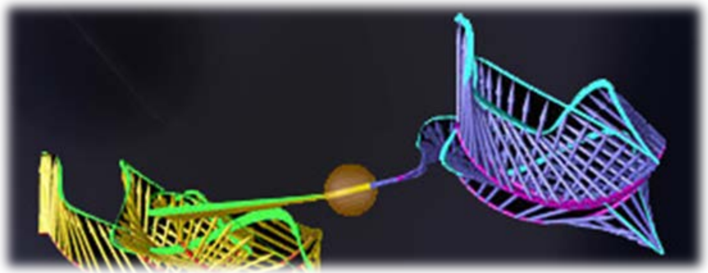

Response to Technical Questions

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for the LQCD-ext II Project

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Q1) FY17 Performance Summary – Milestones

Comparison of Actuals to Plan

Milestone #	Description	Actual Results	% of Plan	Planned Cost ($K)	Actual Cost ($K)	Planned Completion	Actual Completion
4	Additional computing resources deployed by the project, expressed as an average of the HISQ and DWF algorithm performances in TFlops. – *Combined Resources* BNL-IC (40 nodes): 36 TF 16p expansion: 9 TF Total ≥ 45 TF	52.4 TF BNL-IC: 36 TF 16p, 4th rack: 16.4 TF	116%	1.138	355(1)	08/30/17	11/15/16
5	222 TF-yrs aggregate computing delivered	239 TF-yrs(3)	107%	1,840	1,792(2)	09/30/17	09/30/17

(1) Actual cost incurred for the 16p expansion at JLab. The additional planned procurement at BNL was put on hold due to uncertainty in the FY18 budget.

(2) Includes salary costs for operations, storage hardware, and other misc. operating expenses (travel, spares, repairs, tape, etc.)

Q1) FY17 Performance Summary – KPIs

Performance against Key Performance Indicators (KPIs)

KPI #	Measurement Indicators	Target	Actual Results
19	% of tickets closed within two business days	≥95%	92.3% BNL: 91% FNAL: 95% JLab: 91%
20	Frequency of vulnerability scans performed at each site on nodes visible from the Internet	Scans performed at least weekly at each host institution	Daily scans performed at all sites.
21	% of average machine uptime across all LQCD computing sites	≥95%	99.1% Conventional: 98.9% Accelerated: 99.2%
22	Customer Satisfaction Rating	≥92%	88%

Q1) FY18 Performance Summary – KPIs
(Through May 21, 2018)

Performance against Key Performance Indicators (KPIs)

KPI #	Measurement Indicators	Target	Actual Results
27	% of tickets closed within two business days	≥95%	98% BNL: 96% FNAL: 98% JLab: 100%
28	Frequency of vulnerability scans performed at each site on nodes visible from the Internet	Scans performed at least weekly at each host institution	Daily scans performed at all sites.
29	% of average machine uptime across all LQCD computing sites	≥95%	99.7% Conventional: 99.6% Accelerated: 99.7%
30	Customer Satisfaction Rating	≥92%	TBD

- JLab data through January 2018

Q2) What are the pros and cons of the Institutional Cluster Model

PROS

1. Can occasionally run larger jobs than hardware node-count allocation.
2. More flexibility to accommodate times when burn-rate is above or below steady-state.
3. Flexibility to change allocation levels amongst architecture types.
4. Larger staff to support operations -> less dependent on a single, vital staff member.
5. Increased direct access to specialists in networking, storage, hardware management, etc.
6. Potential economies of scale (LQCD project avoided significant procurement overhead through the execution of an option on the existing RHIC-ATLAS contract)
7. Potential to reduce funding agency cash flow constraints by not requiring a large upfront system procurement expense. In current model, hardware costs are amortized over a 5-year period.
8. Reduced procurement workload on project team. Activities such as RFP preparation, review and evaluation of vendor proposals, delivery and implementation coordination, acceptance testing, etc. will be handled by site staff.
9. Larger user base amortizes enterprise level software. Example: BNL IC Globus allows transfers directly to/from tape.

Q2) What are the pros and cons of the Institutional Cluster Model

<u>CONS</u>

1. May result in running on hardware that is sub-optimal for USQCD, if lab and project strategic directions are not aligned.
2. May need to compromise on hardware design in order to take advantage of economies of scale.
3. Less personalized user support, especially if support levels are defined under Service Level Agreements (SLAs).
4. Reduced user support to help troubleshoot code problems.
5. Less flexibility in ability to adopt new hardware architectures.
6. Timing of new architecture acquisitions or existing system expansions may not be ideally synchronized with USQCD needs.
7. Potential for less synergy between system architects, software developers, and lab theory groups.
8. Changes in lab leadership or priorities can have a significant impact (positive or negative) on level of support and desire to meet USQCD needs.

Q2) What are the pros and cons of the Institutional Cluster Model

OBSERVATIONS

1. The success of an Institutional Cluster model, or any relationship, depends strongly on the individuals involved.
2. If a cluster can automatically push jobs to a cloud, would be fine for single node QCD jobs if cloud is cost competitive and data transfer costs are small. Not suitable for multi-node jobs since most cloud solutions do not have strong interconnects.
3. BNL has a liaison for each stakeholder group on its clusters to represent that group's users. USQCD is one of many stakeholders running on the BNL ICs.
4. Currently, the BNL liaison manages details of allocations of CPU and disk time to each USQCD project. At FNAL and JLab, this work is done by site personnel who are closely connected to USQCD and the LQCD project. Depending on the relationship between the project and each lab, USQCD may need to provide resources to perform this function.
5. HEP and/or USQCD will need to decide whether an LQCD Project point of contact will be required to manage the relationship with the labs, negotiate for resources, establish and track MOUs, manage DOE funding distributions, etc., or whether this function will be performed by a point of contact from USQCD.

Q4) Response to FY17 Review Suggestions

Suggestion #1: The project should consider shifting focus from specialized LQCD purchases to institutional based purchases, given the success of the BNL Institutional Cluster (IC) and budget pressures on the national NP and HEP programs. USQCD and the project should develop a plan to merge the LQCD purchase process, including requirements gathering, benchmarking, and acceptance, into the lab IC purchase process.

Response: We agree with this suggestion and have established agreements with BNL to purchase computing cycles from BNL ICs as opposed to initiating a standalone hardware procurement.

In the fall of 2017, we revised the FY17 Alternatives Analysis document to include an expanded use of the BNL IC. Through the Acquisition Evaluation Committee, we established benchmarks to evaluate the performance of BNL IC options (BNL-IC, BNL-KNL, and Skylake) to help determine the appropriate mix of BNL hardware to meet USQCD needs. These benchmarks and the recommendation of the evaluation committee is documented in the FY17 Acquisition Review Committee Report, dated 11/15/2017, which is posted on the 2018 DOE Review Website.

We also modified the existing MOU and established new MOUs with BNL documenting roles, responsibilities, allocations, etc. for the BNL-IC, BNL-KNL, and BNL-SL clusters. In FY18, we will begin discussions with Fermilab for the establishment of an institutional cluster at Fermilab that will meet USQCD computing needs.