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July 21, 2014

**PRESIDENT OF THE UNIVERSITY
CHAIRMAN OF THE BOARD
CHAIR OF THE COMMITTEE ON GROUNDS AND BUILDINGS**

**ACTION BY CONCURRENCE – AMENDMENT OF THE BUDGET AND APPROVAL
OF EXTERNAL FINANCING, COMPUTATIONAL RESEARCH AND THEORY
FACILITY, LAWRENCE BERKELEY NATIONAL LABORATORY AND BERKELEY
CAMPUS**

EXECUTIVE SUMMARY

The Computational Research and Theory (CRT) facility project is for construction of a 75,788 assignable square feet (asf) high performance computing and office facility to support the co-location of computational science research activities with the National Energy Research Scientific Computing Center (NERSC) and the Energy Sciences Network adjacent to the main Lawrence Berkeley National Laboratory (LBNL) site. This facility would enable the advancement of scientific knowledge and applications to societal challenges by providing a highly productive environment for multidisciplinary research and access to leading computational and networking facilities. Since the time the facility was conceived, the Department of Energy (DOE) has now committed to occupy the facility and has executed an occupancy agreement.

This item requests an augmentation of \$18 million to be funded with external financing. The budget augmentation is associated with the following: building modifications associated with DOE-funded High Performance Computing scope, alterations to project program space that will better accommodate recent changes in the high performance computer industry practices, and compliance with federal electrical safety and other standards recently raised by DOE.

The project is approximately 72 percent complete. This augmentation will allow the project construction to be completed in March 2015.

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RECOMMENDATION

The President of the University recommends, subject to concurrence of the Chairman of the Board and the Chair of the Committee on Grounds and Buildings, that the President be authorized to:

1. Amend the 2014-15 Budget for Capital Improvements and the Capital Program as follows:

From: Lawrence Berkeley National Laboratory and Berkeley Campus: Computational Research and Theory Facility – preliminary plans, working drawings, and construction – \$124,944,000 to be funded from external financing supported by Lawrence Berkeley National Laboratory funds (\$119,944,000) and external financing to be supported by Berkeley campus funds (\$5 million).

To: Lawrence Berkeley National Laboratory and Berkeley Campus: Computational Research and Theory Facility – preliminary plans, working drawings, and construction – \$142,944,000 to be funded from external financing supported by Lawrence Berkeley National Laboratory funds (\$137,944,000) and external financing supported by Berkeley campus funds (\$5 million).

2. Obtain additional external financing in an amount not to exceed \$18 million. The President shall require that:
 - A. Interest only, based on the amount drawn down, shall be paid on the outstanding balance during the construction period.
 - B. As long as the debt is outstanding, the available funds of the Lawrence Berkeley National Laboratory (LBNL) shall be maintained in amounts sufficient to pay the debt service and to meet the requirements of the authorized financing.
 - C. The general credit of the Regents shall not be pledged.
3. For the additional \$3.8 million in contingency funding, require that the approval of the Vice President of Budget and Capital Resources be obtained for all expenditures exceeding \$1.9 million. The LBNL shall submit a formal letter requesting expenditure of the additional funds and identifying the work attributed to these additional funds.
4. Execute all documents necessary in connection with the above.

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BACKGROUND

The Computational Research and Theory (CRT) facility project is providing a new building of approximately 75,788 assignable square feet (asf). This includes 30,764 asf of high-performance computing space (including 9,870 asf shelled area) and 45,024 asf for offices and conference space that will accommodate the staff of the Lawrence Berkeley National Laboratory (LBNL) National Energy Research Scientific Computing Center (NERSC) Division, the Scientific Networking Division, the Computational Research Division (CRD), and some staff from the joint LBNL/Berkeley campus research projects in computational science and engineering. The total combined office space will accommodate up to 300 staff members. Additionally, the project includes installation of new electrical feeders from the Grizzly Peak Substation.

