Southern California Edison
Customer Technology Application Center
Profile #84

Executive Summary

Southern California's Customer Technology Application Center (CTAC) represents a new wave in demand-side management for several reasons. The facility, fully one-acre in size and located just 30 miles east of Los Angeles, not only promotes energy-efficient technologies but provides industrial customers with critical services related to environmental compliance. Without CTAC, Edison may have lost several major accounts because of these customers' inability to remain profitable while implementing costly pollution prevention technologies. CTAC has not only served to enhance Edison's other DSM programs, and to provide customers with energy and money saving solutions, but serves as a critical economic development tool for Southern California.

The facility itself houses several "centers," each targeted for specific customer classes. Architects, builders, and contractors can visit the Home Efficiency Center to see demonstrations of energy-efficient lighting, and heating and cooling. The home demonstrates energy-efficient appliances, steel stud construction, wiring schemes, and proper insulation and duct installation, as well as an electric vehicle parked in its garage! The Commercial Technology Center features efficient technologies such as heat pumps, thermal energy storage systems, efficient HVAC systems, and commercial food technologies.

The Center's central purpose is to bridge the gap between technology development and commercialization of efficient electric technologies which result in a beneficial air quality impact. As such, the Industrial Technology Center is perhaps CTAC's best known, promoting advanced infrared curing technologies, for example, which reduce emissions of volatile organic compounds as regulated by the South Coast Air Quality Management District. In several instances, CTAC's role with process efficiency applications, from ultraviolet curing to infrared drying to the use of robotics, has been critical for industrial customers, literally making the difference between relocation and profitability within the region.

CTAC also contains a Lighting Design Center which showcases hundreds of advanced lighting products which customers can see in specific applications. Another center focuses exclusively on electromagnetic fields. CTAC also contains meeting rooms, an auditorium, and a resource library, each important ingredients in its overall success. By bringing these centers together, CTAC serves several important functions concurrently, providing a powerful model of a new and important utility customer service role in a dynamic utility industry.

SOUTHERN CALIFORNIA EDISON
Customer Technology Application Center

Sector:	*Residential, Commercial, Industrial*
Mechanism:	*Promotes energy-efficient technologies, environmental solutions, and customer economic competitiveness. Six centers provide customer education through research and demonstrations to support other SCE DSM programs especially related to industrial customers' air quality compliance*
The Centers:	*Industrial Technology, Home Efficiency Building, Lighting Design, Commercial Cooking, EMF Education, Commercial Technology*
History:	*Research and development in 1988; Opened in January of 1990*

1993 PROGRAM DATA

Total operating costs:	*$4.3 million*
Total visitors:	*27,052*

CUMULATIVE DATA (1990-1993)

Total operating costs:	*$24 million*
Total visitors:	*>106,000*

CONVENTIONS

For the entire 1994 profile series all dollar values have been adjusted to 1990 U.S. dollar levels unless otherwise specified. Inflation and exchange rates were derived from the U.S. Department of Labor's Consumer Price Index and the U.S. Federal Reserve's foreign exchange rates.

The Results Center uses three conventions for presenting program savings. ANNUAL SAVINGS refer to the annualized value of increments of energy and capacity installed in a given year, or what might be best described as the first full-year effect of the measures installed in a given year. CUMULATIVE SAVINGS represent the savings in a given year for all measures installed to date. LIFECYCLE SAVINGS are calculated by multiplying the annual savings by the assumed average measure lifetime. CAUTION: cumulative and lifecycle savings are theoretical values that usually represent only the technical measure lifetimes and are not adjusted for attrition unless specifically stated.

SCEcorp, with assets of more than $21 billion, is the parent holding company of Southern California Edison Company and three non-utility subsidiaries collectively known as The Mission Companies. The Mission Companies include Mission Energy Company, one of the nation's largest non-utility power producers, Mission First Financial, and Mission Land Company. Southern California Edison Company (SCE), the largest subsidiary with over 16,400 employees, is the nation's second largest electric utility based on the number of customers. The 108 year old investor-owned utility serves more than 4.1 million customers in central and southern California. Its service territory covers 50,000 square miles and is home to more than 11 million people.[R#1]

SCE 1993 STATISTICS	
Number of Customers	*4.12 million*
Energy Sales Revenue	*$7.40 billion*
Energy Sales	*73,308 GWh*
Summer Peak Demand	*16,475 MW*
Generating Capacity	*20,606 MW*
Reserve Margin	*20 %*
Average Electric Rates	
All Customers	*10.1 ¢/kWh*

In the past four years the Los Angeles area has been especially hard hit with both natural and social disasters, impacting SCE's operations and taxing its ability to provide reliable services. Fires, flooding, mudslides, riots, and earthquakes have had catastrophic repercussions throughout the area. Then on January 17, 1994, the biggest recorded earthquake in Los Angeles history, 6.7 on the Richter scale, hit the urban area. Initially, more than one million SCE customers lost power. SCE worked around-the-clock, logging over 30,000 hours, and restored virtually all service within 24 hours after the earthquake, a truly remarkable accomplishment. SCE sustained damage to two major substations northeast of Los Angeles. The utility's gas-fired powerplant at Ormond Beach near Oxnard also suffered some damage. Edison officials say current estimates of the total damage are very rough, but "it most likely is under $100 million," according to Kevin W. Kelley, an SCE spokesman.[R#6]

In 1993, SCE generated 73,308 GWh and had gross operating revenues of $7.4 billion. Of the total energy sold 63.2% was generated from utility-owned facilities and 36.8% was purchased power. SCE takes great pride in its diverse resource mix. Some 10 power supplies comprise their unique amalgam. Twenty-four percent of SCE's generation is from oil and gas; 22% is from nuclear; 14% is from coal; 3% is from hydro; 37% is bought from other utilities and other power producers. In 1992, SCE's purchases from other producers included 15,988 GWh from cogeneration, 1,866 GWh from biomass generation, 1,598 GWh from wind, 5,820 GWh from geothermal, and 695 GWh from solar generation.[R#5]

Utility DSM Overview

Southern California Edison (SCE) is one of the nation's leading utilities in demand-side management. SCE has offered DSM programs since the mid-seventies and has pioneered in many areas, paying particular attention to data collection and evaluation. After sharing the national leadership for energy efficiency with Pacific Gas & Electric in the late 1970s through the mid 1980s, Edison like PG&E reduced its DSM expenditures in the late 1980s citing its excess capacity situation.

SCE DSM PROGRAMS

Residential

Energy Management Services
Action Line
Rate Communication
Conservation Financing Progam
Residential Energy Management Incentives
Low-Income Custsomer Assistance
Residential Energy Surveys
Compact Fluorescent Bulb Campaign
Super Efficient Refrigerator
California Home Energy Rating System
Appliance Rebate
Water Heater Blankets
Low Flow Shower Heads
Water-Energy Conservation Partnership
Appliance Efficiency Incentives
New Construction
Direct Assistance

