit to the Director of Accelerator Operations for approval.

Path to Authorization for CM Commissioning-Hardware

The following list must be completed prior to the request for authorization to cooldown and RFon operations in the LERF for LCLS-II cryomodule commissioning.

1. Required for Cooldown
 - a. Develop a Cooldown/Cryo hardware Hot Check Out Checklist by Dec. 14th 2018
 - i. Checklist must include transmission of all PVs that can impact cryogenic operations (JT valves...)
 - ii. Checklist must verify that the LCLS-II PVs are accessible on the Cryogenic network.
 - b. Complete Cooldown/Cryo HCO prior to opening connections to LERF/CHL and request for authorization to initiate CM cooldown.
 - c. **C1-R3**: Evaluate with the Cryogenic group the failure modes and impact of the proposed hot-wire anemometer. Installation requires approval of Cryogenic group leader.
 - d. **C1-R2**: Reevaluate with the Cryogenic group the ultra clean 2K and dirty cooldown header connection. Implement required changes.
2. Required for RFon
 - a. Develop a RFon hardware Hot Check Out Checklist by Jan 7th 2019
 - b. Complete the RFon hardware Hot Check Out Checklist prior to the request for authorization to initiate RFon tasks.
 - c. Complete RADCON checklist (verify credited controls)
3. **C6-R6**: Perform the first 40K bump when risk to CEBAF program is near zero, i.e. prior to beam operations (Jan 23rd 2019). **C1-R1** must be completed well in advance of the actual bump.

Path to Authorization for CM Commissioning-Controls

The following actions must be completed on the path **to authorization** to start cool-down and cryomodule commissioning.

1. **C5-R1**: Lock down **all remote write access** to JLab LCLS-II hosts (OS, firmware, PLC code, EPICS code and PVs) on Nov. 26th. Identify and empower a local authority to receive code from SLAC/JLab and approve and oversee its installation on JLab host by a local individual.
 - a. Lock down to be verified by Cuffe, Bickley, Boehnlein (or designee)
 - b. Transfer responsibility for remote access from IT/CNI to Operations
2. Develop a high level software tracking system for each LCLS-II host at JLab (firmware, PLC, epics).
 - a. Date, version, checksum, modification summary, rollback version, names of individuals with write access, repository tag.
 - b. google doc/Office365 shareable spreadsheet seems appropriate.
3. Define the software requirements for cryomodule commissioning.
4. Develop a process for verifying/auditing that the JLab hosted code supports the cryomodule requirements and is consistent with the high level tracking “checksum” and version.
5. Complete an audit of **all** JLab hosts by Jan. 7 2019 that establishes that the LCLS-II host configuration is consistent with the high level tracking system in item 2 and supports the cryomodule commissioning requirements in item 3.

LCLS-II BCR Scope of Work

The current plan is to test cryomodules at each partner lab with no planned re-test. Each lab has one test facility which can accommodate one cryomodule's testing at a time. This BCR adds scope for an additional testing facility at JLAB to allow for more testing cycles and to address potential cryomodule delivery delays associated with unplanned test facility downtime, unplanned re-testing of reworked CMs, and supply chain delays associated with cavity deliveries.

The committee and LCLS-II STL interprets the BCR to cover acceptance testing and commissioning of cryomodules in the LERF. Cryomodule commissioning activities are defined in the presented OSP.

The planning, scheduling and execution of development and training activities are not within the scope of the BCR.

Recommendations:

1. **C0-R1:** Limit scope of work to cryomodule acceptance testing and commissioning.
2. **C0-R2:** Limit **all** work (including Channel Access-CA writes, firmware downloads) to local operation for the commissioning operations.
3. **C0-R3:** Develop a comprehensive development and training plan and schedule that includes appropriate controls for remote development and operations. Present these plans to LCLS-II project and Lab management.
 - a. After Directorate approval to proceed, there will be an Operations transition to operations review prior to execution.

Charge #1 (J. Creel-lead, S. Suhring)

Charge #1: Has the potential risk to CEBAF (including Cryogenics) operations due to LCLS-II cryomodule commissioning in the LERF been identified and minimized?

Yes/No

Are there additional mitigation measures that can reduce the risk?

Yes

Is the level of risk acceptable?

