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PRESIDENT OF THE UNIVERSITY

ACTION UNDER PRESIDENT'S AUTHORITY--AMENDMENT OF THE BUDGET FOR CAPITAL IMPROVEMENTS AND THE CAPITAL IMPROVEMENT PROGRAM, AND APPROVAL OF EXTERNAL FINANCING FOR SATELLITE CHILLER PLANT, RIVERSIDE CAMPUS

It is recommended that:

Pursuant to Standing Order 100.4(q)

- (1) The President amend the 2002-03 Budget for Capital Improvements and the 2002-05 Capital Improvement Program to include the following project:

Riverside: Satellite Chiller Plant- preliminary plans, working drawings, construction and equipment - \$8,090,000 to be funded from campus funds (\$1,000,000) and external financing (\$7,090,000).

Pursuant to Bylaw 21.4(d) and Standing Order 100.4(nn)

- (2) The President approve external financing not to exceed \$7,090,000 to finance construction and related costs for the Satellite Chiller Plant, Riverside campus, subject to the following conditions:
 - a. Interest only, based on the amount drawn down, shall be paid on the outstanding balance during the construction period;
 - b. Repayment of the debt shall be from the University's annual appropriation from the State of California and other lawfully available funds of The Regents; and
 - c. The general credit of The Regents shall not be pledged.
- (3) Officers of The Regents be authorized to provide certification to the lender that interest paid by The Regents is excluded from gross income for purposes of federal income taxation under existing law.
- (4) Officers of The Regents be authorized to execute all documents necessary in connection with the above.

A Key to abbreviations and the project description is attached.

KEY

Capital Improvement Program Abbreviations

S	Studies
A	Acquisition
P	Preliminary Planning
W	Working Drawings
C	Construction
A/C	Augmentation for Construction
E	Equipment
A/E	Augmentation for Equipment
-	State (no abbreviation)
F	Federal Funds
G	Gifts
HR	Hospital Reserve Funds
LB	Bank Loans or Bonds
LR	Regents' Loans
N	Reserves other than University Registration Fee
R	University Registration Fee Reserves
U	Regents' Appropriations
X	Others (Source known, but not included above, e.g., campus discretionary funds)
Q	Funds from sources yet to be determined
CCCI	California Construction Cost Index
EPI	Equipment Price Index

2002-03 Budgets for Capital Improvements
and 2002-05 Capital Improvement Program
Scheduled for
Regents' Allocation, Loans, Income Reserves,
University Registration Fee Reserves, Gift Funds,
And Miscellaneous Funds

Campus and Project Title (Total Cost)	<u>Prefunded</u>	Proposed <u>2002-03</u>	Projected After <u>2002-03</u>
<u>Riverside</u>			
Satellite Chiller Plant	P	\$ 283,000	X
	W	\$ 365,000	X
	C	\$ 352,000	X
	C	\$7,090,000	LB
(\$8,090,000)			

DESCRIPTION

The Riverside campus proposes to construct a 7,000 gsf Satellite Chiller Plant located on the East Campus north of parking lot 9 and in proximity to a new 2.7 million gallon thermal energy storage (TES) tank currently under construction. The proposed Satellite Chiller Plant would house two 2,000-ton chillers, related chilled water pump units, and control systems. In addition, this project would construct cooling towers adjacent to the new plant. The building would be designed to accommodate future expansion of approximately 6,000 tons of additional cooling capacity. The plant would be scheduled to be operational by winter quarter 2002-03. Its construction would enable the campus TES system to operate at the highest possible energy efficiency while providing additional chilled water capacity to the campus.

Background

Enrollment at the Riverside campus has grown significantly during the last four years, increasing from approximately 8,200 FTE students in 1997-98 to over 12,800 FTE students in 2001-02.

In an effort to support the instructional and research needs of the growing campus population, the University is planning to provide an additional 480,000 asf of new space by 2008. The existing 5,000-ton Central Plant has met the campus chilled water requirements to date but would not be able to satisfy all projected chilled water demands beyond 2001-02 (See Table 1).

During a prolonged period of hot weather in Summer 2001, the campus began to experience a significant shortfall in cooling capacity. Projects recently completed (the Entomology Building Seismic Replacement facility and the Pest Control Insectary Quarantine and Containment Facility) and those in development will generate additional demand, further straining the capabilities of the cooling system. The campus has implemented several initiatives to expand

cooling capacity, including the completion of production-enhancing modifications to existing equipment at the central plant and throughout existing campus buildings. However, even with these enhancements, additional cooling capacity is required to support buildings scheduled for completion over the next several years.

The Satellite Chiller Plant at the Riverside campus would be the final component of a three-part energy conservation program designed to better meet the campus' growing energy needs. The first two components, a second TES tank and associated distribution lines, have already been funded by the University with non-state sources and are under construction. The campus now proposes that a Satellite Chiller Plant be constructed to complete the energy conservation program and meet existing and near-term demand for chilled water.