The project is located on LBNL property and was selected to allow NERSC and other computational research projects to be adjacent to LBNL and the Berkeley campus. Additionally, the project site will allow the building to access the Western Area Power Authority electrical supply, which can provide more electricity at a cheaper rate than that of commercial Pacific Gas & Electric. LBNL has projected savings of \$4.6 million per year in reduced electrical costs when NERSC and other computing programs are able to operate at CRT.

The project was initially approved by the Regents in March 2007, with a total project budget of \$90 million. Since then, two separate actions amended the project's budget to a current total of \$124,944,000 funded from campus funds (\$5 million) and external financing (\$119,944,000). A budget adjustment was also approved administratively in March 2014. This approval made adjustments to the line items listed in Attachment 1. Please see Attachment 2 for a funding breakdown of all budget approvals associated with this project.

Status and Need for Augmentation

The augmentation request is precipitated by building modifications associated with Department of Energy (DOE) funded High Performance Computing scope, alterations to project program space that will better accommodate recent changes in the high performance computer industry practices, and compliance with federal electrical safety and other standards recently raised by DOE.

Description of the Additional Expenses

Hard Costs – \$11,350,000

Increases to the building construction cost are a result of the following:

- High Performance Computer Scope Funded by DOE
LBNL has recently received DOE funding for the manufacturing and installation of the next generation high performance computer system for NERSC to be located in the CRT facility. These will be among the highest performing computers in the world dedicated to scientific research, and will provide new and advanced research opportunities for both

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LBNL and the Berkeley campus. In anticipation of this delivery, the project will need to include installation of new piping and cabling connections that are capable of supporting these computers.

- High Performance Computing Floor Changes

The computing level is located above the mechanical level and below two levels of offices. As a result of evolving High Performance Computing (HPC) requirements, the project will have to include implementation of the following changes and modifications:

- The seismically isolated four foot high access floor is designed to protect the HPC from damage in an earthquake event. Recent changes to the access floor performance criteria required changes to the design, additional cost, and delay in the fabrication of this critical path item.
- The HPC cooling water piping penetrates the computing floor from the mechanical level below. In response to the changing seismic floor design, the size and locations of the floor penetrations changed.
- Rebar design was modified to strengthen the floor and coordinate with a fluid seismically isolated floor design.
- A DOE committed project to build a Tape Storage Room in CRT required infrastructure changes including relocation of electrical panels.

- Electrical Safety Enhancements

In order to provide the safest facility for the building's occupants as well as the greatest protection of its valuable assets, LBNL increased electrical safety protocols to adhere to both the University's and DOE's demanding electrical safety standards. With this augmentation, the processes and procedures for implementing DOE's new electrical safety program will be developed and associated impacts will be negotiated with the project's contractors. The estimated impact has been included in the line 1 (Building Construction) of the proposed budget.

- DOE-Driven Safety Standards

In order to provide the highest level of safety for maintenance workers, LBNL has decided to conform to DOE's higher standards for maintenance safety, despite this not being a DOE project. As a result, the project will include provision of or upgrade to the following: unit substations, medium voltage switchgear, access control system, perimeter grounding grid, and lighting and switches in the mechanical level. The budget augmentation also includes updated telecommunication and improved public address and security access.

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- Sustainable Heating

In an effort to improve sustainability and lower operational costs, it is proposed to provide the improvements required to capture the excess heat from the high performance computers and use it to heat the facility, including approximately 66,000 gross square feet (gsf) of office space. This innovative and highly efficient design relieves LBNL of installing a conventional gas boiler. However, without a conventional gas boiler, an auxiliary heater is required to insure minimum indoor temperatures are met when the computers are not running and not providing the excess heat. The proposed auxiliary heating system will provide heat during the times when the computers are not operational.

- Unanticipated Costs:

The project has incurred some additional, unanticipated costs, including the following:

Existing Retaining Wall

Uphill from the CRT, in an area containing multiple underground existing utilities, an existing retaining wall has begun to fail. This wall will be shored to protect the project's main electrical duct-bank, located above this wall and feeding down to the new facility.

