Sacramento Public Library Authority

September 29, 2011

Agenda Item 8.0: Agreement: Central Library Green Facilities Program

TO: **Sacramento Public Library Authority Board Members**

FROM: **Don Tucker, Director of Facilities**

RE: **Agreement: Central Library Green Facilities Program**

RECOMMENDED ACTIONS:

Adopt Resolution 11-47, A Resolution Approving the Agreement for Library Authority's Participation in the City of Sacramento's Green Facility Program

REASON FOR RECOMMENDATION

The City of Sacramento's Department of General Services has proposed terms for the Sacramento Public Library Authority to participate in the City's Green Facilities Program (GFP). The program encompasses many energy efficiency projects throughout the City and several of the improvements are planned at the Central Library. The basic concepts of the program were described for the Authority Board in August 2009 and in the December 2010 Director's Report. The final version was delivered to Library staff on July 25, 2011.

The basic concept of the GFP is to fund $250,200 in major improvements to the heating and cooling systems at the Central Library through a Federal Department of Energy Grant called the Energy Efficiency and Conservation Block Grant (EECBG). These improvements, when completed, will yield immediate energy savings to the Library estimated at $2,207 per month. The EECBG funds will be reimbursed to the City of Sacramento from these savings over the next twelve years at the rate of $2,095 per month, a net monthly savings to the Library of $112 per month. At the end of the twelve year payback period, the Library will enjoy the full amount of the monthly energy savings.

Library staff is recommending acceptance of the terms of the GFP Agreement as presented by City of Sacramento General Services. This is consistent with the Library's overall strategy in reducing energy use and costs and is consistent with common trends in the energy management field.

ATTACHMENTS

Resolution 11-47, A Resolution Approving the Agreement for Library Authority's Participation in the City of Sacramento's Green Facility Program

Exhibit A: City of Sacramento Green Facilities Program Letter of Agreement dated July 25, 2011

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Sacramento Public Library Authority

RESOLUTION NO. 11-47

Adopted by the Governing Board of the Sacramento Public Library Authority on the date of:

SEPTEMBER 29, 2011

A RESOLUTION APPROVING THE AGREEMENT FOR THE LIBRARY AUTHORITY'S PARTICIPATION IN THE CITY OF SACRAMENTO'S GREEN FACILITY PROGRAM

BE IT HEREBY RESOLVED THAT:

1. The Authority Board approves the Letter of Agreement with the City of Sacramento to participate in the Green Facilities Program for energy efficiency upgrades at the Central Library.

2. The Library Director is authorized to sign all documents related to this Letter of Agreement within the approved terms.

_____
Sandy Sheedy, Chair

ATTEST:

Rivkah K. Sass, Secretary

By:_____
Brenda Haggard, Assistant Secretary

ATTACHMENTS:
Exhibit A: City of Sacramento Green Facilities Program Letter of Agreement dated July 25, 2011

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DEPARTMENT OF
GENERAL SERVICES

OFFICE OF THE DIRECTOR

CITY OF SACRAMENTO
CALIFORNIA

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July 25, 2011

Rivkah K. Sass
Director, Sacramento Public Library Authority
828 I Street
Sacramento, CA 95814

Dear Ms Sass,

This letter serves as an agreement between the City of Sacramento and the Sacramento Public Library confirming the Library's participation in the Green Facilities Program (GFP) for the Central Library facility. The terms and conditions of the program are outlined in the attached document as well as descriptions of the projects. The Central Library is participating in the GFP and as a result is taking advantage of a number of energy efficiency retrofits that will result in less energy consumption by the facility and improved comfort of the Library.

_____ _____

Reina J. Schwartz
Director, Dept of General Services

Rivkah K. Sass
Director, Sacramento Public Library Authority

GREEN FACILITIES PROGRAM
ENERGY EFFICIENCY FOR CITY FACILITIES PROGRAM
WORK PLAN – PHASE I

INTRODUCTION

The Department of General Services has developed the Green Facilities Program (GFP) to implement energy efficiency projects in City facilities. The GFP will audit, design, and implement energy savings projects in number of facilities located throughout the City of Sacramento. These projects will reduce energy usage and reduce greenhouse gas emissions.