Nonresidential

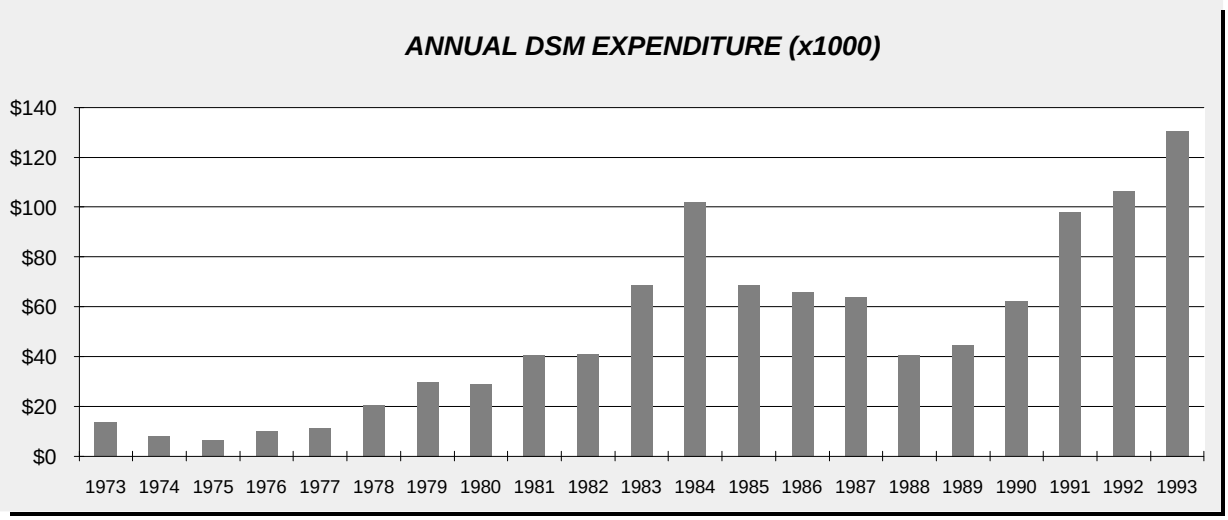
Commercial and Industrial Lighting
Commercial and Industrial HVAC
Commercial and Industrial Motor
Commercial and Industrial Audit

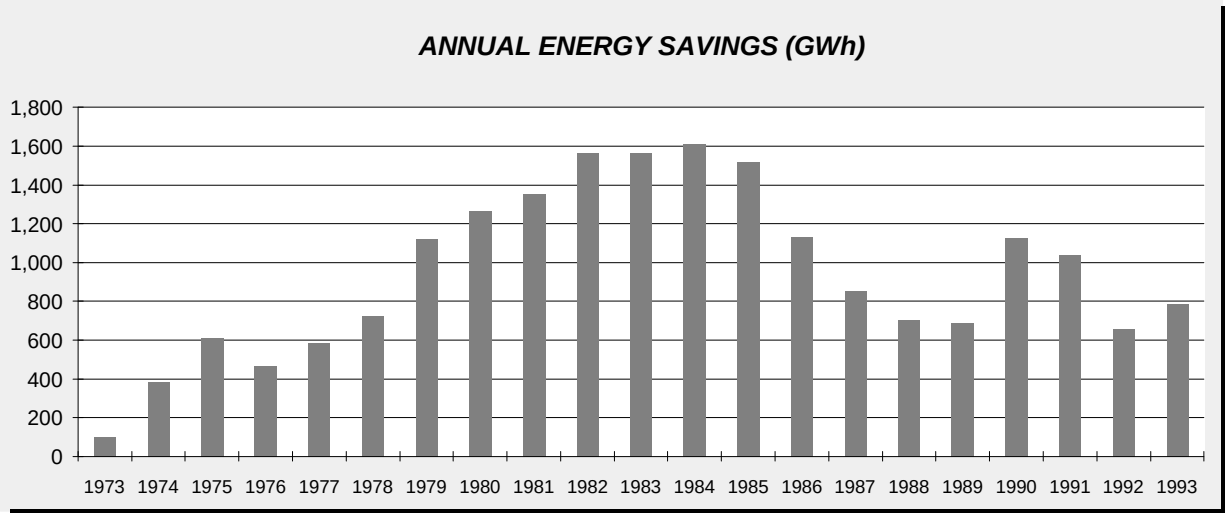
Other

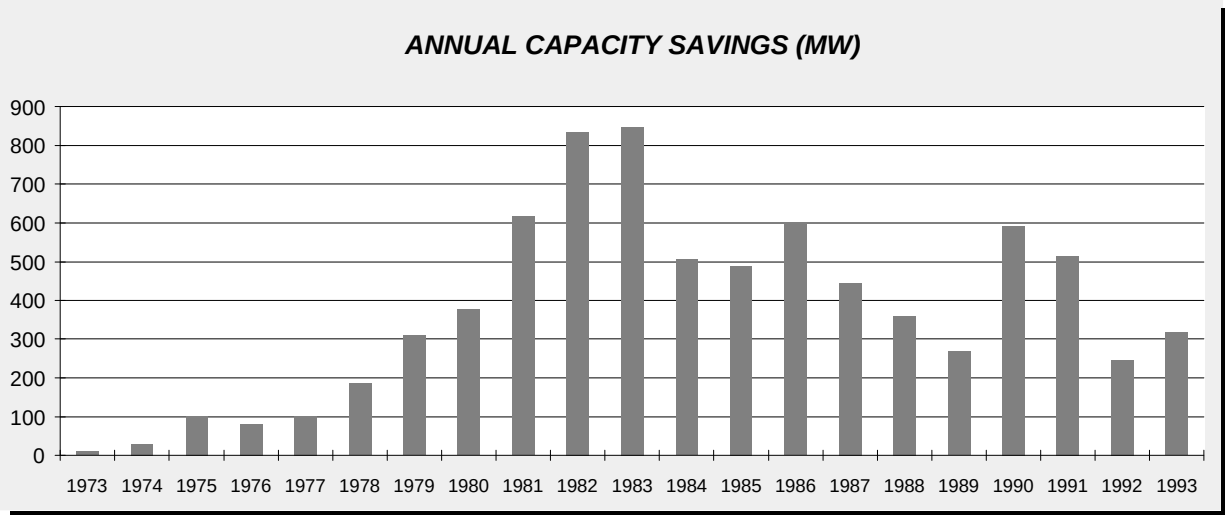
Customer Technology Application Center
Energy Efficiency Rate Structure
Trees Forever
Commercial, Industrial, Agricultural Audit
Air Conditioner Inspection and Maintenance
Energy Management Hardware Rebate
Design For Excellence

DSM OVERVIEW	DSM EXPENDITURE (x1000)	ENERGY SAVINGS (GWh)	CAPACITY SAVINGS (MW)
1973	$13,541	96	10
1974	$7,953	383	29
1975	$6,316	609	100
1976	$9,877	467	80
1977	$11,215	586	101
1978	$20,447	720	184
1979	$29,705	1,121	308
1980	$28,868	1,267	377
1981	$40,835	1,351	616
1982	$40,903	1,565	835
1983	$68,762	1,568	848
1984	$102,019	1,610	505
1985	$68,630	1,518	489
1986	$65,708	1,131	602
1987	$63,969	849	445
1988	$40,768	700	360
1989	$44,568	683	268
1990	$62,000	1,129	591
1991	$97,708	1,039	514
1992	$106,143	658	246
1993	$130,700	783	317
Total	$1,060,635	19,833	7,825

SCE then increased its DSM spending starting in 1990 thanks to the influence of the California Collaborative. In 1992 and 1993, SCE's investments in DSM were equal to 1.4% and 1.9% of its gross revenues respectively. SCE's total expenditures for DSM for 1992 and 1993 combined were $236 million. In 1993 SCE's DSM programs yielded energy savings equal to 1.1% of the total energy demand. These programs also yielded peak capacity savings equal to 1.9% of the utility's peak demand.[R#1] ■







Program Overview

Southern California is faced with the nation's poorest air quality and exhibits one of the most congested transportation systems in the United States. This has prompted tougher clean air legislation for the South Coast Air Quality Management District of Southern California which in turn has created a financial burden on SCE's industrial customers. Less stringent out of state air emission standards has created stiff competition for SCE, enticing longtime customers to move from SCE's service territory.

Thus, in 1988, SCE sought and received regulatory approval to research and develop technology programs which provide for greater energy productivity and environmentally-compliant solutions to the challenges of its customers. SCE also believed electric technologies could add customer value by improving process and production efficiency and reducing costs. In order to fully research and develop beneficial uses of electricity under the direction of the Research Department, SCE constructed the Customer Technology Application Center (CTAC) which opened in January of 1990.

