Report from the Project Manager

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Brookhaven National Laboratory
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Outline

- Completion of the initial computing project (FY06-09)
- Starting up the extension project (FY10-14)
- Starting up the ARRA project
- FY10-11 hardware procurement plans
- FY09 user survey results

LQCD Computing Project Summary (FY06-09)

- The LQCD Computing Project officially concluded on September 30, 2009.

- Successfully deployed and operated computing facilities at BNL,FNAL and JLab over the period FY06-FY09 (*Oct 1, 2005 through Sep 30, 2009*)
  - FY06-09: QCDOC at BNL
  - FY06: Kaon cluster at FNAL; 6n cluster at JLab
  - FY07: 7n cluster at JLab
  - FY08/09: J-psi cluster at FNAL

- Average uptime across the metafacility over the 4-year project: 96%

- Final Project Cost
  - Project Budget: $9.2M
    - *$5.87M for equipment*
    - *$3.33M for personnel, materials & supplies (e.g. storage hardware)*

  - Final Cost: $8.9 M (*97% of budget*)
    - *$5.75M for equipment*
    - *$3.35 for personnel, materials & supplies (e.g. storage hardware)*

  - Surplus of ~$300K has been carried forward to the Extension Project (LQCD-ext)
   - Mix of operating and equipment funds

Summary of Tflop/s Deployed

Year	Tflop/s Deployed	
	Baseline	Actual
FY2006	2.0	2.6
	1.8 Tflop/s at FNAL	*2.3 (FNAL Kaon)*
	0.2 Tflop/s at JLab	*0.3 (JLab 6N)*
FY2007	2.9	2.98 (*JLab 7N*)
FY2008	4.1	5.75 (*FNAL J-Psi*)
FY2009	2.5	2.65 (*FNAL J-Psi*)
Total	9.0	14.0

Summary of Tflop/s-yrs Delivered

	Goal	Actual	% of Goal
FY2006	6.2	6.26	101.0%
FY2007	9.0	9.67	107.5%
FY2008	12.0	12.07	100.3%
FY2009	15.0	17.95	119.7%

FY09 USQCD Delivered TFlops-yrs
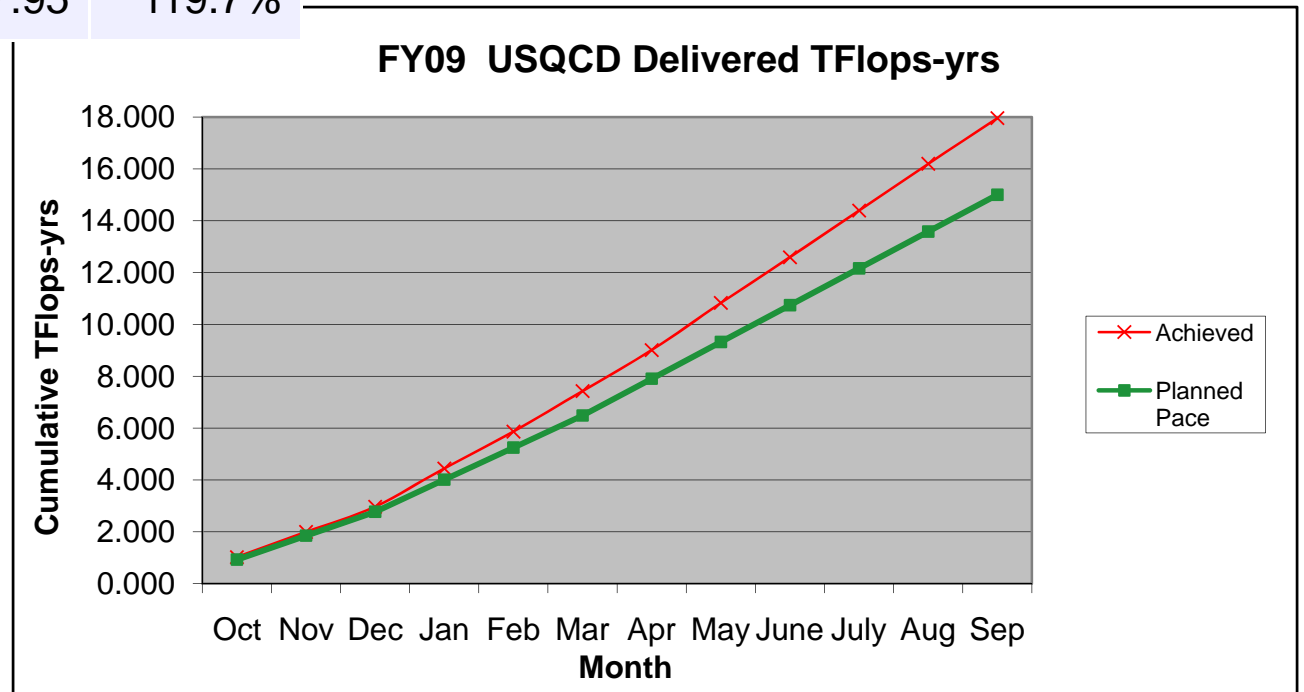
LQCD-ext Project – *Approved Oct 2009*