Bedrock

Unforeseen bedrock, found along Perlmutter Road while installing utility piping and conduit, required jackhammering and contributed to project delays.

Telecommunications

After initial testing, it was determined that the telecom/network service to the building would require additional feeds installed from Building 50 to the CRT.

- Schedule Delay

The added work described above has resulted in a four-month schedule delay – from December 2014 to March 2015. In order to preclude additional delays beyond March 2015, LBNL is proposing to authorize overtime work. Without this authorization, the move-in and startup of DOE's HPC systems would be delayed, jeopardizing UC's commitment to DOE and revenue in the lease space.

Soft Costs – \$2,150,000

The project will require some additional design work associated with the scope issues described above. The four-month schedule delay will also increase costs associated with commissioning, integration of the DOE-funded work, punch list activities, and close out.

Interest During Construction (IDC) – \$700,000

This augmentation funds an additional \$700,000 in IDC to support the proposed \$18 million of financing (\$420,000) and the revised scheduled substantial completion (\$280,000). The original

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project completion was projected to be December 2014. Completion date is now March 2015. At the time of placing the approved project in long-term financing in April 2014, the \$6.8 million of budgeted IDC was reduced to \$4.7 million, and the remaining \$2.1 million of the approved IDC was reallocated to the construction project budget. The proposed action increases the \$4.7 million of IDC by another \$280,000. Total IDC, including the augmentation, is now projected at \$5.4 million.

Contingency – \$3.8 million

The project contingency would need additional funds so this project can be completed. This augmentation request proposes approval of an additional \$3.8 million in contingency, ten percent of the remaining construction costs. LBNL will be required to submit a formal request to the Vice President of Budget and Capital Resources to expend any funds over \$1.9 million of the \$3.8 million in additional contingency. The Vice President of Budget and Capital Resources will consider and take action on the request.

ENVIRONMENTAL ANALYSIS

A Final Environmental Impact Report (EIR) (SCH# 2007072106) analyzing construction and operation of the Computational Research and Theory (CRT) project pursuant to the California Environmental Quality Act (CEQA) was certified by the Regents in November 2007. A Finding of No Significant Impact (FONSI, re: DOE/EA-1700) pursuant to the National Environmental Policy Act (NEPA) was issued in February 2011. A Mitigation Monitoring and Reporting Program (MMRP) was instituted as stipulated in the Final EIR and has been executed on schedule during project construction. The CRT project was determined to conform to the LBNL 2006 Long Range Development Plan.

The proposed Augmentation and the various actions which comprise it are found to be consistent with the aforementioned environmental and planning documents. All CRT-related activities, including those items which would extend the anticipated construction of the project by approximately four months, would minimally contribute to environmental impacts that were fully analyzed in the EIR. Much of the Augmentation activity would take place within the now enclosed CRT building, thus minimizing noise and air effects. Construction-related trucks would continue to be managed via LBNL's construction truck trip system to ensure below-threshold aggregate truck impacts. No new significant impacts would be created, no existing significant impacts would be made substantially more severe, and mitigation opportunities and effectiveness would not be impacted by these proposed changes per CEQA Section 15162, et. seq.

ATTACHMENTS

- Attachment 1: Project Budget
- Attachment 2: Project Approval History and Funding Plan
- Attachment 3: Debt Service Funding Plan
- Attachment 4: Summary of Financial Feasibility