CTAC promotes energy efficiency, environmental solutions, and customer competitiveness through demonstrations, education, and supporting programs. CTAC also supports SCE's demand-side management programs by offering technology demonstrations, workshops, seminars, and training and information to commercial, industrial, agricultural, and residential customers as well as employees. The Center also plays an important customer services role by providing a physical location for meetings.

The CTAC facility is 44,875 square-feet in floor area and is located in Irwindale, California about 30 miles east of Los Angeles. It houses five individual centers along with other support facilities. They include the Commercial Technology Center which features working demonstrations of energy-efficient heat pumps, thermal energy storage, and energy management systems; the Lighting Design Center which showcases over 200 energy-efficient lighting applications; the Commercial Cooking Center which demonstrates the latest in efficient electric cooking equipment plus lighting and HVAC systems for the food service customer; the Home Efficiency Center which features indoor and outdoor lighting, heating and cooling, thermostats, strategic landscaping, recycled building products, alternative building technologies, home automation, and efficient appliances; and the Industrial Technology Center which provides sophisticated measurement of equipment efficiencies and instrumentation for emissions monitoring. It also includes an environmentally-controlled room featuring temperature and humidity control, robotics and process efficiency applications including microwave/radio frequency drying and baking. CTAC also houses a Technical Resource Library. The Electric and Magnetic Fields Education Center provides information on the science and issues surrounding EMF. The Learning Center is a 100-seat facility featuring podium control for complete audiovisual needs.[R#2]

CTAC's central purpose is to bridge the gap between technology development and commercialization of efficient electric technologies which result in a beneficial air quality impact and reduced cost. Thus it works in close collaboration with the Environmental Protection Agency, California Public Utilities Commission, South Coast Air Quality Management District (SCAQMD), California Air Resources Board, California Energy Commission, and other regulatory agencies. CTAC has stemmed the potential loss of commercial and industrial customers who considered leaving SCE's service territory or installing their own electric generating systems to reduce power costs. By helping to demonstrate the advantages of various energy-efficient technologies to Edison customers, CTAC is fulfilling its mission of technology transfer and customer satisfaction.

The credibility of CTAC's staff plays a key role in its success. This success is based upon the technology specialists' and consultants' abilities to reduce complex technologies to understandable components for customers and to explain the relative advantages and disadvantages of particular technologies. The specialists help customers analyze their energy costs related to specific end-uses, including the energy and financial returns on their retrofit investments. The staff hopes to sensitize customers to energy technology issues and create a linkage between environmental awareness and SCE goals.

CTAC is not only regarded in Southern California as a positive model for the promotion of the wise use of energy, but has also attracted a good deal of well-deserved national attention. Among the awards that CTAC has received are Renew America's Environmental Achievement Award 1992, SCAQMD's Clean Air Award for Public Education Program on Air Quality Issues, and the California Council on Partnerships Red Tape Project Award. [R#3]

For many years California's emissions requirements for automobiles have been tighter than national standards, causing manufacturers to fit cars with advanced emissions control systems. Now requirements limiting air pollutants of all kinds – with a new focus on stationary sources – are creating even greater market transformations in Southern California. CTAC is part of this transition, assisting SCE's customers with emissions requirements. In fact, internally to the utility, the clean air requirements have created a new way of thinking about demand-side management. DSM is now being used as a highly important economic development tool. SCE and its CTAC staff in particular are attempting to keep industrial customers in Southern California by helping them comply with tough air quality standards while simultaneously fostering their economic prosperity.

THE SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

In November 1990, the U.S. Congress enacted a series of amendments to the Clean Air Act intended to intensify air pollution control efforts across the nation. One of the primary goals of the amendments was an overhaul of the planning provisions for those areas not currently meeting National Ambient Air Quality Standards. It called for market-based implementation of regulations by Federal and State regulatory agencies.

By these laws, the South Coast Air Quality Management District (SCAQMD), established in 1976, is required to develop a Federal Attainment Plan for ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, PM10, sulfate, and lead, to achieve and maintain healthful air quality for its residents. This is accomplished through a comprehensive program of planning, regulation, compliance assistance, enforcement, monitoring, technology advancement, and public education.[R#9]

SCAQMD is the air pollution control agency for the four-county region including all of Los Angeles, Orange and Riverside counties, and the non-desert portion of San Bernardino County. This area, 13,350 square miles, is home to more than 13 million people, or about half the population of the State of California, and is the second most populous urban area in the United States. Pollution from over 9 million motor vehicles, thousands of businesses and industries, and countless consumer products, creates an unfortunate smog factory.

While the California Air Resources Board is responsible for controlling mobile sources of emissions in the South Coast, such as cars, buses, trucks, and trains, SCAQMD is responsible for controlling emissions for stationary sources of air pollution. Stationary sources include anything from large power plants and refineries to the corner gas station. There are about 52,000 of these businesses in the four-county area emitting about 40% of the total air pollution. Because this area's smog problem is so severe, the SCAQMD often finds itself at the forefront of the nation's efforts to reduce air pollution.[R#10] ■

CASE STUDY: SUNSHINE BISCUITS

Sunshine Biscuits makes crackers and cookies in the Los Angeles area. The problem they faced was one of air quality compliance and the need for product improvement. After a visit to CTAC and under the guidance of its specialists, they installed a 100 kW radio frequency post-baking oven, replacing a convection oven to complete the drying cycle on their crackers. By doing so the company was able to increase its production rate by 30%, meet air quality standards, and save 600 barrels of oil per year plus $715,000 in operating and maintenance costs per year. This high efficiency technology switch also improved cracker quality by providing more precise moisture control.[R#3]

CASE STUDY: MILLER BREWING COMPANY

Miller Brewing Company located in the Southern California area needed to meet air quality regulations, wanted to reduce compliance costs, and still maintain their competitiveness in the beer industry. At CTAC's suggestion, they solved their problem by installing a 65 million Btu low NOx burner. The low NOx burner enabled Miller to reduce NOx by 22 tons per year per boiler, reduce SCAQMD compliance costs by $1.8 million per boiler, and defer 5.6 MW of cogeneration.[R#3]

MARKETING

SCE's Customer Technology Application Center, like other utility-run energy resource centers, provides a fundamental reorientation to marketing energy efficiency. Rather than promoting individual technologies through incentive-based campaigns and prescriptive paths using conventional "market push" strategies, CTAC is grounded in a needs-based "customer pull" strategy where technologies are deployed for those situations where they will provide the maximum benefit. While customizing measures and technologies for specific customers on a reactive basis, it also provides for a proactive orientation, assessing and addressing customers' unique environmental and economic needs.

Fundamental to getting customers in the door is CTAC's location. When SCE staff were deciding where to put the facility they used a 12-point criteria which strongly emphasized customer access. Not only did SCE want to locate the Center within a half hour of SCE's headquarters, but it wanted to provide customers with easy freeway access in a central location.

To make maximum advantage of the Center a wide range of marketing tools has been employed. One tool is CTAC's information packet which contains fact sheets on the facility and its centers. SCE has also produced a 10-minute video that introduces customers to the facility, all its displays and centers, and a broadcast of advantages that it can offer via efficiency. Promotional press releases that update the latest technologies and happenings at CTAC are sent to customers, other utilities nationwide, and manufacturers. CTAC also participates in Earth Day and other events, lending demonstrations of energy-efficient technologies and providing comprehensive information wherever possible. The staff has also developed and installed energy-efficiency exhibits at the SCE San Dimas office and the SCE Mammoth Service Center.

Media coverage for CTAC has been bountiful and positive. For example, in the past three years CTAC has appeared in the Los Angeles Times, the San Gabriel Tribune, the Pasadena Star News, the L.A. Business Journal, Industrial Finishing Magazine, Sunset Magazine, and the EEI Press tour. In addition CTAC has been featured on local and regional television and radio stations. This media coverage has raised the Center's profile among large customers and has enlightened many other customers about the Center's existence and function.

