

# Innovative Designs for Energy Efficiency Activities (IDEEA)

## SCE Community College Retrofit Program (CCRP)

### *Final Program Report*

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*Submitted to:*

William Grimm

Southern California Edison



*Submitted by:*

Richard Fox  
Intergy Corporation  
925.556.2604  
rfox@intergycorp.com





## **Executive Summary**

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The SCE 2004-2005 Community College Retrofit Program was implemented by Intergy with the goal of bringing California Community Colleges into the energy efficiency program arena already shared by the University of California and California State University facilities. Although initially targeted to two community college districts, Los Angeles and San Bernardino, the program ultimately influenced projects at 9 sites from 7 community college districts. The program was selected for implementation in SCE's 2004-05 IDEEA (Innovative Designs for Energy Efficiency Activities) Program. The program has a unique and innovative program design that accomplished long-term peak energy and demand savings, and established a permanent framework for a comprehensive, long-term, energy management program at the 109 community colleges in California.

Leveraging \$1.2 million in funding, the program achieved over 6.4 million gross kWh in energy savings, exceeding its kWh goals by 5% and kW demand reduction goals by over 20%. Projects implemented under this effort include HVAC central plant upgrades, lighting retrofits, retro-commissioning for standard and lab specific systems, personal computer power management applications, and vending machine controls. After a start in early 2005, implementation activities wrapped up in June of 2006.

The program had a strong impact in increasing community college awareness of energy efficiency programs and has proven to be the launching pad for the investor owned utility statewide 2006-2008 Community College Partnership Program.

The Program was initially targeted to three of the colleges in the Los Angeles Community College District (LACCD) – Los Angeles Southwest College, West Los Angeles College, and East Los Angeles College; and two colleges in the San Bernardino Community College District (SBCCD) - Crafton Hills College and San Bernardino Valley College. Prior to the implementation of this program, Community Colleges in California had received limited energy efficiency funding. Instead of targeting all the Community colleges from the start, this program was designed to target a manageable number of colleges in the beginning, with the intent of developing a long-term reliable infrastructure that can be applied to other colleges in the future.

The colleges within SBCCD, over the last two years, had gone through a detailed energy audit of their facilities. As a result of these audits, energy efficiency projects had been identified. Funding constraints had not allowed all of the projects identified in SBCCD to be implemented – funding from this program allowed these identified projects to be implemented. Examples of projects identified within SBCCD included interior and exterior lighting upgrades, chiller plant upgrades, conversion of multi-zone units to variable air volume, and facility commissioning. The Program did not assign any specific co-pay percentage for all projects – it was designed instead to treat each project on a case-by-case basis to determine the minimum required college co-pay amounts. These custom incentives allowed the program to use its funds more effectively and exceed its energy savings and demand reduction goals.



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Program Implementer Name: Intergy Corporation  
IOU: Southern California Edison  
Program Title: The SCE Community College Retrofit Program  
Program Number:

### **1.0 Program Description**

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SCE's 2004-05 Community College Retrofit Program accomplished long-term peak energy savings and demand reduction and helped establish the foundation for the new 2006-08 Community College Partnership Program. The IOU administered partnership program is a statewide permanent framework for a comprehensive, long-term, energy management program at the 109 community colleges in California.

The 2004-05 Community College Retrofit Program provided various energy efficiency retrofits, including lighting and HVAC, to Los Angeles (LACCD), San Bernardino (SBCCD), and other community college districts. The SCE-administered program was implemented by Intergy in close partnership with the college districts.

LACCD and SBCCD were primary partners on the original IDEEA Program proposal, and five sites were initially targeted: East Los Angeles, West Los Angeles and Los Angeles Southwest of LACCD and Crafton Hills and San Bernardino Valley College of SBCCD. After implementation activities commenced, several circumstances changed the program's approach such as the ability to influence bond-funded projects, the timeline to implement projects governed by Department of State Architects, the limited staff resources of the colleges. A revised approach expanded the customer eligibility to include all 41 community colleges within SCE service territory. Ultimately, projects at 9 sites from 7 districts were completed under this program, including several with LACCD and SBCCD which account for about a third of the overall program energy savings. All sites were added with the approval of the SCE program manager, Bill Grimm.