- LQCD-ext was approved following the Critical Decision (CD) process outlined in DOE Order 413.3A

  - ☐ CD-0: *Approve mission need*
    - Proposal was peer reviewed and the need for an extension of the LQCD project was discussed at the February 2008 High Energy Physics Advisory Panel (HEPAP) meeting.
    - Approval granted April 13, 2009

  - ☐ CD-1: *Approve alternative selection and cost range*
    - Review held April 20 at DOE/Germantown
    - Approval granted August 26, 2009

  - ☐ CD-2: *Approve performance baseline*
  - ☐ CD-3: *Approve start of construction*
    - These two reviews were conducted jointly
    - Review held August 13-14 at DOE/Germantown
    - Approval granted October 29, 2009

  - ☐ CD-4: *Approve start of operations or project completion*
    - Scheduled to occur at the completion of the project.

LQCD-Ext Project Scope & Budget

- Acquire and operate dedicated hardware at BNL, JLab, and FNAL for the study of quantum chromodynamics during the period FY2010 through FY2014.

- Computing hardware will be sited at each host laboratory and locally managed following host laboratory policies and procedures (security, ES&H, etc.)

- Approved Budget = $18.15 million
  - Funding provided by DOE Offices of High Energy and Nuclear Physics
  - Obligation budget profile:

Expenditure Type	FY10	FY11	FY12	FY13	FY14	Total
Personnel	1,139	1,306	1,456	1,340	1,644	6,885
Travel	13	11	12	12	12	60
M&S	104	84	84	84	84	440
Equipment	1,684	1,779	1,974	2,589	2,379	10,405
Management Reserve	60	69	75	75	81	360
Total	3,000	3,250	3,600	4,100	4,200	18,150

Performance Goals & Execution Strategy

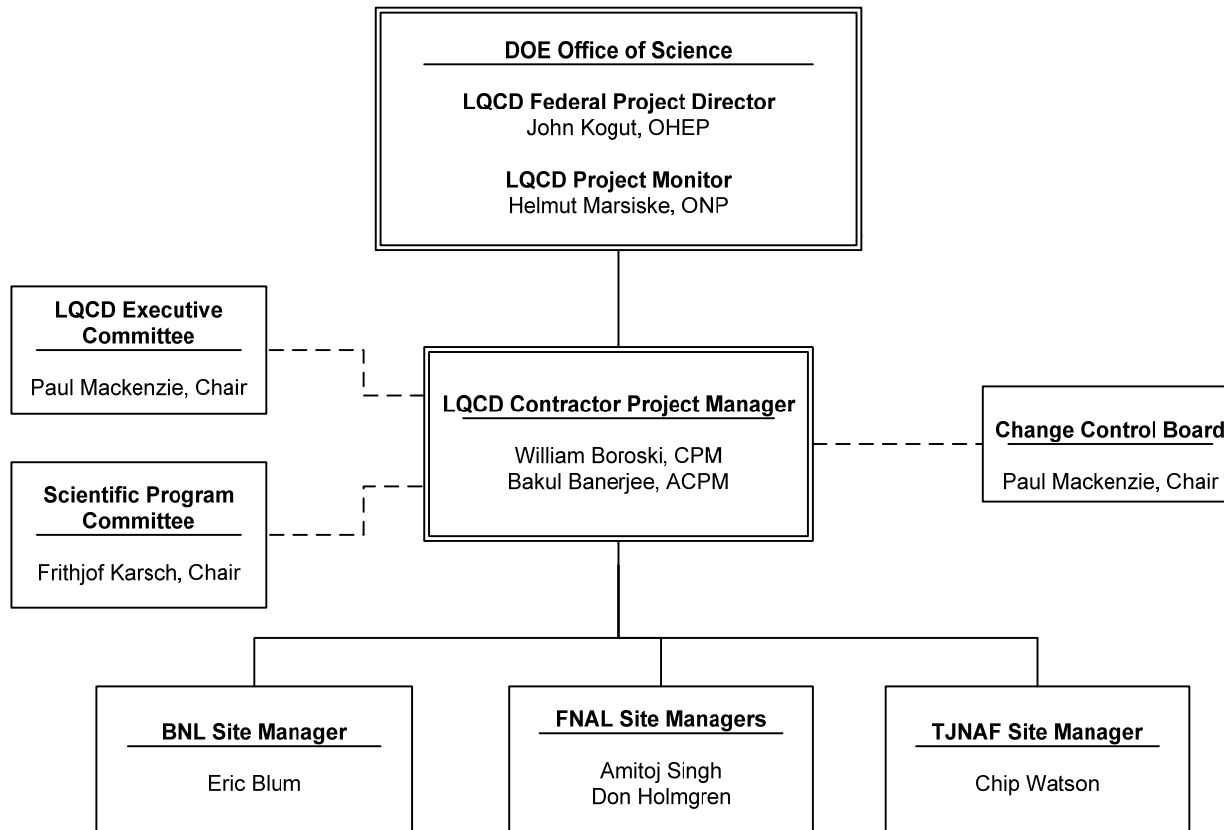- Performance Goals (defined in PEP and OMB e300 Business Case)