A major portion of CTAC's marketing is directed towards the industrial sector. To this end, the staff began by familiarizing industries with the new technologies available by conducting seminars and workshops for such groups as the Southern California Finishers and Fabricators Association. Demonstrations were conducted using waterborne, ultraviolet, and powder coatings for interested manufacturers. For example, CTAC in a joint effort with SCAQMD and the California Furniture Manufacturing Association, evaluated low-volatile organic compounds coatings for the wood furniture industry. Research at CTAC identified some very good waterborne coatings that can lower emissions and provide high quality products. In fact, the promotion of these test results have had national impacts on the wood furniture industry.

Specific to SCE and CTAC's collaboration on the Clean Air Coatings Technologies program, staff found a base of 23,000 manufacturing and industrial customers in SCE territory that could benefit from the program. By using telemarketing, direct mail, symposia, trade shows, field customer contacts, and trade ally partnerships, SCE has successfully marketed the program, explaining what it is and how it works, and introducing the new clean air technologies.

The Industrial Technology Center staff, in partnership with the Lawrence Livermore National Laboratory, also developed an informational program, including filming at CTAC, describing and demonstrating new technologies and compliant coatings. The entire program was transmitted via satellite to five community colleges in California and three sites on the East Coast. Through the use of uplinking, CTAC and Lawrence Livermore were able to contact more than 1,000 participants in several different locations. More of these satellite transmission "classes" are planned for 1994.

CTAC OUTREACH

CTAC has been featured in nationally-televised program segments and 10 national publications. The staff also has shared expertise on using CTAC as a tool to promote energy efficiency and support conservation programs with six California utilities, 17 U.S. utilities, 20 international utilities, and dignitaries from 19 foreign countries.

CTAC continues to be monitored by other utilities, specifically Pacific Gas & Electric, Electricite de France, San Diego Gas & Electric, Commonwealth Edison, Arizona

Public Service, and the Northwest Utility Group for development of similar facilities. Mexican and Canadian agencies have also tracked CTAC's progress.[R#2]

DELIVERY

Technology exists to improve air quality, comfort, convenience, product quality, workplace productivity, and energy utilization and efficiency. What has been lacking is a place and method to aid in the implementation of these technologies for industry and the public. CTAC has been this conduit for implementation.

The facility has been equipped with tested, commercially available electric and gas technologies, and a wealth of information about them. Once a customer becomes aware of the advantages of a particular technology demonstrated or displayed at CTAC to improve their operations, they may choose to work with the Industrial Technology specialists by providing a sample of their product. Different types of coatings are applied to the product until it meets the customer's specifications.

In addition to promoting technology transfer through demonstration and product application, CTAC also supports SCE's ongoing DSM programs. Customers that are interested in lighting, for example, can learn at CTAC and then are directed to Edison's existing lighting incentive programs. Through unbiased demonstrations, training, seminars, technical research, and cooperation with SCE's DSM programs, CTAC can help to determine the ability of new technologies to meet customer needs. Potential risk to the customer is reduced when the technology can be demonstrated and evaluated.

THE INDUSTRIAL TECHNOLOGY CENTER

One of the areas severely affected by the business environment in Southern California deals with heating, drying and curing technologies. The extremely large number of companies that apply a coating and/or perform a cleaning operation are drastically impacted by state, local, and federal regulations.

In November 1990, the SCAQMD enacted a series of rules and regulations which affected major industrial segments such as printing, coatings, aerospace, and wood furniture manufacturing. Rule 1130 applies to the printing industry, 1136 applies to wood furniture and cabinet coating operations, 1107 to coating of metal parts and ☞

CASE STUDY: HENDRY TELEPHONE PRODUCTS

Hendry Telephone Products of Goleta, manufactures metal telephone equipment racks. They wanted to streamline their finishing operations by moving the equipment through the powder coating booth and the curing oven in one continuous process. A system with those capabilities would require an expensive convection oven and a larger building. After meeting with their Edison technology representative, a team from CTAC and Energy Services was assembled to solve the problem. Together, the team recommended a new curing system, a hybrid gas convection/infrared oven, which cured powder paint in less than 14 minutes. The new equipment, which fit into the existing building, utilized the best from gas and electric technologies. It resulted in reduced air pollutants and increased production capacity by more than 300 percent. With the new finishing system, powder paint cured by the hybrid oven, Hendry will save almost $143,000 each year in finishing costs. Also, the new oven has reduced emissions of nitrogen oxides by 34%, a significant reduction over the conventional oven. The new oven also uses 14% less energy.

CASE STUDY: TOM ANDERSON GUITARWORKS

Anderson Guitarworks is a small company of 15 employees which manufactures custom-made guitars. Located in Newbury Park, they wanted to bring their finishing operation in-house without introducing the objectionable odors and discomforts usually associated with a solvent-based paint operation. Working with their Edison technology representative and CTAC the company discovered ultraviolet curable coatings with low emissions and odors to be a viable solution. After trying numerous coatings Anderson Guitarworks invested $50,000 in a new spray booth, a high volume low pressure spray gun, and an ultraviolet curing booth to apply and cure the sealers and topcoats, thereby bringing them into compliance and improving their productivity. Because of their innovation in converting to compliant coatings and curing technologies, the company saved both time and money, including 30% cost savings, and the process provided even greater flexibility and control in achieving the perfect guitar.

products, and 1109 to strict record keeping. More than 1,700 wood product manufacturers in the South Coast Basin, for example, emit over 22 tons each day of ozone-forming volatile organic compounds from paints, stains, lacquers, and solvents. New rules require cutting ozone-forming pollution from wood product makers by 20 tons per day or more than 90% by 1996.[R#3]

CASE STUDY: PROPAK-CALIFORNIA

Propak-California produces millions of plastic bottles and containers at its Gardena facility. They also produce silkscreen labels on about 20 percent of its products. When new air quality regulations required low solvent coating, the company discovered inks that were free of reactive organic compounds (ROCs) cured with ultraviolet light. With the help of SCE's Energy Services Department and CTAC, Propak invested in UV curing systems and ROC-free inks, bringing production into air quality compliance along with added benefits. The smaller UV curing systems replaced large electric resistance drying ovens, freeing up 5,000 square feet in the facility to be used for additional production. Additionally, the new energy-efficient UV systems reduced the company's electricity use significantly.

These regulations created the thrust behind CTAC's development of The Industrial Technology Center (ITC). The Center boasts the latest electric technologies for heating, curing, and drying manufactured industrial products. The technologies include ultraviolet curing, infrared heating, radio frequency curing, and microwave drying. Besides reduced emissions, the new technologies promise rapid cure rates, low processing temperatures, durable finishes and improved product performance, which results in overall product quality and operating efficiency improvements and reduction in energy cost. So, not only do select technologies alleviate air emissions, but they can also use less energy.

The ITC also displays three different lighting systems and 20 different fixtures appropriate for industrial applications that allow customers to compare applications of various energy -efficient lighting systems.

One of the most innovative programs at CTAC is SCE's Clean Air Coatings Technologies program. Program staff work hand-in-hand with the Industrial Technology Center and together offer significant benefits to industries such as furniture manufacturing, wood finishing, metal coating, automobile refinishing, electronics, printing, adhesive applications, aerospace, and cleaning and degreasing operations through the demonstration and use of energy-efficient technologies and compliant coatings. SCE is the only utility in the nation to have such a program.

The Industrial Center is set up as a laboratory for SCE's customers. There customers can actually bring in their product, be it a piece of furniture, a golf club, a wheel or even a credit card, and with the assistance of technology specialists can use the coating and curing equipment on their product. Then they can test the results of using ultraviolet light curing, infrared drying, powder coating or water-based finishes and determine the best method for their specific situation.