To be evaluated by Cryogenics and Accelerator Operations after mitigations

Findings:

- Many potential risks have been identified

Charge #1 (J. Creel-lead, S. Suhring)

Comments:

- Additional risks were identified during the review
- Some risks are mitigated by performing the initial installation and final removal u-tube operations and the initial 300K to 4.5K cooldown when the CEBAF machine is at 4.5K
- Other risks will be mitigated through a tightly controlled incremental procedural approach to testing. The initial investigations with RF power will occur in small incremental steps one cavity at a time until the impact on the CEBAF machine is understood before moving on to multiple cavity or full cryomodule operation
- The intention to perform 40K LCLS2 cryocycles while the CEBAF machine is at 2K remains a high risk to CEBAF operations. Cryomodule cryocycles have never been performed while the CEBAF machine was operating beam.
- The connection between the 2K return and the dirty line remains a high risk to CEBAF operations for accidental cross contamination.
- The operation and integration of the LCLS2 heaters must be well defined

Charge #1 (J. Creel-lead, S. Suhring)

Recommendations:

- **C1-R1:** Completion of the written procedures and first trial of the 40K cycle should be advanced and completed before beam restoration activities begin in January 2019. M+M = 3, Complete by 1/25/19
- **C1-R2:** Connection between the ultra clean 2K return and the ultra dirty cooldown header must be reevaluated and additional mitigations added to further reduce risks of cross contamination between the warm dirty gas header and the subatmospheric LINAC 2K return. H+M = 4, Complete by 1/3/19
- **C1-R3:** The proposed hot wire anemometer needs to be evaluated to ensure that if the wire breaks off and moves downstream that it does not pose an undue risk of lodging in a valve preventing normal operation or damaging the cold compressors. L+M = 2, Complete by 1/3/19
- **C1-R4:** Conduct of the cryogenic operator must be identified in writing including monitoring parameters, values, and trends that are to be avoided or would trigger a stop to testing for further evaluation. L+H = 3 Complete by 1/3/19
- **C1-R5:** Document the intended operation of the LCLS2 heaters and explain how they will be used to minimize LINAC return pressure fluctuations to values acceptable to support C100 operation with approval by Cryo, SRF, and Accel Ops. M+M = 3, Complete by 1/3/19

Charge #2 (P. Vasilauskis-lead, M. Bickley)

Charge #2: Is the Cryomodule Commissioning OSP complete and comprehensive? **Complete mostly, comprehensive yes.**

Are the roles and responsibilities well defined for both local and remote personnel, including operational and support staff? **Roles and responsibilities are well defined for local operations but not as well for remote operations.**

Findings:

- A draft version of the OSP was provided for review and presented to the panel. While the local process and responsibilities were covered, only the local aspect of remote operations was covered in detail.
- An intent to train up to 24 SLAC operators in RF operations and commissioning was revealed as well as the desire for remote commissioning capability. Neither is covered in the OSP.

Charge #2 (P. Vasilauskis-lead, M. Bickley)

Comments:

- A clear flow of authorization to start cryomodule commissioning in the LERF was not presented.
- The roles and responsibilities at SLAC are not clear, and it is not clear that SLAC personnel including LCLS-II project staff are engaged in planning for LERF LCLS-II activities.
- Scope beyond the Cryomodule Commissioning is not well defined nor is it clear what JLab's responsibilities are for this scope (and how/if JLab staff will be paid for this activity).
- Plans to allow remote testing and/or software development to be executed by SLAC personnel from virtually any location, and without being in communication with other SLAC personnel who may be operating remotely, is a concern. There is no indication of a "conduct of operations" for remote personnel. Ideally, all remote operations should be conducted in a control room environment.

Charge #2 (P. Vasilauskis-lead, M. Bickley)

Recommendations:

- **C2-R1:** A list of items needing completion before cooldown should be developed by LCLSII management so that appropriate resources, time, and expectations can be understood. L+H = 3, Complete by 1/3/19
- **C2-R1A:** Develop a list of required signed-off documents, Pressure System documents, approved OSP, lists of authorized operators, etc. to be completed prior to cooldown. L+H = 3, Complete by 1/3/19
- **C2-R1B:** Develop a list of required signed-off documents, Pressure System documents, approved OSP, lists of authorized operators, etc. to be completed prior to RFon operations. L+H = 3, Complete by 1/3/19
- **C2-R2:** An overarching document describing LCLSII/JLab coordination should be developed. This should include a discussion on conduct of operations for LCLS-II testing at JLab. M+M = 3 , Complete by 1/20/19

Charge #3 (B. May-lead, H. Fanning)

Charge #3: Is the “Safety Assessment” document complete and comprehensive? **Not yet**,
Is the hardware and software ready for safe and effective operation? **Not yet**

Findings:

- The Preliminary Hazard Analysis Report (PHAR) is complete and comprehensive.
- The Hazard Analysis and Mitigation for Operations (HA) does not include or address all the Hazard Events in the PHAR that have a an Un-Mitigated Risk Level of High or Medium. The OSP should reflect this as well.