	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014
Planned computing capacity of new deployments, **Tflop/s**	11	12	24	44	57
Planned delivered performance (JLab + FNAL + QCDOC), **Tflop/s-yr**	18	22	34	52	90

- Acquisition and Operations Strategy
  - The QCDOC at BNL will be operated through the end of FY10.
  - Existing clusters at FNAL and JLab will be operated through end of life
    - *Typically 4 years –determined by cost-effectiveness*.
  - New systems will be acquired in each year of the project and will be operated from purchase through end of life, or through the end of the project, whichever comes first.
  - New computing systems will be sited at FNAL, JLab, and BNL. Based on price/performance, the systems may include highly integrated hardware such as the anticipated BlueGene/Q.

LQCD-ext Management Organization

DOE Office of Science

LQCD Federal Project Director
John Kogut, OHEP

LQCD Project Monitor
Helmut Marsiske, ONP

LQCD Executive Committee

Paul Mackenzie, Chair

Scientific Program Committee

Frithjof Karsch, Chair

LQCD Contractor Project Manager

William Boroski, CPM
Bakul Banerjee, ACPM

Change Control Board

Paul Mackenzie, Chair

BNL Site Manager

Eric Blum

FNAL Site Managers

Amitoj Singh
Don Holmgren

TJNAF Site Manager

Chip Watson

Structure unchanged from the original computing project…

LQCD-ARRA Project

- In early 2009, funding was approved for the LQCD American Recovery and Reinvestment Act (ARRA) Computing Project
  - Total project cost is $4.97M, funded by the American Recovery and Reinvestment Act (ARRA) of 2009.
  - Budget covers the period FY09 through FY13 and provides for hardware purchases and four years of operations (~$3.5M for hardware and 1.47M for operations support).

- The major performance goal of the LQCD-ARRA project is to deploy resources capable of an aggregate of at least 60 Tflop/s of performance sustained in key LQCD kernels.

- Although we interact regularly, the LQCD-ARRA project is managed independently of the LQCD-ext project.
  - Chip Watson is the Contractor Project Manager for the LQCD-ARRA project.
  - All hardware procured with LQCD-ARRA funds will be located at JLab

- LQCD-ARRA resources will be allocated by the USQCD Scientific Program Committee following the existing allocation process.

LQCD-ARRA Hardware Plans

- Hardware deployment plan calls for a phased deployment, with the first phase funds committed by the end of FY2009 and the second phase committed in FY2010.
  - The first phase of hardware procurement and deployment is complete
  - Planning/procurement for phase two deployment is underway.