In 1992, more than 40 industrial companies accepted SCE's invitation to bring in product samples and experiment with the latest formulation in powder, high solids, waterborne, and radiation-cured surface coatings as well as infrared and ultraviolet curing technologies using the expertise available at CTAC. In 1993 the number of participants more than doubled. Of the 150 companies who worked with the ITC in 1992 and 1993, about one-third of those companies made one or more process changes as a result. Naturally CTAC serves as a particularly valuable resource for those businesses who do not have their own test and evaluation facilities.[R#3]

THE COMMERCIAL TECHNOLOGY CENTER

The Commercial Technology Center (CTC) promotes efficient end-use technologies to commercial customers. Within this division is the state-of-the-art Lighting Design Center as well as a Commercial Cooking Center and a Foodservice Demonstration Center. The CTC also displays an internal combustion engine replacement exhibit that promotes replacement of combustion engines motors with environmentally compliant and efficient electric motors. Promoting technologies in heating, ventilation, and air conditioning is CTC's demonstration of high efficiency heat pumps. Additionally, an ice-sphere thermal energy storage system, which uses energy at night in off-

peak hours to create ice which in turn is used for cooling during the day, provides backup cooling during peak consumption periods. Computers provide data on equipment efficiency comparisons for a variety of heating and air conditioning equipment.[R#3]

THE LIGHTING DESIGN CENTER

Due to the importance of high quality, energy-efficient lighting for businesses, CTAC created the Lighting Design Center to be used by its commercial and industrial customers and the professional lighting design community. It is one of the largest and most comprehensive of its type in the western United States. (See also Profile #27 on the Northwest Lighting Design Lab.) The Center displays many different fixture types and systems including new low-brightness fluorescent parabolic troffers, compact fluorescent downlights, T-8 lamps, and commercially available metal halide and high pressure sodium downlights. Large walk-in booths where the colors of various lamps can be compared are a highlight of the Center. Here, over 60 different lighting color temperature applications can be compared side-by-side.[R#3]

Extensive displays of incandescent, fluorescent, and high-intensity discharge lamps show not only lamp types, shapes, and sizes but also the operating characteristics of each of the sources. Merchandise lighting is demonstrated by a full-size show window, complete with mannequin, that shows how these important display areas can be effectively lighted with high-efficiency lamps and fixtures at wattage levels considerably below those of previous equipment.

THE COMMERCIAL COOKING CENTER

Also within the CTC is the Commercial Cooking Center which displays a production/test kitchen that is available to manufacturers and customers for demonstration and testing of new ideas and equipment. Food Service Specialists at CTAC can assist in the retrofit or design of a customer's facilities. It not only provides a demonstration for customers who buy restaurant equipment, but also as an act of hospitality, provides on-site catering to the energy decision-makers who visit the Center.

The Commercial Cooking Center also works in conjunction with SCE's demand-side management programs. SCE's Commercial Cooking Program also known as "Culinary Connections" is designed to inform SCE's more than 20,000 food service customers about the availability of energy-efficient electric cooking equipment. CTAC's Cooking Center promotes this program through its equipment demonstrations, seminars, trade shows, and design projects.

The Foodservice Demonstration Center (FDC) accommodates the needs of small and large foodservice customers such as hospitals, schools and correctional facilities. The FDC provides electric cooking equipment for demonstration in a state-of-the-art kitchen equipped with seating for 50 people along with cameras for videotaping and audience viewing as the food is prepared by chefs.[R#3]

THE HOME EFFICIENCY CENTER

The Home Efficiency Center's (HEC) primary feature is a mockup of a home that presents sophisticated energy-saving technologies with elaborate home automation systems designed to reduce costs while making the home environment more safe, more comfortable, and more enjoyable. The home features energy-efficient appliances, heat pumps, conservation materials, recycled building materials, and alternative building technologies. The garage contains an electric vehicle along with its recharging unit.

CTAC's former Residential Technology Center (RTC) used a House-of-the-Future as a promotional tool for SCE's demand-side management programs. A cooperative venture between SCE and four local builders has resulted in the completion of over 35 prototype House-of-the-Future homes. In Phase 1 of the program, homes are each equipped with a unique touch screen home automation system which controls such items as heating and air conditioning, interior and exterior lighting, and security system. In Phase 2, the prototype homes stress not only energy efficiency through sophisticated home automation technologies, but also water reduction. SCE's goal is to reduce domestic water consumption by a minimum of 25 percent through the use of advance fixtures and the home automation system's electronic controls. Also included in the House-of-the-Future project were energy-efficient washers and dryers, refrigerators, electric ranges, computerized security and lighting systems, and a heat pump control system that efficiently regulated a home's temperature.[R#3] ☞

While the House-of-the-Future was a marked success, it was simply too small to effectively handle the number of visitors who came to tour the home. The home was 1,000 square feet, making it difficult to accommodate mid-sized and large tours, and also making it difficult to change-out appliances with their more advanced counterparts. Ruby Irigoyen, CTAC Manager, noted that keeping the house equipped with the state-of-the-art technologies was difficult since the house was so small it was physically difficult to change out washing machines and other appliances quickly and in an aesthetically pleasing way.

CTAC has replaced the House-of-the-Future with a larger residential demonstration. While not a complete house structure, the new facility will allow for larger tour groups and for new and advanced appliances and technologies. By easing space constraints, the "house" will be able to provide a larger array of displays. For instance, the facility will have metered appliances to demonstrate energy consumption levels. The "house" will have a refrigerator produced by Whirlpool, the winner of the SERP (Super Efficient Refrigerator Program) competition. The "house" will also have a residential lighting display, and walls will be exposed to show metal and wooden studs, insulation, wiring systems, and ducts. By demonstrating to builders how to properly install ducts, CTAC will work to alleviate shoddy duct installations, a major source of energy loss in homes in southern climates. (For more information on duct testing and repair, see Profile #51)

THE LEARNING AREA

The 100-seat Learning Area is a multi-purpose conference room and a central exhibit area that promotes information exchange among vendors, trade and professional associations, commercial organizations, and public policy groups as well as SCE customers and employees. In 1991, the Learning Area hosted 12 South Coast Air Quality Management District seminars for SCAQMD officials, commercial and industrial customers, city and school representatives, and vendors and manufacturers. The Clean Air Coatings Technologies program sponsored over 20 seminars directed toward the autobody industry, printers, and wood furniture finishers and manufacturers. In 1992 and 1993 combined, over 150 seminars and workshops were presented for almost 7,000 customers and employees.[R#3]

THE ELECTRIC AND MAGNETIC FIELDS CENTER

The EMF Center is the first of its kind for the United States electric utility industry though Hydro-Quebec has a similar facility located in Sainte Julie, Ontario. The Center provides information on the science and issues surrounding EMF, including demonstrations, interactive exhibits, and seminars. It is open for educational seminars, workshops, and customer consultations and provides the latest literature and publications on electric fields and their effects on humans.

STAFFING

The entire facility of CTAC is run by 33 full-time equivalent staff. These include some of the following: energy management analysts, 3 electrical engineers, lighting and HVAC experts, events coordinators, 2 industrial technology specialists, curriculum developers, six retirees who work approximately 8 hours per week, support and clerical staff, administrators and more. CTAC is presently downsizing to 30 FTE's in order to run more cost effectively.[R#12]

MEASURES INSTALLED

Unlike DSM programs targeted at specific end-uses and customer groups, CTAC's mission and influence is far broader. CTAC presents a myriad of technologies including the Commercial Center's high efficiency heat pumps, the ice-sphere thermal energy storage system, the Cooking Center's energy saving appliances, and the Lighting Center's over 200 lamp and lighting options; the Home Efficiency Center with its load control hardware, state-of-the-art metering, electric vehicle, home-automation system, and high efficiency appliances, heat pumps and lighting.