**PROJECT BUDGET
COMPUTATIONAL RESEARCH AND THEORY
LAWRENCE BERKELEY NATIONAL LABORATORY
CCCI 5135**

<u>Cost Category</u>	<u>Approved Budget March 2014</u>	<u>Augmentation Request</u>	<u>Proposed Budget July 2014</u>	<u>% of Total</u>
Site Clearance	\$799,000	-	\$799,000	0.6%
Building Construction	89,331,000	\$10,100,000	99,431,000	69.6%
Exterior Utilities	2,846,000	750,000	3,596,000	2.5%
Site Development	2,856,000	500,000	3,356,000	2.3%
A/E Fees	9,864,000	600,000	10,464,000	7.3%
Campus Administration	6,682,000	1,200,000	7,882,000	5.5%
Surveys, Tests, Plans, Specs	2,100,000	100,000	2,200,000	1.5%
Special Items (excl. financing)	5,566,000	250,000	5,816,000	4.1%
Financing Costs	4,700,000	700,000	5,400,000	3.8%
Contingency	<u>200,000</u>	<u>3,800,000</u>	<u>4,000,000</u>	<u>2.8%</u>
<i>Total P-W-C</i>	\$124,944,000	\$18,000,000	\$142,944,000	100.0%
Groups 2 & 3 Equipment	<u>0</u>	<u>0</u>	<u>0</u>	
<i>Total Project</i>	\$124,944,000	\$18,000,000	\$142,944,000	

Project Statistics:

	<u>Approved March 2014</u>	<u>Proposed July 2014</u>
GSF	139,700	134,249*
ASF (includes shell space)	73,700	75,788*
Efficiency Ratio: ASF/GSF	52.8%	56.4%
Project Cost/GSF	\$894	\$1,065
Building Cost/GSF	\$639	\$741

*The changes in GSF and ASF are associated with minor design and space modifications made since approval of the January 2012 item. The March 2014 item inadvertently did not pick up these changes.

ATTACHMENT 2

LBNL/UCB Computational Research and Theory Facility

PROJECT BUDGET APPROVAL HISTORY AND FUNDING PLAN

APPROVAL	External Financing	Gifts	LBNL Operating Funds	TOTAL
March 2007: Budget Approval - Regents Approval				
<i>Action</i>	\$ 85,000,000	\$ 5,000,000	\$ 444,000	\$ 90,444,000
Approved Budget	\$ 85,000,000	\$ 5,000,000	\$ 444,000	\$ 90,444,000
May 2008: Budget Approval, Certification EIR, Design Approval - Regents Approval				
<i>Action</i>	\$ 22,500,000	\$ -	\$ -	\$ 22,500,000
Approved Budget	\$ 107,500,000	\$ 5,000,000	\$ 444,000	\$ 112,944,000
Nov 2008: Reapproval of Ext Financing - Regents Approval				
<i>Action</i>	\$ 107,500,000	\$ -	\$ -	\$ 107,500,000
Approved Budget	\$ 107,500,000	\$ 5,000,000	\$ 444,000	\$ 112,944,000
January 2012: Budget Approval and Increase in External Financing - Regents Approval				
<i>Action</i>	\$ 17,444,000	\$ (5,000,000)	\$ (444,000)	\$ 12,000,000
Approved Budget	\$ 124,944,000	\$ -	\$ -	\$ 124,944,000
March 2014: Budget Adjustment - Administrative Action				
<i>Action</i>				\$ -
Approved Budget	\$ 124,944,000	\$ -	\$ -	\$ 124,944,000
July 2014: Proposed Budget Amendment - Action by Concurrence				
<i>Proposed Action</i>	\$ 18,000,000	\$ -	\$ -	\$ 18,000,000
Proposed Budget	\$ 142,944,000	\$ -	\$ -	\$ 142,944,000

DEBT SERVICE FUNDING PLAN

At the January 18, 2012 meeting, the Regents articulated the debt funding plan for \$124,944,000 of the total project cost for the Computational Research and Theory (CRT) program. The augmentation of \$18 million results in a revised total project cost of \$142,944,000. The increase will be funded with additional external financing, and will be repaid from LBNL funds over a period of five years.