- Phase 1 hardware was deployed to production in January 2010
  - 320-node Infiniband Cluster (6 Tflops)
  - 130-node GPU Cluster (~30 Tflops)
  - File servers, 14 nodes, ~24 TB/each, Lustre file system (~300 TB)

- Phase 2 hardware deployment timeline
  - Hardware procurement activities well-underway
  - April – early use on Infiniband expansion
  - April – award GPU expansion contract
  - May – production running on Infiniband expansion
  - Aug – early use of GPU cluster expansion
  - Sep – production running on all ARRA resources

LQCD-ext FY10/11 Procurement Plans

- The FY2010 and FY2011 machines will be deployed at Fermilab, in existing computer room facilities (no schedule risk).

- The FY10/11 systems will be acquired across the FY10/11 fiscal year boundary.
  - Purchasing scheme will be analogous to the FY08/09 cluster purchase
  - More efficient and cost-effective process

- The FY10 portion of the procurement will be an Infiniband cluster
  - FY11 portion will likely contain GPUs

- FY10 procurement process well underway
  - RFP scheduled for release Apr 16
  - Timeline
    - June – Award cluster contract
    - Late July/early Aug – Take delivery of first rack
    - Oct/Nov – release in friendly user mode
    - Nov/Dec – release to production

User Survey Results

- To those who participated in our survey, THANK YOU!

- Survey consisted of 25 questions covering various aspect of compute facility operations and service delivery, as well as the allocation process.
  - Many questions had sub-questions specific to the three host laboratories

- Total respondents: 55
  - Small sample size can be problematic, so outliers have potential to significantly affect results.

Employed by	Count
BNL	6
FNAL	3
Jlab	4
University or college	38
Other	2

Type	Count
Student	8
Postdoc	17
Faculty	25
Other university staff	0
Lab scientist	4
Lab computing professional	8
Other university staff	17

- Survey results have been shared with our DOE OHEP and NP program managers. Survey completion satisfies a OMBe300 performance goal.

Satisfaction with the Compute Facilities

- 96% of respondents rated overall satisfaction level as "satisfied" or "very satisfied"

- Areas of satisfaction (satisfaction rating >85%)
  - □ User support and Responsiveness at all three sites
  - □ Documentation at BNL and JLab
  - □ System reliability at BNL and FNAL
  - □ Effectiveness of e-mail communication at BNL and FNAL
  - □ Satisfaction with general purpose user tools at BNL and JLab

- Areas for potential improvement (satisfaction rating <84%)
  - □ System reliability
  - □ Ease of access at all three sites (comments mainly related to Kerberos)
  - □ Online documentation (insufficient, too technical, out-of-date)

- Helpdesk Effectiveness
  - □ 31 of 34 helpdesk requestors noted receiving response within 6 working hours
  - □ 80% of problems were solved using initial response
  - □ Nearly 100% of problems solved within 3 days
    - Small number of respondents noted resolution time > 3 days (e.g., file recovery, system offline due to maintenance).

Satisfaction with Proposal/Allocation Process

- Satisfaction rating continues to show improvement in all areas. FY09 ratings are significantly better than FY07 ratings.

	FY07	FY08	FY09
Overall satisfaction with the proposal process	69%	81%	84%
Clarity of the Call for Proposals	79%	91%	93%
Transparency of the allocation process	61%	64%	79%
Apparent fairness of the allocation process	63%	73%	88%
Belief that the allocation process helps maximize scientific output	70%	78%	85%

- Many positive comments submitted by respondents

- Some concerns/suggestions voiced in survey responses:
  - Consider increasing the transparency of the SPC decision-making process
  - Effort to get computing time with USQCD is more than that required to get time through NERSC or NCSA. Opportunity for process improvement?

Summary

- The LQCD computing project officially ended on September 30, 2009
  - □ All key performance milestones and metrics were successfully met.
  - □ We regularly received "green" scores on all quarterly progress reports.
  - □ Total project costs were within the approved budget allocation
    - Acknowledging that the host laboratories provided significant infrastructure resources, the value of which is significant.

- The LQCD-ext project was approved in October 2009 after successfully navigating the formal DOE critical decision process
  - □ Plans are well along for the FY10 hardware procurement

- The LQCD-ARRA project was approved in early 2009. The initial hardware installation is in place with usage on GPUs increasing steadily. Plans are underway for the second hardware procurement.

- Taken together, the combined funding allocations for the LQCD-ext and LQCD-ARRA projects is consistent with the level of funding requested in the original extension project proposal ($18.15M + $4.97M = $23.12M \approx $22.9M$).

- User survey results once again help us understand what we're doing well and where we might consider making some improvements – thank you for your feedback!