Working in concert, the Satellite Chiller Plant, the TES expansion, and the distribution lines would make it possible for the Riverside campus to conserve energy by purchasing the electricity required to power the Satellite Chiller Plant during off-peak hours. The Satellite Chiller Plant would chill large quantities of water during off-peak hours to meet the thermal needs of the outlying areas of this rapidly expanding campus; the chilled water would then be stored in the TES tank, available for distribution and use as needed through the distribution lines to various buildings in outlying campus locations.

Because energy would be purchased during off-peak hours, the proposed program also would result in cost savings to the campus. In addition, operational and maintenance costs would be reduced substantially because building-specific distribution systems would not be required. The shortfall in needed energy supply that would be experienced in the absence of the project is illustrated in the following table.

Table 1
Existing and Projected Chilled Water
Demand and Capacity Without Proposed Project

BUILDING NAME	USE	ASF	DATE	CHILLED WATER DEMAND (Cooling Tons)	(DEFICIT) or SURPLUS TONS CAPACITY
EXISTING PLANT @ 5,000 TONS CAPACITY	General Campus	1,630,694		5,720	(720)
Entomology Seismic	Laboratory/Office/Class	42,969	2002	276	(996)
Insectary & Quarantine	Laboratory/Office	25,200	2002	516	(1,512)
<i>Subtotal</i>	<i>Through Summer 2002</i>	<i>1,698,863</i>		<i>6,512</i>	<i>(1,512)</i>
BUILDING NAME	USE	ASF	DATE	CHILLED WATER DEMAND (Cooling Tons)	(DEFICIT) or SURPLUS TONS CAPACITY
Science Lab 1	Laboratory/Office/Class	25,600	2003	309	(1,821)
Physical Sciences 1	Laboratory/Office	73,250	2004	906	(2,727)
Engr Bldg Unit 2	Dry Lab/Class	89,686	2004	426	(3,153)
Biological Sciences	Laboratory/Office	31,666	2005	241	(3,394)
Interdisciplinary Studies	Class/Comp. Lab/Office	68,000	2006	249	(3,643)
Psychology Building 1	Office/Vivaria/Lab	50,000	2007	234	(3,877)
Material & Physical Sci	Office/Lab/Class	74,000	2008	910	(4,787)
<i>Subtotal</i>	<i>Summer 2003 – 2008</i>	<i>412,202</i>		<i>3,273</i>	<i>(4,787)</i>

The cooling loads shown in Table 1 would be reduced by a 75% diversity factor with the Satellite Chiller Plant. A central chiller facility would be able to take advantage of a diversity factor, which would allow a smaller total number of tons to provide the cooling needs of several buildings than the number of total tons that would otherwise be required for individual “stand-alone” chillers in each building.

Project Description

The proposed project would increase campus cooling capacity to a total of 9,000-tons by constructing a new 7,000 gsf Satellite Chiller Plant with two 2,000-ton chillers. The plant would be designed to accommodate future expansion of approximately 6,000 tons of additional cooling capacity. This project would also provide the related cooling towers to serve the chiller requirements and would extend the TES chilled water piping distribution to future campus building sites along East Campus Drive.

The satellite plant would utilize modern industrial controls, which would integrate with the existing control system in the campus central plant. The new plant would also utilize energy conservation measures such as “Primary-Secondary” pumping configurations, Variable Frequency Drives (VFD) and high “Delta T” chilled water operating conditions for reduced pumping requirements and reduced motor sizes. Additionally, the Satellite Chiller Plant would

integrate with the campus TES system, providing a more efficient means of charging the campus TES tanks during off-peak hours. The plant cooling towers would also be equipped with VFDs on all fan motors and high "Delta T" in order to improve chiller efficiency and reduce condenser water pumps and motors. The construction of the Satellite Chiller Plant would enable the campus TES system to operate at the highest possible energy efficiency while providing additional chilled water capacity to the campus.

The proposed Satellite Chiller Plant project would allow the campus to make optimum use of the thermal energy storage expansion project currently under construction for existing cooling loads and allow cooling loads for future planned buildings to be shifted to the off-peak period. This fact forms the basis of the project's economic and financial feasibility analysis.

CEQA Classification

In conformance with the California Environmental Quality Act and University procedures for implementing CEQA, the campus prepared an Initial Study and proposed Mitigated Negative Declaration for the project and an amendment of the 1990 Long Range Development Plan.

Financial Feasibility

The total project cost of \$8,090,000 at CCCI 4019 would be funded by campus funds (\$1,000,000), and externally financed with state funds as the repayment source (\$7,090,000). Assuming 10 year financing of \$7,090,000 at 5.50 % interest, the average annual debt service for the project would be \$941,000. Payment of the debt service would be from savings in state-supportable purchased utilities costs resulting from the efficiencies realized by the proposed project. The University has requested approval (known as a Section 28 exemption) to expend these state purchased utility budget support funds toward the debt service. The Department of Finance approval of the Section 28 exemption would be required before external financing would be obtained and before the project would proceed.