The GFP includes four distinct services provided by DGS.

- First, an energy audit is performed to analyze the actual energy usage of the facility based on the existing mechanical and electrical systems and the hours of operation of the facility.
- Second, energy modeling of more energy efficient mechanical and electrical systems is conducted to determine how to improve the overall system energy use.
- Third, audit findings and modeling results are presented to the department and an agreement to move forward with implementation is put in place.
- Finally, after the equipment is installed, monitoring/verification is completed to ensure the systems are performing as expected.

Phase I will include the following facilities: Pannell Community Center, Central Library, and five City Parking Garages.

FINANCING – GREEN FACILITIES PROGRAM LOAN FUND

The Department of General Services was awarded grant funds from the Department of Energy through the Energy Efficiency and Conservation Block Grant (EECBG). DGS will use $1.9 million of the grant to establish a revolving loan fund to fund the projects identified in the work plan-phase I. DGS will fund “Phase I” projects with grant funding and will have the option to either 1) wait until the funds revolve back into the fund to do Phase II or 2) secure outside funding for Phase II while the Phase I loans are paid back.

As mentioned above, DGS will provide the energy audit, design, implementation, and measurement/verification for the projects. Each department will pay back their loan through estimated energy savings from the projects plus a 3% interest rate to cover administrative costs. The estimated savings, i.e. loan re-payment amount, is based on actual hours of operation by the facilities and the energy saved based on new equipment or systems changes. The loan re-payment is agreed to by DGS and the customer department before the project is implemented. If the Department changes its hours of operation or uses the equipment differently than it originally did at the time of the savings estimates, the Department will still be responsible for the loan re-payment amount. The intent of this program is to be a net zero impact on the department’s budget.

PROJECT DESCRIPTIONS

1. **Heating Hot Water Boiler Replacement**

- **Existing Condition:** The facility currently utilizes two (2) twenty year old gas fired boilers to satisfy the heating demand of the entire Library. The current boilers were delivered with operating efficiencies of 80%. It is unlikely they are currently operating at that efficiency. Additionally, the strategy that controls the activation of the boilers is based on outside ambient air temperature which is outdated and not as energy efficient as other strategies currently available.

- **Energy Conservation Project Description:** The existing boilers shall be replaced with two (2) high efficiency condensing boilers. Part load efficiencies are also greatly improved when compared to the existing boilers. The control sequence of the boilers will also be updated, basing boiler demand on return water temperature rather than outdoor ambient temperature. The combination of inherently more efficient equipment running fewer hours will result in greatly decreased gas consumption.

- **Measurement and Verification**
  - Utilize the existing dedicated gas flow meter at the lead boiler to log gas consumption. This same meter will be used to log the consumption of the new lead boiler. Since the existing second boiler rarely energizes, and only during extreme cold weather conditions, it's operation is negligible compared to the lead boiler. However, a new gas flow meter identical to the existing will be installed on the second boiler as part of this work, thus exact consumption can be verified on both boilers regardless of which one is operating.

2. **Hot Water Pump Motor Replacement with Addition of VFDs**

- **Existing Condition:** The facility currently utilizes two (2) constant volume pumps to distribute hot water produced by the boilers to the building terminal units. Currently, these hot water pumps are either running at full capacity or are turned off, leading to a greater amount of electrical consumption than is necessary at part load conditions. Compounding the inefficiencies of the system, the motors driving these pumps are old and becoming increasingly inefficient.

- **Energy Conservation Project Description:** The existing hot water pump motors shall be replaced with premium efficiency motors. These motors will be driven by new variable frequency drives (VFD), enabling the pumps to operate at decreased speeds during periods of smaller heating demand. Savings will result in the form of decreased electrical consumption.

- **Measurement and Verification**
  - Log pre and post retrofit hot water pumps power consumption and run hours for stipulated period and comparison of pre and post data will reveal actual kwh savings.