Comments:

- The Hazard Analysis should address the Hazard Events (at least High and Medium Hazard Events) in the PHAR. All the documents should line up.

Recommendations:

- **C3-R1**: To attain a RC<3, update the HA and ensure the OSP and the HA are consistent. When the documents align, the HA should undergo the same level of management review and have the same level of management sign off as the PHAR. L+M = 2, Complete by 1/3/19

Charge #4 (H. Fanning-lead, B. May)

Charge #4: Are the Cryomodule Commissioning OSP and Safety Assessment documents consistent with Accelerator and LERF Operations Directives (AOD and LOD) and the Lab Accelerator Safety Envelope(ASE), Final Safety Assessment Document (FSAD) and ESH&Q manual? **Yes**

Findings:

- OSP and Safety Assessment was provided in Draft form. Project hazard profile is consistent with FSAD. Project made a decision to use the safety controls in the ASE to address ionizing radiation and ODH.

Comments:

- Various comments have been submitted to improve the OSP and need to be incorporated.
- Other procedural documents also need to be finalized.

Recommendations:

- **C4-R1**: The Cryomodule Commissioning OSP and Safety Assessment is in Draft form. They need to be finalized and approved before testing commences. Impacts to JLab capabilities need to be considered in the Risk analysis, not just project risks. L+M = 2, Complete by 1/3/19

Charge #5 (A. Boehnlein-lead, M. Bickley, S. Hartman, K. White)

Charge #5: Are the remote access rules of engagement well defined, appropriate and comprehensive? Are the remote roles and responsibilities defined, appropriate, and understood by local and remote staff?

No to both

Findings:

- Channel access (by name/host) is to be used for restricting write access to EPICS process variables.
- Remote access is treated similar to experimental halls, and uses the standard user process, with an additional vetting set by IT personnel. The remote access process uses the Central IT infrastructure.

Charge #5 (A. Boehnlein-lead, M. Bickley, S. Hartman, K. White)

Comments:

- While there are plans to restrict channel access, there are only administrative controls with respect to updating code or firmware that controls all of the cryomodule and the LLRF. This is a significant risk to the project.
- Remote access does not require an accelerator user account. It is not clear what processes will be used to deactivate users. The IT division is not the appropriate authority vetting access to the LCLS-II project.
- It is not clear that the remote roles and responsibilities are understood or well defined--multiple explanations were given for what the remote access would be, ranging from read-only monitoring, on-call support for local operations, to software/firmware development, to training SLAC operators.
- The OSP describes the responsibilities of various operators with respect to remote access, however, the remote access provisions described do not provide the tools to allow the operators to perform these duties.
- **Withdrawn recommendation, Outside scope of BCR - C5-R2:** Implement a mechanism to prevent remote logins to the LERF controls network without first notifying the designated operator. This may require permission for read channel access as well as for write channel access. All engineered controls to restrict access by remote users must be in place and tested prior to LCLS-II cryomodule commissioning, including channel access. The local LERF operator should have the ability to see who has access to the LCLS-II controls network. The operator must be able to easily disable specific remote logins in the event of problems.

Charge #5 (A. Boehnlein-lead, M. Bickley, S. Hartman, K. White)

Recommendations:

- **C5-R1:** The Director of Accelerator Operations must have final approval of all staff on the LERF/LCLS-II remote access list and channel access list. L+H =3, Complete by **12/1/18**

Charge #6 (S. Suhring-lead, J. Creel, K. White)

Charge #6: Is the Cryomodule Commissioning scope of work well defined? Is the plan and scheduling process compatible with the CEBAF and cryogenic operations and scheduling process?

Yes. The Cryomodule Commissioning scope as defined in the BCR is well defined and mirrors much of what has been learned during the original 4GeV commissioning and subsequent cryomodule testing through the 12GeV era.

However, there seems to be additional work beyond the BCR which could interfere with the known scope of work. Operator training, procedure development, etc.

Is the plan and scheduling process compatible with the CEBAF and cryogenic operations and scheduling process?

Yes. As presented, most major commissioning steps take place during CEBAF SAD periods. These SAD times are the basis for the LCLSII commissioning schedule. LCLSII, the Cryo Group, and Accelerator Operations have met a number of times over the last 3 months to work out a high level plan for the commissioning effort.

The committee understands that this collaborative approach to both long and short range planning has worked in the past and should continue to work going forward.