The University and the Berkeley campus are not part of the funding plan for the augmentation. The source of the debt service payment on \$18 million will be the following LBNL funds:

- 1) Occupancy charge (Depreciation & Facilities Cost of Capital Money [FCCM]) to the Department of Energy (DOE) for use of the CRT facility. LBNL is authorized to charge DOE a preapproved annual reimbursement rate for DOE occupancy. The reimbursement amount is a factor of straight line depreciation and the FCCM rate applied to the annual (declining) book value. The FCCM rate is based on the five-year treasury rate. The current FCCM rate used for years one through five is near the historical low. The FCCM rate used for years six through 30 assumes a reasonable increase to get to the current ten-year average. However, this combined reimbursement amount does not fully cover the debt service. (See Table 1 below for all LBNL funds pledged towards debt service.)
- 2) Additional LBNL funds will be used towards debt service payment to cover the shortfall. They are as follows:
 - a. Net revenue generated from the Solar Energy Research Center (SERC) occupancy charge to DOE, less the SERC debt service payments,
 - b. University's LBNL management fee building fund, and
 - c. A portion of LBNL's annual earned performance fee.

TABLE 1: LBNL FUNDING SOURCES

LBNL Funds for <u>\$137,944,000</u> (Yrs.1-5)	Funding Plan (in 000's)
Facility Occupancy Charge [1]	\$ 4,972
Additional LBNL funds [2]	6,643
Total Debt Service	\$11,615

LBNL Funds for <u>\$119,944,000</u> (Yrs. 6-30)	Funding Plan (in 000's)
Facility Occupancy Charge [1]	\$5,012
Additional LBNL funds [2]	2,560
Total Debt Service	\$7,572

Notes: [1] Facility Occupancy Charge represents the depreciation and facility cost of capital money (FCCM). Additional LBNL funds will need to be used if FCCM is not at levels projected.
 [2] Additional LBNL funds include Net Rev generated from SERC, Management Fee Building Fund, and Annual Earned Performance Fee. Berkeley campus will not be covering any part of the debt service related to the augmentation

TABLE 2: DEBT SERVICE FUNDING PLAN

Year	Revenue			Total LBNL Debt Service (3,4,5)	Annual LBNL Funds (6)	STIP on LBNL Fund Balance	Annual LBNL Fund Balance less Delta with STIP (7)
	CRT and SERC Occupancy fee (1)	Estimated Endowment Annual Total Return Payout Amount (2)	Total				
Est. 2014 LBNL Funds Balance							\$8,759,000
1	\$6,587,178	\$240,000	\$6,827,178	(\$5,856,330)	\$700,000	\$156,448	\$10,586,295
2	\$8,717,647	\$370,000	\$9,087,647	(\$12,495,544)	\$700,000	\$118,176	\$7,996,573
3	\$8,602,780	\$500,000	\$9,102,780	(\$12,495,545)	\$700,000	\$79,557	\$5,383,365
4	\$9,213,190	\$500,000	\$9,713,190	(\$12,495,545)	\$700,000	\$49,515	\$3,350,525
5	\$9,071,296	\$500,000	\$9,571,296	(\$12,495,545)	\$700,000	\$16,894	\$1,143,170
10	\$9,685,137	\$500,000	\$10,185,137	(\$8,452,256)	\$83,197	\$156,226	\$10,571,288
15	\$8,658,094	\$500,000	\$9,158,094	(\$8,452,257)	\$83,197	\$261,502	\$17,694,950
20	\$7,631,051	\$500,000	\$8,131,051	(\$8,452,257)	\$83,197	\$295,540	\$19,998,182
25	\$6,604,008	\$500,000	\$7,104,008	(\$8,452,257)	\$83,197	\$252,834	\$17,108,445
30	\$3,629,550	\$500,000	\$4,129,550	(\$8,452,257)	\$83,197	(\$0)	(\$0)
34	\$1,341,401	\$0	\$1,341,401	\$0		\$177,323	\$11,998,840
	\$244,248,377	\$14,610,000	\$258,858,377	(\$267,144,926)	\$5,579,920	\$5,946,469	