The final list of sites includes: West LA, East LA, and LA Southwest Colleges of LACCD, Crafton Hills College of SBCCD, Chaffey College of Chaffey CCD, Compton College of Compton CCD, Orange Coast College of Coast CCD, Victor Valley College of Victor Valley CCD, and Santa Monica College of Santa Monica CCD.

#### **1.1 Program Goals**

The initial program goals associated with the \$1.2 million budget were 5,896,625 kilowatt hours in net annual energy savings, and an associated demand reduction goal of 867 kW.

### **2.0 Project Overview**

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As the projects completed under the Program were diverse, and some site specific, the following sections offer an overview of the various projects along with their achieved savings. The following table summarizes each project's contribution to the overall program energy savings achieved.

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College	Project	Gross kW Demand Savings	kWh Annual Energy Savings
Compton College	HVAC RCx	209	2,535,823
Crafton Hills College	Lighting and HVAC retrofits and upgrades	238	1,822,918
East Los Angeles College	PC power management	0	464,022
Los Angeles Southwest College	Vending machine controls	0	20,670
Victor Valley College	Vending machine controls	0	85,860
Santa Monica College	Laboratory HVAC RCx	43	379,391
Orange Coast College	Lighting Retrofits	8	20,370
Chaffey College	Central plant upgrade	600	1,067,000
West Los Angeles College	Vending machine controls	0	52,290
<b>Grand Totals</b>		<b>1098</b>	<b>6,448,344</b>

**2.1. *Crafton Hills College, SBCCD—Lighting retrofits and central plant upgrades***

The first projects completed under the program were lighting and HVAC retrofits at Crafton Hills College of SBCCD. The lighting retrofits were comprehensive, including T12 to T8 conversions, LED exit signs, and induction and compact fluorescent exterior lighting. The addition of gym skylights enhanced the lighting retrofits. The HVAC retrofits included interconnecting two chilled hot water plants and a conversion to a variable airflow distribution system. The central plant interconnect physically connected the piping of the two plants, revised the control scheme, and added variable speed drives to the chilled and hot water pumps so the system could maximize chiller efficiency through appropriate load scheduling. The variable air distribution system upgrades added damper controls and variable speed drives to the supply and exhaust fans.

Annual Energy Savings:      1,822,918 kWh                      Demand Savings:      238 kW

**2.2. *Compton College, Compton CCD—HVAC system retro-commissioning***

The single largest project completed under this program was the retro-commissioning of the HVAC system for three Compton College facilities. This project, highlighted in a State of California, Department of General Services *Flex Your Power Newsletter*, involved revisions of the pump and fan schedules. Key to the savings was maximizing the amount of “free” cooling through the following response to a call for cooling: circulate local chilled water loop to satisfy load, circulate main chilled water loop to satisfy load, use thermal ice storage to satisfy load, and finally, operate chiller to satisfy load. By operating the fewest pumps and least chiller capacity to satisfy the load, the system efficiency is enhanced versus the standard operation of the chiller and cooling loops.

The HVAC system efficiency measures also included repairs to water valves, actuator, and other controls as well as reduced motor/pump capacity to accurately match loads.

Annual Energy Savings:      2,535,823 kWh                      Demand Savings:      209 kW

**2.3. *Santa Monica College, Santa Monica CCD—Laboratory retro-commissioning***

One of the more innovative projects of the program was the retro-commissioning of the laboratory airflow system at Santa Monica College. This system has over 50 fume hoods and multiple instructional and research laboratories. Due to code and safety requirements, these laboratories require 100% outside air ventilation without recirculation, also known as “single-pass air.” Accordingly, all air must be conditioned, primarily through mechanical means. Although the single-pass air is necessary, the system at Santa Monica was exceeding the actual ventilation needs and effectively over ventilating the facilities.

This project retro-commissioned the airflow system to eliminate or reduce the over ventilation condition. Multiple fume hoods were repaired to achieve the proper airflow rates, and the overall room airflow balances were adjusted to maintain the appropriate pressure differentials. These efforts reduced the cooling, heating, and fan energy requirements of the system.

Annual Energy Savings:      379,391 kWh                                  Demand Savings:      43 kW

**2.4. *Chaffey College, Chaffey CCD—Central plant upgrade***

At Chaffey College, the project involved building a new central plant to replace a distributed system. The new plant involved the ground up construction of a chilled and hot water plant to serve the entire campus and incorporated interconnections to many of the existing loads. The plant includes two 600 ton chillers and associated cooling towers, four gas fired boilers (not incented under this program), and ten variable speed pumps for water distribution.