But in addition to these technologies and aside from displays meant to teach and educate, a greater effort focuses on the Industrial Center. Here, technologies such as UV curing, infrared heating, radio frequency curing, microwave drying, powder coating, and water based finishing, present viable solutions to environmental compliance problems with VOC, NOx, SOx, PM10, carbon, and sundry emissions and provide economic benefits through greater efficiency and increased production. ■

MONITORING

Attempting to estimate the overall savings that have accrued as a result of CTAC's presence is an imprecise exercise at best. The facility's effect is both direct and indirect and influences both short and long-term decision making. It was established to raise awareness and demonstrate the economic and environmental benefits of highly efficient electrotechnologies. Thus the Center has had the effect of changing attitudes, but quantifying this effect is nearly impossible.

Naturally, CTAC maintains a computer database of the number of participants at various seminars that it has conducted, as well as the number of visitors per sector. Thus the Center's impact can be measured in terms of participation, but not energy savings without detailed and complex and costly evaluation. Trying to accurately monitor the energy savings attributable to CTAC would be difficult indeed, requiring accurate reporting on the part of all visitors in terms of any energy efficiency measures they employed as a result of their visit. Furthermore, assessing this impact would literally take years, as some visitors to the Center may be influenced to take action not in the current year, but years later, further obfuscating the Center's impact.

For the purposes of SCE's DSM accounting, CTAC does not have specific kWh savings goals. Instead the energy savings are accounted for in each of SCE's conventional DSM programs. Energy Services, Energy Efficiency, and Market Services are the SCE divisions in charge of implementing all DSM programs and utilize CTAC as a tool for their programs. For example, SCE's tremendous success with clean air coatings has clearly resulted from the capabilities demonstrated at CTAC, but the actual savings are accrued by the Clean Air Coatings Technologies program.[R#11]

EVALUATION

After 16 months of operation a customer and employee evaluation was conducted by in-house staff. Surveys of seminar and workshop participants for 1993 found that roughly 40% of respondents rated CTAC excellent, 45% very good, and 11% good. The results concluded that the facility was getting the job done, but also offered some suggestions on how to improve services. Also a Technical Advisory Board, whose members include representatives of the California Energy Commission, the Public Utilities Commission, and the Air Quality Management District, has been formed as a mechanism for input and to validate the direction of CTAC.

While monitoring CTAC's overall effect is highly challenging and would be very costly to do accurately, there are a handful of select case studies which illustrate its effect. These cases pertain to the Industrial Technology Center and Commercial Technology Center. Due to the large scale individual measures installed and site-specific applications, monitoring of savings and emissions for some end-uses have been assessed and are presented herein.

In 1992, Paul S. Delaney of SCE evaluated the environmental, source fuel, and economic benefits of SCE's Clean Air Coatings Technologies program. To determine the overall economic and environmental benefits, SCE analyzed 13 customer projects that resulted in process modifications in 1992. Once process changes were categorized as energy conservation or fuel substitution, engineers began applying a California Public Utilities Commission (CPUC) three-pronged test to determine the net environmental impacts, cost effectiveness, and source fuel efficiency.

The life cycle environmental benefits impact was conducted by calculating site electrical consumption data on a system wide basis. Once that data was available, SCE determined associated emissions (NOx, SOx, PM10, VOC and carbon) using formulas that equated pounds of emissions to megawatt-hours of electricity use. For comparison purposes, NOx emissions from gas consumption at the customers' sites were evaluated using allowable limits for small process heaters and ovens from the SCAQMD. Reduction in VOCs, air toxics, and ozone depleting substances were estimated using material safety data sheets for the appropriate materials and quantities provided by the end-user.[R#8]

Evaluation of cost effectiveness included a life cycle energy cost analysis and cost of controlling emissions at customer sites or from the generation of electricity. Finally, SCE evaluated traditional source fuel efficiency over the estimated life of the equipment or process change resulting in lifecycle energy savings in MWh. The results of these industrial findings are discussed in the following section on savings. ■

DATA ALERT: The impact data presented in this section is based on an evaluation of 13 retrofit projects carried out as a result of CTAC and its staff's expertise with electrotechnologies.

The results of the case study evaluation of 13 retrofit projects produced three categories of projects. Nine of the projects were energy conservation projects, two were fuel substitution projects, and two were load retention projects. Combined, these projects adopted a total of eighteen different process changes.

LIFECYCLE IMPACTS	SOURCE FUEL (MWh)	COST (x1000)
Before	170.8	$27,600
After	79.7	$13,400
Savings	91.1	$14,200

In order to perform the analyses of the thirteen projects it was necessary to assume a lifecycle for each of the adopted process changes. With coatings technologies changing very rapidly, especially for water-borne and high-solids coatings, SCE found that it didn't make sense to expect these new processes to last 20 years. As a result, the zero VOC processes, such as powder or UV, were evaluated at 20 years, while the low-VOC processes were analyzed at ten years and at 5 years, depending on the specific application.

Source Fuel Efficiency and Energy Conservation Results: The gas and electric source energy savings over the estimated life of the equipment or process change are as follows: Before the measures were installed, the projects used a total of 170.8 MWh of electricity for their combined lifecycles. After the retrofits they used 79.7 MWh of electricity. This resulted in a total lifecycle savings of 91.1 MWh of electricity.[R#8]

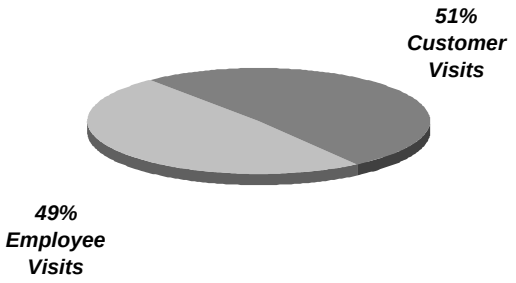
EVALUATED EMISSION SAVINGS BY POLLUTANT	TOTAL LIFECYCLE SAVINGS (lbs.)
NOx	738
SOx	130
PM10	17
Carbon	228,238
VOC	116,285
TCA	51,496
Air Toxics	1,377
Total	398,281

Environmental Analysis Results: The environmental analysis was combined for conservation, fuel substitution, and load building projects. For the environmental impacts over the life of the process change, the emissions savings, or reduction in emissions for the five primary constituents, trichloroethane, and air toxics were calculated and also "dollarized" using values provided by SCAQMD for the cost of controlling the emissions. The emissions savings results were as follows: NOx - 738 lbs., SOx - 130 lbs., PM10 - 17 lbs., Carbon - 228,238 lbs., VOC - 116,285 lbs., TCA - 51,496 lbs., and Air Toxics - 1,377 lbs. These emission reductions save $10,987,943 assuming net emissions reductions all the way back to the power plant.[R#8]

Cost Effectiveness Analysis Results: The expenditures for these select retrofit projects in 1992 were approximately $870,300. Total lifecycle costs of all the programs before the retrofits were $27.6 million. These cost assessments include environmental, energy, equipment, program, and other costs extrapolated out for the life of the equipments' energy usage. After each project was retrofitted with an efficient electrotechnology, the same extrapolation was performed, resulting in a lifecycle cost of $13.4 million. The result is an overall savings of $14.2 million over the life of the projects.[R#8]

PARTICIPATION

Since CTAC opened in 1990, over 106,000 visitors have come to the Center. Attendance in 1993 totaled 27,052 with 13,277 or 51% customer attendance, and 13,775 or 49% employee attendance. Visitors have included customers, representatives from governmental agencies, utility plant managers, contractors, designers, consulting engineers, architects, developers, business owners, utility representatives, trade associations personnel, equipment distributors, and regulatory agencies.