Charge #6 (S. Suhring-lead, J. Creel, K. White)

Findings:

- A scheduling process was not presented.
- The presented cryomodule commissioning outline includes activities, anticipated staffing requirements, and time estimates.
- The outline is based on CEBAF SAD dates.
- A list of known competent staff for both RF and Cryogenics operators was presented
- The OSP, LCLS II Cryomodule Testing in the Low Energy Recirculator Facility, is well developed, but not ready for final approval.
- LCLSII testing is planned for weekdays, 7am to Midnight

Charge #6 (S. Suhring-lead, J. Creel, K. White)

Comments:

- The presented 6 month schedule captured the LCLS-II project scope for commissioning the first two cryomodules. Scope beyond LCLS-II project (OPS scope) and the schedule for the additional LCLS-II modules was not presented.
- The use of ATLis as a control document should be reviewed for administrative appropriateness. The proper responsible individual(s) should be carefully determined so that approvals are understood, well-reasoned and informed.
- An LCLS II commissioning “ATLis group” should be provided to segregate LCLS II test plans from general LERF work.
- SLAC on-call lists should be made available prior to the start of commissioning.

Charge #6 (S. Suhring-lead, J. Creel, K. White)

Recommendations:

- **C6-R1:** Develop a scheduling process, long and short term, for LERF/LCLS-II tasks that includes the cryogenic and operational considerations. L+M = 2, complete by 1/3/19
- **C6-R2:** Identify appropriate LCLSII planning and approval authority. M+M = 3, Complete by **12/1/18**
- **C6-R3:** Clarify CM commissioning responsibilities (JLab and LCLS-II). L+L = 1, Complete by 1/3/19
- **C6-R4:** Complete the OSP before requesting cooldown and testing in the LERF. L+L = 1, Complete by 1/3/19
- **C6-R5:** Write down the process for how daily decisions are going to be made, approved and communicated. M+L = 2, Complete by 1/3/19
- **C6-R6:** Conduct a 40K temperature bump test in January as proof of concept to determine baseline impact to CEBAF Operations. M+M = 3, Complete by 1/25/19

Charge #7 (M. Bickley-lead, S. Hartman)

Charge #7: How are configuration and process changes tracked and managed? **Tracked with ATLis. Unclear how these are managed.**

Is the mechanism for planning, reviewing, authorizing, and scheduling tasks, new or old, appropriate and understood by local and remote staff. **For commissioning, yes. For work outside the scope of the BCR, no.**

Is there a change management process? **No.**

Findings:

Charge #7 (M. Bickley-lead, S. Hartman)

Comments:

- When remote staff are on site they should be introduced to JLab's change management procedures and expectations, in preparation for their implementation of changes from off-site.
- A change management process was not presented. Source code management, which was discussed, is only part of a complete system for managing changes.
- Clear guidelines for quality of task documentation (clarity of description, execution details, delegation of execution, backout, communication of results) will improve the development and testing process.
- The understanding of tools and procedures by remote staff was not discussed.
- **Withdrawn recommendation, Outside scope of BCR C7-R3:** Processes must be developed and approved to meet JLab standards sufficient to ensure the risk to CEBAF operations is comparable to typical development and support tasks.

Charge #7 (M. Bickley-lead, S. Hartman)

Recommendations:

- **C7-R1:** Designate the staff responsible for managing configuration and process changes. Approval of hardware and software changes must be delegated to an appropriate authority. L+M=2; complete by 1/3/19.
- **C7-R2:** Designate a representative at LCLS-II to be responsible for ensuring adherence to change control processes for SLAC employees. L+H=3; complete by 1/3/19.

Review Charter

LERF/LCLS-II Cryomodule Commissioning Transition to Operations Review

November 7, 2018

2018-11-12

0.1 Reviewers

- **Chair:** Will Oren (Eng. Div)
- Karen White (SNS, Controls)
- Steven Hartman (SNS, Instrument Controls)
- Amber Boehnlein (JLAB: IT)
- Harry Fanning (JLAB: Acc. Div. Safety Officer)
- Bob May (JLAB: EHS&Q)
- Paul Vasilauskis (JLAB: Operations)
- Steve Suhring (JLAB: Operability)
- Matt Bickley (JLAB: Deputy/Software/Controls)
- Jonathan Creel (JLAB: Cryogenics)

0.2 Preamble

The use of the LERF vault to commission LCLS-II Cryomodules is a significant change to the nominal LERF operations as described by the LERF Operations Directives(LOD). The cryomodule commissioning operation will involve JLab staff (SRF-OPS, Accelerator-Operations, Eng) as well as Industrial Users from SLAC. The proponents are also proposing to have a mix

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of local, remote and local-remote operations that will require strong coordination between the local and remote participants.