By centralizing the mechanical equipment, operational efficiencies were enhanced. The electric energy savings and demand reduction here are based only on the conversion of existing loads over to the new central plant.

Annual Energy Savings:      1,067,000 kWh                                  Demand Savings:      600 kW

**2.5. *East Los Angeles College, LACCD—Surveyor PC power management application***

Another innovative project achieved under this program was the installation of the Surveyor PC Power Management application at East LA College. At this site, client-server applications were installed to actively manage the power settings of approximately 2,000 networked PCs on three primary networks. This application provides control of the native operating system power management features to the network administrators such that energy saving operational profiles can be enacted. At this site, key operational profiles were included for labs, faculty, and administrative work areas. Profiles are completely flexible; sample profiles are:

- Labs:                      Students turn PCs on at beginning of first class, units go into sleep mode during breaks, and units shut down after last class
- Faculty:                Faculty turns PCs on upon arrival, units go into sleep mode after period of inactivity, and units shut down in evening
- Admin:                 Staff turns PCs on upon arrival, units to into sleep mode during lunch, and units shut down in evening

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The system allows users to delay sleep or shutdown through active input, and all work is saved by the operating systems prior to shutdown.

For the Surveyor application, demand reduction was not calculated as no protocol was defined to account for the highly variable timing of when individual PCs would be in operation. For example, all units might be on at peak time during class and lab sessions in afternoon.

Annual Energy Savings: 464,022 kWh                      Demand Savings: no savings protocol

**2.6.        *West Los Angeles College, LACCD—Vending controls***

At West LA College, 41 vending controls were added to the refrigerated cold beverage and snack machines. The vending controls generally act as occupancy sensors for the units, thereby reducing operating hours.

For the vending control measures, demand reduction was not calculated as no protocol was defined to account for the highly variable timing of when individual units would be in operation. For example, all units might be on at peak time during a break between afternoon classes.

Annual Energy Savings: 52,290 kWh                      Demand Savings: no savings protocol

**2.7.        *Los Angeles Southwest College, LACCD—Vending controls***

At LA Southwest College, 13 vending controls were added to the refrigerated cold beverage and snack machines. The vending controls generally act as occupancy sensors for the units, thereby reducing operating hours.

For the vending control measures, demand reduction was not calculated as no protocol was defined to account for the highly variable timing of when individual units would be in operation. For example, all units might be on at peak time during a break between afternoon classes.

Annual Energy Savings: 20,670 kWh                      Demand Savings: no savings protocol

**2.8.        *Victor Valley College, Victor Valley CCD—Vending controls***

At West LA College, 54 vending controls were added to the refrigerated cold beverage and snack machines. The vending controls generally act as occupancy sensors for the units, thereby reducing operating hours.

For the vending control measures, demand reduction was not calculated as no protocol was defined to account for the highly variable timing of when individual units would be in operation. For example, all units might be on at peak time during a break between afternoon classes.

Annual Energy Savings: 85,860 kWh                      Demand Savings: no savings protocol

**2.9.        *Orange Coast College, Coast CCD—Lighting retrofits***

One of the more basic projects completed in the program were the lighting retrofits at Orange Coast College. The lighting retrofits involved T12 to T8, metal halide, and compact fluorescent lighting conversions.

Annual Energy Savings: 20,370 kWh                      Demand Savings: 8 kW

### **3.0 Program Achievements**

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#### **3.1 Program Energy Savings**

SCE's 2004-05 Community College Retrofit Program accomplished long-term peak energy savings and demand reduction, and provided the foundation to establish the IOUs' new 2006-08 Community College Partnership Program. This new program is a statewide permanent framework for a comprehensive, long-term, energy management program at the 109 community colleges in California.

The Community College Retrofit Program provided various energy efficiency retrofits, including lighting and HVAC, to Los Angeles Community College District (LACCD), San Bernardino Community College District (SBCCD) and other community colleges. The project was lead by Intergy in close partnership with the College Districts. For LACCD, three colleges—East Los Angeles, West Los Angeles and Los Angeles Southwest were included. For SBCCD, Crafton Hills College was included. Chaffey College, Compton College, Orange Coast College, Victor Valley College, and Santa Monica College were added to the project with SCE's approval.