3. **Secondary Chilled Water Pump Motor Replacement with Addition of VFDs**

- **Existing Condition:** The existing secondary chilled water (CHW) pumps serve the needs of the five rooftop air handling units (AHU) and currently operate at a maximum constant speed. Considering the seasonal fluctuations and the diversity loads of each AHU, the chilled water being delivered is often in excess of the actual space conditioning needs and results in the consumption of excess pumping energy. Compounding the

inefficiencies of the system, the motors driving these pumps are old and becoming increasingly inefficient.

- **Energy Conservation Project Description:** New variable frequency drives (VFD) shall be applied to the secondary chilled water pumps to control the pump speed. This will provide the ability to control the chilled water flow by matching pump output with system demand thus reducing pumping energy consumption. Also, the motors for both pumps shall be replaced with premium efficiency motors which will also have an inherently positive impact on electrical consumption independent of the VFDs.

- **Measurement and Verification**
  - Log pre and post retrofit chilled water pumps power consumption and run hours for stipulated period and comparison of pre and post data will reveal kwh savings.
  - Reduced chilled water pump flow with the difference in chilled water supply and return temperatures will be used to reveal actual electrical consumption savings.

4. Replace Air Handler Fan Motors and Replace Inlet Guide Vanes with VFDs

- **Existing:** The supply fans of the rooftop AHUs 1, 2, 3 & 5 have VFDs, while the return fans for these units utilize old inlet guide vanes to regulate the air quantity. The supply fan for AHU-4 uses only inlet vanes. These inlet guide vanes as currently assessed are in marginal condition. Additionally, the motors serving these fans are old and inefficient.

- **Energy Conservation Project Description:** The inlet vanes shall be removed in favor of installing variable frequency drives to control the speed of these fans and the airflow they produce. The installation of VFDs on all the return fans motors and supply motor of AHU-4 will allow the Direct Digital Control (DDC) system to reduce the speed of the fans to match system requirements when load conditions call for it. Also, the motors for each of these fans will be replaced with premium efficiency motors which will also have an inherently positive impact on electrical consumption independent of the VFDs.

- **Measurement and Verification**
  - Log pre and post of the installation of VFDs on the return fans power consumption and run hours for stipulated period and comparison of pre and post data will reveal kwh savings.

5. Cooling Tower Fan Motor Replacement with Addition of VFDs

- **Existing:** The fans of the two rooftop cooling towers currently run at full capacity and at a constant volume regardless of the heat rejection requirements of each chiller's condenser barrels. This consumes more electrical energy than is required to maintain condenser return water temperature.

- **Energy Conservation Project Description:** Variable frequency drives (VFD) shall be installed on both cooling tower fan motors to control the fan speed. This will enable the system to vary the airflow through the cooling tower based on fluctuating condenser water system demands. Also, the motors for both pumps will be replaced with premium efficiency motors which will also have an inherently positive impact on electrical consumption independent of the VFDs.

- **Measurement and Verification**
  - Log pre and post ECM power consumption of both fans and run hours for stipulated period and comparison of pre and post data will reveal kWh savings.

6. CO_2 Demand Control Ventilation (DCV) at AHU-4

- **Existing:** Air Handling Unit (AHU-4) provides conditioned air to the Library Galleria. This area was designed and is used for large gatherings with a capacity of up to several hundred people. The design of the air ventilation system serving this area is to meet the requirement of the space based on the maximum design occupancy and its associated ventilation rates. Ventilation air is not reduced in response to low levels of occupancy. This amounts to wasted energy spent conditioning outside air that is not needed.

- **Energy Conservation Project Description:** Carbon Dioxide (CO_2) based Demand Control Ventilation (DCV) control strategy shall be implemented to adjust the amount of outside air based on the number of occupants and ventilation demands of those occupants. The reduction of the conditioning of outside air will result in chiller/pump electrical consumption savings. During the heating season, this translates into decreased boiler gas consumption.

- **ECM Measurement and Verification**
  - Fan energy consumption will be tracked by logging pre and post fan power and run hours for stipulated period. Comparison of the pre and post consumption data will reveal actual savings.
  - Chilled water and Hot water savings related to DCV will be tracked by comparing pre and post air handler air flow and mixed vs supply air temperatures. Using standard engineering equations, heat content rejected or added to the conditioned space can be calculated and related to actual kWh or therms savings.