The financial analysis of the project is based on a 15-year comparison of two alternatives. The first alternative (BAU) is the construction of individual small chillers in all state-funded buildings currently projected in the capital improvement program through fiscal year 2008-09. The main drawbacks to this approach are increased capital costs per ton, lower efficiency, and the inability to shift chiller operation to off-peak hours which would lead to higher overall per kWh rates for the entire campus. The second and preferred alternative is the construction of a Satellite Chiller Plant with an initial capacity of 4,000 tons.

Compared to the BAU alternative, this project is expected to save \$38.0 million in electricity purchases and \$1.1 million in maintenance costs over 15 years in nominal dollars. The overall savings for constructing the Satellite Chiller Plant over the BAU Alternative, including the cost of financing, is \$36.6 million on a nominal basis over 15 years (\$6.2 million, net present value). From a financial and energy conservation standpoint, construction of a Satellite Chiller Plant is the preferred solution to expanding chilled water cooling capacity for the Riverside campus.

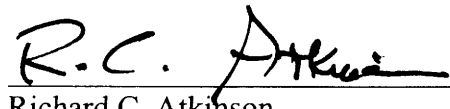
Fiscal Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
BAU-Cost per kwh	\$0.0525	\$0.0735	\$0.0753	\$0.0772	\$0.0811	\$0.0831	\$0.0852	\$0.0873	\$0.0895	\$0.0917
BAU MW consumed	66,780	68,960	74,026	76,241	79,567	83,475	87,295	90,396	93,496	96,597
BAU-Annual cost (000's)	\$3,506	\$5,066	\$5,574	\$5,886	\$6,294	\$6,770	\$6,997	\$7,438	\$7,891	\$8,368
Chiller-Cost per kwh	\$0.0525	\$0.0538	\$0.0551	\$0.0565	\$0.0579	\$0.0593	\$0.0608	\$0.0623	\$0.0639	\$0.0655
Chiller MW consumed	64,816	66,903	71,849	73,998	77,227	81,020	81,718	84,728	87,737	90,746
Chiller-Annual Cost (000's)	\$3,403	\$3,512	\$3,865	\$4,077	\$4,363	\$4,691	\$4,846	\$5,151	\$5,466	\$5,799
Savings MW consumed	1,964	2,027	2,177	2,242	2,340	2,455	2,476	2,567	2,659	2,750
Energy Savings (000's)	\$103	\$1,554	\$1,709	\$1,808	\$1,930	\$2,079	\$2,476	\$2,286	\$2,426	\$2,569
Debt Service (000's)	\$941	\$941	\$941	\$941	\$941	\$941	\$941	\$941	\$941	\$941
Net Energy Savings (000's)	\$<838>	\$613	\$768	\$867	\$989	\$1,138	\$1,535	\$1,345	\$1,485	\$1,628

The campus currently has a favorable rate of \$.0525 per kWh which terminates in 2004. Based on discussion with the City, the campus feels that it would be unable negotiate lower than market rates for electricity without shifting its cooling load to off peak hours. Current rates in the campus territory range from \$.081 to \$.10 per kWh.

The table above shows the projected energy cost per kWh, projected usage and projected annual cost under the BAU case and with the Satellite Chiller. With the Chiller, the campus would be able to save an average of \$1.9 million annually from a combination of electricity rate savings and decreased usage. With the chiller, the campus should be able to continue to enjoy a favorable electricity rate from the City based on its partial load shifting capabilities. Additionally, the amount of units consumed declines with the improved energy efficiency of the chiller design, decreasing an average of 2.4 million kWh annually.

FY 2004 is the last year of the current electricity contract at a rate of \$.0525 per kWh. At this rate, during the first full year of the chiller's operation, the savings are insufficient to pay for all of the debt service. At a rate per kWh of \$.065, the savings would be sufficient to pay for the debt service. In FY 2004, the campus has committed to use other campus funds to fund any shortfall in debt service. From FY 2005, the difference in the annual cost with the chiller is sufficient to pay the debt service on the external financing and to fund operating expenses.

Approved by:



Richard C. Atkinson
President of the University

6/26/02
Date

Attachment

**PROJECT STATISTICS
SATELLITE CHILLER PLANT
CAPITAL IMPROVEMENT BUDGET
RIVERSIDE CAMPUS
CCCI 4019**

<u>Cost Category</u>	<u>Amount</u>	<u>% of Total</u>
Site Clearance	35,000	0.4%
Building	5,838,000	72.2%
Exterior Utilities	688,000	8.5%
Site Development	50,000	0.6%
Fees	468,000	5.8%
A&E/PP&C	160,000	2.0%
Surveys, Tests, Plans	133,000	1.6%
Special Items ^(a)	390,000	4.8%
Contingency	328,000	4.1%
Total	\$8,090,000	100.0%
Group 2 & 3 Equipment	0	
Total Project	\$8,090,000	

^(a) Special items include constructability review \$50,000, CEQA \$10,000, utility shutdown \$20,000, special technical consultant \$16,000, and capitalized interest \$294,000.