These changes and their potential impact on JLab staff and CEBAF/LERF operations drive the need for a thorough review of the LCLS-II cryomodule commissioning plans, roles and responsibility, safety and system readiness prior to the transition to operation.

Safe and effective operations of the CEBAF Accelerators is the responsibility of the Director of Accelerator Operations and as such will conduct a review of plans for Commissioning the LCLS-II Cryomodules in the LERF. This review will establish that the plans, processes and systems are ready for safe and effective operations. The charge for this review follows.

0.3 Charge

The charge for this review is to evaluate plans, organizations, roles and responsibilities, systems (hardware and software) involved in commissioning the LCLS-II cryomodules in the LERF vault. The reviewers are encouraged examine in detail the novel aspects of this plan and their potential to impact other on-going efforts at the laboratory.

Specifically, the review panel is requested to assess:

- Charge 1
Has the potential risk to CEBAF (including Cryogenics) operations due to LCLS-II cryomodule commissioning in the LERF been identified and minimized? Are there additional mitigation measures that can reduce this risk? Is the level of risk acceptable?
- Charge 2
Is the Cryomodule Commissioning OSP complete and comprehensive? Are the roles and responsibilities well defined for both local and remote personnel, including operational and support staff?
- Charge 3
Is the "Safety Assessment" document complete and comprehensive? Is the hardware and software ready for safe and effective operation?
- Charge 4
Are the Cryomodule Commissioning OSP and Safety Assessment documents consistent with Accelerator and LERF Operations Directives (AOD and LOD) and the Lab Accelerator Safety Envelope (ASE), Final Safety Assessment Document (FSAD) and ESH&Q manual?

Review Charter (continued)

- Charge 5
Are the remote access rules of engagement well defined, appropriate and comprehensive? Are the remote roles and responsibilities defined, appropriate, and understood by local and remote staff.
- Charge 6
Is the Cryomodule Commissioning scope of work well defined? Is the plan and scheduling process compatible with the CEBAF and cryogenic operations and scheduling process.
- Charge 7
How are configuration and process changes tracked and managed? Is the mechanism for planning, reviewing, authorizing and scheduling tasks, new or old, appropriate and understood by local and remote staff? Is there a change management process?

Agenda-Day 1

Monday, 12 November 2018

- 08:30 - 09:00 **Executive Session**
Convener: Arne Freyberger (JLAB-Accelerator Division-Operations Department)
Location: room 1201
- 09:00 - 09:15 **CEBAF-LERF Cryogenics**
- 09:15 - 09:30 **CEBAF Remote Operations**
- 09:30 - 10:30 **LERF Cryomodule Test Facility Overview**
Convener: Kevin Jordan (JLab)
- 10:30 - 11:30 **Cryo Process and Controls**
Conveners: Edward Daly (JLab), Matt Marchlik (JLab)
- 11:30 - 11:45 **Break ()**
- 11:45 - 12:15 **Remote Commissioning/Operations/Controls**
Convener: Wesley Moore (JLAB)
- 12:15 - 12:30 **Morning Q&A with LERF Team**
- 12:30 - 13:30 **Lunch ()**
- 13:30 - 14:15 **LERF Cryomodule Testing OSP**
Convener: Mr. Michael Drury (Jefferson :Lab)
- 14:15 - 14:45 **Typical Cryomodule Test Schedule**
Convener: Mr. Michael Drury (Jefferson :Lab)
- 14:45 - 15:45 **Break/Executive Session**
Review Committee
- 15:45 - 16:15 **LCLS-II Operations: (remote)**
Convener: Alex Ratti (SLAC)
- 16:15 - 16:45 **Change Management**
Review Committee
Convener: Curt Hovater (JLAB)
- 16:45 - 17:30 **Executive Session/Report Writing: Review Committee**
Review Committee
- 17:30 - 17:31 **Adjourn**

Agenda-Day 2

Tuesday, 13 November 2018

- 08:30 - 11:00 **Executive Session: Review Committee**
Review Committee
Convener: Arne Freyberger (JLAB-Accelerator Division-Operations Department)
Location: bldg 52, ESH&Q (room 9)
- 11:00 - 11:30 **Close Out with LERF Team**
Location: bldg 52, ESH&Q (room 9)
- 11:30 - 11:31 **Adjourn**
Location: bldg 52, ESH&Q (room 9)