1. Occupancy fee is set by depreciation and cost of capital calculation know as FCCM. FCCM rate is set by the Treasury Secretary and historically tracks 5-year notes.
2. \$14.4M gift from Simons Foundations.
3. LBNL Debt service for external financing for CRT (\$119.9M) and SERC (\$14.4M) April 2014 AN Taxable General Bond Issuance.
4. Year 1 Debt Service excludes partial year capitalized interest for the SERC and CRT projects.
5. UC External Financing for \$18M with annual interest @ 4% to be paid back from LBNL funds over 5 years.
6. Projected LBNL net management fee earned is \$96.2M over this time period.
7. The estimated 2014 LBNL Funds Balance of \$8.8M includes cash payout for an additional \$2M SERC augmentation (SERC budget increases from \$56.4M to \$58.4M).

The table above summarizes the combined debt service funding plan for both UC-financed buildings being provided for DOE use at LBNL, including CRT and the Solar Energy Research Center (SERC). In combination, the two buildings generate DOE funding (from Facilities Capital Cost of Money [FCCM] and Depreciation) to offset most of the combined debt service. Any remaining debt service will be paid from additional LBNL funds. The table includes the following:

- A. Revenue – The cumulative allowable cost to DOE (through the CRT and SERC occupancy charge for FCCM and Depreciation) and the estimated payout from the Simons endowment, the cumulative debt service.
- B. Debt – LBNL debt service for the recent General Revenue Bonds and the proposed augment of \$18 million.
- C. Annual LBNL Funds – additional LBNL funds (i.e., from annual management fee resources) needed to avoid Annual LBNL Fund Balance (far right column) from going below \$0.
- D. STIP – estimated annual STIP earnings on LBNL Fund Balance (based on a 1.5% STIP rate).

SUMMARY OF FINANCIAL FEASIBILITY

LAWRENCE BERKELEY NATIONAL LABORATORY AND BERKELEY CAMPUS	
Project Name	Computational Research and Theory (CRT)
Project ID	912314
Total Estimated Project Cost	\$142,944,000
Interest During Construction	\$5,400,098

Proposed Sources of Funding	
External Financing supported by LBNL Funds	\$137,944,000
External Financing supported by Berkeley Campus	\$5,000,000
Total	\$142,944,000

Financing Assumptions for External Financing (\$18,000,000)	
Amount Financed	\$18,000,000
Anticipated Repayment Source	LBNL Funds
Anticipated Fund Source	LBNL Operating Funds and additional LBNL Funds: Occupancy charge (Depreciation & FCCM) to DOE for use of the CRT facility, Net revenue generated from the SERC facility occupancy charge to DOE, less the SERC debt service payments, UC's LBNL management fee building fund, and a portion of LBNL's annual earned performance fee.
Financial Feasibility Rate	4.0% for 5 years
First Full Year of Principal	Year 1 (FY 2015)
Final Maturity	Year 5 (FY 2019)
Estimated Annual Debt Service	\$4,043,000

TABLE 3

The table below represents a likely amortization schedule for repayment of the \$18,000,000.

Payments Per Year					1
Amortization Period (Years)					5
Principal Amount					\$18,000,000
Annual Interest Rate					4.00%
Periodic Payment					\$4,043,288
Year	Beginning Balance	Interest	Principal	Ending Balance	
2015	\$18,000,000	\$720,000	\$3,323,288	\$14,676,712	
2016	\$14,676,712	\$587,068	\$3,456,220	\$11,220,492	
2017	\$11,220,492	\$448,820	\$3,594,468	\$7,626,024	
2018	\$7,626,024	\$305,041	\$3,738,247	\$3,887,777	
2019	\$3,887,777	\$155,511	\$3,887,777	\$0	

Should the UC-DOE Prime Contract be extended, final terms on this augmentation can be revised with consent of the Office of the President.