Energy efficiency efforts were coordinated with facilities management staff to identify opportunities for improvement. Specific technologies were reviewed, and an onsite audit was performed at each facility to identify the full potential for energy reduction for the individual projects. These included lighting retrofit projects, a fume hood optimization project, HVAC upgrades, and vending miser installations.

The SCE Community College Program had an intended energy reduction goal of 5,896,625 kWh and 867 kW. As can be seen in the table below, the program surpassed the kWh goal by 5% and the kW goal by over 20%.

<b>Performance Goals</b>	<b>kWh Savings Goal</b>	<b>Net kWh Savings Achieved</b>	<b>% of Goal</b>	<b>Gross kWh Savings Achieved</b>	<b>kW Savings Goal</b>	<b>kW Savings Achieved</b>	<b>% of Goal</b>
All Projects	5,896,625	6,190,410	105%	6,448,344	867	1,054	121.5%

#### **3.2 Program Cost Effectiveness**

Including fully loaded program costs, the program achieved a gross dollars per kilowatt hour ratio of \$0.19/kWh. Considering that this includes all administration, marketing, and direct implementation costs and all program incentives, the program would be considered highly cost effective. As most of the implementation involved typical lighting and HVAC measures with lives of 16 years or greater, the leveled cost of \$0.01348 (per kWh) further indicates that the program was highly cost effective.

## **4.0 Program Challenges**

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The Program was very successful in attaining and exceeding its goals – however, there were challenges that needed to be overcome.

### Process for Project Approval and Implementation

One of the challenges was that the overall process time for implementing energy efficiency projects with colleges tended to be lengthy. Process time was difficult to control as it was dependent on various factors within the college like when the school session was open, when college personnel were available to respond to information and data needs, or when the Board of the college was going to meet to decide on a certain project or funding. A customer satisfaction survey found that 3 out of 5 customers returning surveys rated themselves as *Satisfied* or *Very Satisfied* and none rated any dissatisfaction with the program. This indicates that participant satisfaction did not seem to be adversely affected by the long implementation timelines.

For the implementation contractors, 3 out of 3 surveyed rated themselves as *Very Satisfied* for all responses. We received one *Satisfied* response from one contractor regarding the equipment installation inspection process.

### Awareness

There was a lack of awareness amongst college personnel and facility staff regarding funding and incentives available from the utilities. It was challenging to get their attention and educate them about energy efficiency. It was found to be critical that the facility staff not only be closely involved with the project, but “drive” the project from inception. Achieving this level of ownership from the facility staff for these projects significantly improved the likelihood of success. Another lesson learned was to effectively partner with local contractors that have a working relationship with the college facility staff. This strategy had the benefit of not forcing the facility staff to choose amongst contractors – it also had the added benefit of the contractor, who already had an existing relationship with the college, to market the program with the college staff.

### Budget Cuts for Colleges

Capital budgets of the community colleges had been persistently and critically insufficient when it came to investing in cost-effective energy efficiency improvements, resulting in extensive foregone opportunities. The past two years had been particularly difficult for campus energy managers to implement energy efficiency projects. The state budget allocation process had severely strained the campuses’ abilities to manage their energy systems and budgets. This resulted in a large number of colleges not having sufficient funds to provide enough co-pay amounts to successfully implement energy efficiency projects.

## **5.0 Goal Attainment**

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The program successfully delivered and exceeded its goals. These included:

- 105% of the energy efficiency kWh energy savings goal within the original budget.

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- Over 120% of the kW demand reduction goal within the original budget.
- One of the key elements of the program's accomplishments was quality control. It was essential to make sure that the equipment was installed and operating correctly. Toward this goal, Intergy inspected all sites after installation and then verified the installations with the SCE inspector and installation contractor in attendance.
- Achieved a quantum increase in awareness about energy efficiency in the community college arena, ultimately resulting in the IOUs' \$30 million statewide 2006-08 Community College Program.

## **6.0 Lessons Learned**

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The focus of this program has primarily been raising awareness about energy efficiency, cost effective energy efficiency retrofit projects, and building a successful partnership between SCE and California Community colleges. Lessons learned from each of these key areas are briefly discussed below.