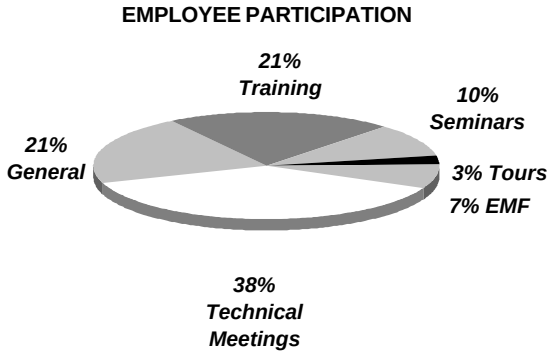
CUSTOMER PARTICIPATION 1990-PRESENT	PERCENT
Industrial	22
Commercial	42
Residential	4
General	29
EMF	3

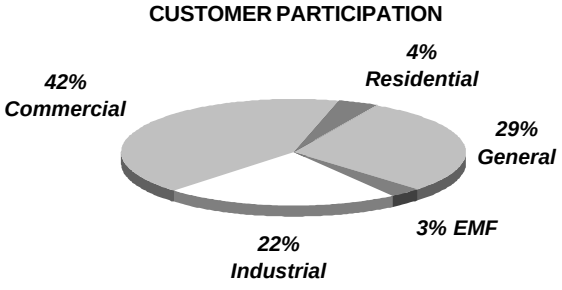
In terms of customer areas of interest, visitors have been primarily interested in commercial services (42%), general information (29%), industrial services (22%), residential services 4%, and electromagnetic fields (3%). Of the 13,277 customers who visited CTAC, 22% or 2,924 attended workshops or seminars.

SCE employee attendance at CTAC events has been divided into the following categories: technical meetings (38%), general meetings (21%), training classes (21%), seminars (10%), tours and demonstrations (3%), and EMF sessions (7%).

EMPLOYEE PARTICIPATION 1990-PRESENT	PERCENT
Technical Meetings	38
General Meetings	21
Training Classes	21
Seminars	10
Tours	3
EMF	7

In addition to customers and employees, CTAC has hosted legislators, regulators, several heads of state, foreign dignitaries, the media and other utilities. ■





Cost of the Program

COSTS OVERVIEW	INTERIOR BUILD-OUT (x1000)	FURNITURE/ EQUIPMENT (x1000)	TELECOM/ COMPUTER (x1000)	GENERAL OPERATIONS (x1000)	SHOW EQUIPMENT (x1000)	TOTAL COST (x1000)
1988	$0	$0	$0	$132	$28	$159
1989	$334	$172	$32	$1,050	$1,985	$3,573
1990	$810	$226	$111	$3,062	$1,409	$5,618
1991	$320	$118	$86	$4,394	$898	$5,815
1992	$534	$238	$238	$3,229	$270	$4,509
1993	$327	$32	$14	$2,880	$1,046	$4,299
Total	$2,326	$785	$480	$14,746	$5,636	$23,973

Since planning began in 1988 through 1993 Southern California Edison has spent just under $24 million on the Customer Technology Application Center. Of the total cost, fully $14.7 million has been for operating expenses (salaries, lease costs, overhead, and general administration), $5.6 million was spent on equipping the Center with demonstrations and exhibits, and $2.3 million was spent on building-out the interior of the Center.

CTAC's development costs can be described and examined in a number of different ways. For instance, SCE likes to view CTAC's development in three basic phases. The Center's "concept phase" took place in 1988 and reflects the relatively low costs of planning and architectural studies. The year 1989 makes up the second phase, the "design and construction" phase. The third phase, simply called "operations," began in 1990 and continues to the present with annual costs between $4-5 million.

For the purpose of providing readers with the clearest possible cost explanation, this section is divided into two basic categories: start-up and construction costs, and ongoing operating expenses.

Start-up and build-out costs: When Southern California Edison decided to build CTAC, it elected to lease an existing structure in an industrial park rather than build a center from the ground up. (Essentially, CTAC was built from the inside out.) Instead of buying land and then having to build infrastructure such as roads, utility and sewer lines, plus constructing a building, it was CTAC Manager Ruby Irigoyen's job to work within the existing structure's four walls. The construction costs presented in the table above reflect only interior work.

As part of SCE's lease, the building owner agreed to provide a substantial amount of tenant improvements. In fact, the owner paid fully $1,345,544 for fitting the building to suit CTAC's needs. CTAC, however, has continuously evolved over the past four years, requiring a steady stream of capital expenditures related to interior build-out. In addition to the owner-provided modifications, CTAC spent $334,237 for remodelling in 1989 and another $809,940 in 1990. In 1991 it added its education center at a cost of $319,922, a task involving the construction of two classrooms, and also began to develop its resource library. In 1992 CTAC began to build-out its lighting laboratory and in the same year began to develop the commercial cooking center, for a combined cost of $534,490. In 1993 staff rebuilt part of the industrial center at a cost of $327,161. Currently CTAC is revamping its residential center and projects the interior build-out costs related to this project to be on the order of $175,000.

The facility's development has occurred sequentially, developing new centers and further using the total square footage available over time. For instance, in 1990 CTAC occupied 27,397 square feet. This grew to 32,066 in 1991, then to 44,308 in 1992, to 44,875 square feet in 1993. Such a staged approach allowed CTAC to spread its costs over several years.

All told, CTAC has expended $2,325,750 for its interior build-out costs on top of the $1,345,544 provided through

the lease agreement by the building owner. While these cannot be considered start-up costs per se, this sum of just less than $4 million reflects an approximation of what another utility would have to spend to build-out a center like CTAC assuming the utility elected to house the center in an existing building rather than constructing a building from scratch.

Naturally other utilities will have to carefully weigh whether to build and own or lease a facility. While construction costs can be recovered as capital expenditures through the ratebase, SCE management elected to keep costs relatively low through leasing an existing structure. Another option for utilities would be to negotiate leases whereby the owner would pay all interior build-out costs, recouping this money through the monthly lease fee which is typically considered an expense by utilities.

In 1988 and 1989, prior to moving into what is now the home of CTAC, SCE did incur some more conventional "start-up" costs. General operations, including staff time related to the design of the center and working with architects, totalled $131,967 in 1988 and then $1,050,170 in 1989. Also in 1988, the Center purchased its first major piece of equipment, an ultraviolet curing machine for $28,000. This was used to test the Center's overall concept on a customer group, the furniture industry in the region, most threatened by air quality regulations. In fact CTAC rented a 1,600 square foot space in Redondo Beach to work with these customers. The equipment is still in use today.

Ongoing operating costs: Annual operating costs are made up of both the capital costs described above (interior build-out costs, furniture and equipment, and telecommunications and computing equipment) and operating expenses which include general operations and demonstration equipment. Total costs have ranged from $159,483 in 1988 to $3,573,336 in 1989, to $5,617,706 in 1990, and to a high of $5,815,311 in 1991. In 1992 total costs dropped to $4,508,597 and then further to $4,298,572 in 1993.

To provide readers with a clear understanding of the costs to operate the Center, however, it is important to back-out start-up and construction costs, even though much of these costs were incurred in later years. Thus the two major categories of operating expenses are general operations and demonstration equipment. General operations, which include staff salaries, phone bills, lease payments, and other office expenses such as development of curriculum materials, scheduling, mailing, and instructor and technical expert salaries have cost a total of $14.7 million (well over 50% of total costs) while the cost of purchasing equipment for demonstrations has been $5.6 million, approximately 25% of total costs.

Another "cost" which is not listed on CTAC's balance sheet is related to equipment provided at no charge by vendors. Currently the Center receives some of its energy-efficient equipment, outside of the industrial equipment, on consignment for display and use. Under this type of arrangement manufacturers provide equipment, such as commercial cooking equipment, to CTAC at no charge and then periodically change-out and upgrade the equipment. Other equipment has been provided at cost and at reduced costs. Ruby Irigoyen estimates the total value of these arrangements to be $100-150,000. Unfortunately, the most expensive equipment is the industrial equipment which can rarely be donated. Most of the industrial technologies have to be built individually as scaled-down versions of large industrial versions or have to be specially built to serve multiple applications, and require CTAC investments listed in the accompanying cost overview table.[R#12]

While seminars and workshops have generally been free for customers, in 1993 CTAC experimented to see if customers would be willing to pay for technical information and if so, how much? The answer appears to be "yes." In 1993 CTAC spent $24,000 on these workshops and recouped $18,000 from fees resulting in a net cost of $6,000. Customers indicated that general courses ought to be free but that they are willing to share in the costs of technical workshops.