Table 1: Estimated Project Cost, Rebates, Net Cost, and Annual energy savings

The table below illustrates the estimated costs, rebates, and annual energy savings for each project. The project cost estimates will be trued up when the project is completed and a final cost will be determined.

Description	Project Cost	Utility Rebates	Net Cost	Annual Energy Savings
HWH Boiler	$178,000	$2,100	$175,900	$8,509
HWH Pump's Motors & VFDs	$12,800	$1,500	$11,300	$1,455
Secondary CHW Pump's motor & VFDs	$14,900	$3,000	$11,900	$2,910
Cooling Tower Fan's VFDs	$11,000	$2,000	$9,000	$1,940
AH Guide Vanes, Motors & VFDs	$47,900	$8,000	$39,900	$8,892
CO_2 DCV for AHU 4	$4,700	$2,500	$2,200	$2,779
Total	$269,300	$19,100	$250,200	$26,485

Table 2: Loan Re-Payment Schedule.

The annual loan re-payment is based on the estimated cost of the project, interest rate of 3% and the annual estimated energy savings. Once the project is completed the project costs and estimated energy savings will be trued up and a final loan re-payment schedule will be submitted to the Library. At this time we estimate that the annual loan re-payment amount will be $25,135.61 which is as close as we could get to matching the estimated annual energy savings for the projects. This is done so that the Library can use the energy savings to pay back the loan. The 3% interest rate will cover a limited amount of administrative costs. The loan term is 12 years. The loan re-payment will begin in Fiscal Year 2013. The Library will be invoiced annually by DGS for $25,135.61 (or the trued up cost if different) beginning October 2012 for FY 2013. At anytime the Library may pay back the loan in full with no penalty. The Library must notify DGS that it wishes to pay off the loan and DGS will in turn give the Library the total amount owed.

Loan Repayment Schedule - Central Library

	Enter values
Loan amount	$ 250,200.00
Annual interest rate	3.00 %
Loan period in years	12
Number of payments per year	1
Start date of loan	7/1/2011
Optional extra payments	$ -

	Loan summary
Scheduled payment	$ 25,135.61
Scheduled number of payments	12
Actual number of payments	12
Total early payments	$ -
Total interest	$ 51,427.37

Lender name: Green Facilities Program

Pmt No.	Payment Date	Beginning Balance	Scheduled Payment	Extra Payment	Total Payment	Principal	Interest	Ending Balance	Cumulative Interest
1	7/1/2012	$ 250,200.00	$ 25,135.61	$ -	$ 25,135.61	$ 17,629.61	$ 7,506.00	$ 232,570.39	$ 7,506.00
2	7/1/2013	232,570.39	25,135.61	-	25,135.61	18,158.50	6,977.11	214,411.88	14,483.11
3	7/1/2014	214,411.88	25,135.61	-	25,135.61	18,703.26	6,432.36	195,708.63	20,915.47
4	7/1/2015	195,708.63	25,135.61	-	25,135.61	19,264.35	5,871.26	176,444.27	26,786.73
5	7/1/2016	176,444.27	25,135.61	-	25,135.61	19,842.29	5,293.33	156,601.99	32,080.06
6	7/1/2017	156,601.99	25,135.61	-	25,135.61	20,437.55	4,698.06	136,164.43	36,778.11
7	7/1/2018	136,164.43	25,135.61	-	25,135.61	21,050.68	4,084.93	115,113.75	40,863.05
8	7/1/2019	115,113.75	25,135.61	-	25,135.61	21,682.20	3,453.41	93,431.55	44,316.46
9	7/1/2020	93,431.55	25,135.61	-	25,135.61	22,332.67	2,802.95	71,098.88	47,119.41
10	7/1/2021	71,098.88	25,135.61	-	25,135.61	23,002.65	2,132.97	48,096.24	49,252.37
11	7/1/2022	48,096.24	25,135.61	-	25,135.61	23,692.73	1,442.89	24,403.51	50,695.26
12	7/1/2023	24,403.51	25,135.61	-	24,403.51	23,671.40	732.11	0.00	51,427.37