### Raising awareness about energy efficiency

The program has been successful in communicating the benefits of energy efficiency to community college facility staff – creation of the over \$30 Million 2006-08 statewide Community College Partnership Program is testament to that. One of the key lessons learned from the program is that upper management must be actively involved. Involving upper management has the benefit of word about the program spreading faster and more effectively. Upper management also has broader public relations objectives – that energy efficiency projects can effectively deliver operational cost savings in today's community college environment. The program was presented in various local college board meetings. This strategy was effective in raising awareness about energy efficiency with a broader audience within the colleges. We learned that increased awareness levels could be achieved by more actively communicating these projects with local media and political figures. Longer program cycles could also help this objective by allowing colleges to establish long term goals for energy efficiency. Increased awareness in community colleges, as a result of this project, may be leveraged to achieve the same results with K-12 schools.

### Delivering cost effective energy efficiency retrofit projects

The program successfully delivered 105% of the energy efficiency kWh goal (and over 120% of the demand reduction kW goal) within the original budget. One of the key lessons learned from the program, towards achieving this goal, was to closely partner with local college facility staff from the inception of the project. Colleges tend to be different than businesses – where audits can be scheduled and implementation completed with broad overview by the business owner. Most colleges have dedicated facility staff with detailed knowledge and expertise about their energy usage. It is critical that the facility staff not only be closely involved with the project, but “drive” the project from inception. Achieving this level of ownership from the facility staff for these projects significantly improves the likelihood of success. Another lesson learned is to effectively partner with local contractors that have a working relationship with the college facility staff. This strategy has the benefit of not forcing the facility staff to choose amongst

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contractors – it also has the added benefit of allowing the contractor, who already has a relationship with the college, to market the program within the local college. Lastly, involvement of contractors that have established relationships with the college effectively speeds up the completion for the project – given that they are closely aware of the internal college processes to move projects through to completion. These broad strategies used by Intergy to meet its goals could effectively be utilized to introduce and complete energy efficiency projects with other market sectors.

### Creating successful partnerships between SCE and Community Colleges

Colleges are under increased pressure to complete energy efficiency, renewable energy, and demand response projects. Establishing a successful partnership between SCE and the colleges has been one of the key successes of this program. This program has proven to be the launching pad for the statewide 2006-2008 Community College Partnership Program. One of the key lessons learned from the program is to effectively establish a team including an SCE assigned account representative, Intergy, and the college facility staff. This team approach ensures that each party is fully aware of the strengths and weaknesses of each member – thus effectively assigning team roles and responsibilities for the current and future projects. Creating successful partnerships also ensures that the structure can be leveraged to complete projects in other educational segments – for example K-12 schools and preschools.

## **7.0 Program Improvement Recommendations**

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The program was successful in that it achieved 105% of the kWh energy savings goal within the original budget and within the established timelines. Included below are some broad recommendations for improving program performance:

Longer program cycles – Given their structure, community colleges typically have longer decision cycles. Budget approval processes, at higher dollar values, are longer and could take 6 months to a year to be completed. Hence, it is important that IOU programs have longer program cycles than, in this case, the limited 2 year IDEEA Program duration. This will allow bigger and more comprehensive projects to be considered and completed.

Integrated approach – Given the recent budget and administrative environment, community colleges tend to consider an integrated approach to demand reduction – which includes energy efficiency, demand response, and renewable energy sources. It is important that SCE implements more comprehensive approaches that integrate these three approaches. Initial outreach, audits, and implementation should be inclusive of these three broad elements – funding strategies should also consider all three elements in the future.

Combine with water efficiency and recycling – There is an increasing desire in community colleges to be more environmentally responsible. This includes energy efficiency, water efficiency, and recycling strategies. Currently there are completely different entities that pursue and coordinate these elements. It would be efficient for a combined approach and value proposition to colleges – that are inclusive of strategies considering a combination of energy efficiency, water efficiency, and recycling.

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Increased focus on performance contracting – Community colleges are constantly being contacted by ESCOs to do performance contracting. Given the recent availability of state bond monies, quite a few colleges are either considering or have already implemented performance contracting. Having SCE programs that are aware of performance contracts and are, as in this program, flexible enough for integration with performance contracting will allow for more energy efficiency projects to be implemented.