In 1993 workshops and seminars included High Intensity Discharge Lighting, the Systems Approach to Lighting, Merchandising Lighting, Power Quality, Power Quality in Hospitals, Harmonics and Power Quality, and Refrigeration. To date the most frequently presented seminars have been on energy-efficient lighting, HVAC, and industrial coatings and applications. Charges for these workshops ranged from free to $250 per person. Note that CTAC's costs for these workshops range from $30 to $250 per person attending. These costs include consultant presentation and development fees, food and refreshments, and mementos. The total costs for a single workshop can exceed $10,000.[R#12,14] ■

LESSONS LEARNED

Perhaps the most important lesson taught by CTAC's very existence and conceptual design is that the Center goes way beyond a strict definition of demand-side management. Inversely, it demonstrates that the role of DSM is expanding beyond electricity and gas savings from a singular purpose to a broader focus that is more holistic. In Southern California the issue is not only reducing kilowatt-hours or BTUs but also complying with air quality standards. Without a strategy for addressing compliance customers will leave the area resulting in job losses and further depressing the local economy. Thus CTAC is first and foremost a leading national model for how utilities can align their customers' most critical interests with the utilities' short and long term needs.

The second lesson taught by CTAC is that often an electric utility can work with its customers and find solutions that not only serve an environmental agenda but which concurrently result in saved energy and thus dollars. These forms of win-win solutions have appeared far off on the horizon for utilities, but CTAC has demonstrated in a number of instances that by applying advanced technologies it is often possible to meet stringent air quality regulations and support DSM program objectives and targets. Furthermore, several projects carried out by CTAC have resulted in environmental compliance, increased productivity for the customer, and energy savings.

A third key lesson, as articulately described by CTAC Manager of four years, Ruby Irigoyen, is that this form of center is directly in line with current DSM trends. In this era of interest in greater utility competition through further deregulation (and potentially retail wheeling), many utilities seek to reduce their DSM program costs while still engaging significant savings. In one recent case a noted Northeastern utility was directed by its commission to cut its DSM spending in half while still attaining its energy and capacity savings goals. CTAC is well suited to address this industry "megatrend" since information which raises customer awareness is relatively inexpensive especially when compared to direct customer incentives.

Ruby Irigoyen notes that the Center is fundamentally based on mass marketing approach using carefully-defined market segments. Specific types of customers are focused upon for specific technologies. Distributors and vendors are also solicited through targeted marketing approaches. Thus the Center becomes the focal point of the marketing effort. Rather than attempting to market to customers on an individual basis, CTAC allows Edison "to spread its wings" and market to broader market segments. At least in theory this type of approach will allow utilities to reduce the administrative costs of their DSM programs.

Finally, another tough lesson learned by SCE and other utilities is that it may not be possible to achieve environmental goals without a degree of electrification. While the staff is most proud of solutions that not only result in environmental compliance and source fuel efficiency, this may not always be possible. In many instances, electrification will result in the use of additional BTUs of source fuels to meet environmental goals. While air quality concerns get the customer in the door, in some cases the customer can achieve pollution prevention with energy and cost savings, in other cases this may not be possible. [R#12,16]

A host of pragmatic lessons have also been learned by staff. The following points were presented by Ruby Irigoyen:

- "Allow time to test equipment and displays before the opening of the Center." CTAC was opened one month earlier than planned to take advantage of what SCE's Corporate Communications Department considered a slow time for the media, directly after the Christmas and New Year holidays, potentially allowing for more extensive coverage. While this strategy proved successful, advancing the opening took its toll on staff who worked extensive overtime getting ready for the first visitors.

- "Don't understaff the Center. It will only burn out the employees and reduce the quality of service." In CTAC's first year, SCE expected to get 8,000 visitors. Instead 18,000 came through the door, taxing the staff of nine. Furthermore, many of the center's activities are held at night and on weekends, extending the staff and requiring a good deal of overtime. However, now a flexible schedule has

reduced overtime to 1.5% of total hours worked.

- "Design the exhibits and displays so that they can be changed and updated as easily as possible." Exhibits are changed routinely with most change-outs taking place in November and December, CTAC's slowest months. While the Center is well designed for such change-outs, storage space is critical (in fact, "you can't get enough of it") and providing ample room for displays greatly facilitates change-outs. It is important to think carefully about how equipment will be installed and removed, taking into account the width of hallways, the location of wide doors, cargo bays, etc.

- "Ample parking space is a critical factor." Despite the construction of a 50-car parking garage on the site midway through the first year of operation, parking has been a limiting factor at CTAC and one that continues to plague its success. Even now, at busy times, parking is limited and creates an unnecessary burden on staff and visitors alike.

- "Involve regulatory, external agencies, and customers to be on a review committee for the Center. They have extremely good and unique ideas and offer a different perspective than the utility employees." While these agencies and organizations were informally included from the start, a stronger and more formal affiliation such as the current Technical Advisory Group would have been useful from the start to facilitate input from other stakeholders in addition to customers.

- "Involve the community. Doing this develops a strong commitment from them." The City of Irwindale has been important to CTAC's success and efforts have been made to bring in the local Chamber of Commerce and the City Council so that they can take pride in the center and promote its success. Evening meetings of these "stakeholders" have been important to keep them informed of new exhibits and emphases.

- "Don't give away the farm." At the opening of the Center, everything was offered free of charge. By charging a nominal fee in appropriate situations the perceived value of the services increases. As discused in the Cost section, CTAC successfully has experimented with requiring customers to pay for technical workshops. The key lesson learned so far is that customers are willing to pay for technical workshops, but believe that more general courses ought to be free. As a next step staff is considering defining a baseline of services above which customers may be required to share in the costs.

- "Partnerships are important. Involve local colleges and universities so that you can share resources. Also, share these resources with other utilities and agencies as well." To date CTAC has been closely affiliated with several community and regional colleges offering space and technical expertise for evening classes and allowing students hands-on experiences with advanced technologies. CTAC has also been instrumental in encouraging a collaborative effort to establish 2 and 4-year lighting degrees for interested students along with internships at CTAC. Inversely, CTAC has drawn upon the expertise at local colleges to support its programs.

- "Research and actively pursue grant funding." To date CTAC has received joint grant funding with several other agencies including SCAQMD for specific projects. Staff intend to pursue similar funding for research projects in the future to continue to support specific customer needs while continuing to push the envelope of possibilities for its basic mission of working with customers' environmental compliance and energy efficiency. ☞

TRANSFERABILITY

Energy resource centers with a variety of goals and facilities have become one of the most attractive utility options for demand-side management. The trend began with the Northwest Lighting Design Lab which was originally conceived in 1985 and then opened in December of 1989 with a focus on lighting. (See Profile #27) Its success as a customer service tool led to similar centers. Georgia Power, for example, not only operates an intriguing customer storefront in a suburban mall called "The Efficiency Store" primarily targeted at residential customers, but also operates an Energy Planning Center which focuses on more technical applications for larger customers. Portland General Electric's Energy Resource Center opened in 1986 and was effectively used for a variety of customer applications including electric vehicle research and the promotion of electrotechnologies. (See Profile #55)

CTAC's success has been the result of its range of customer services and it important focus on working with customers to develop energy-efficient and environmentally-compliant strategies. This mission is critical to many if not all electric utilities and thus the CTAC concept can clearly be transferred to other utilities in other regions of the country and around the world.

Almost immediately after its opening recommendations were made by the California Energy Commission and the California Public Utilities Commission for construction of similar facilities around the state. Tours have been provided to senior officers of other utilities with more planned in the future. In addition, dignitaries from Australia, Germany, Japan, England, Sweden, and many other countries have visited CTAC.

Within California CTAC is not alone. Pacific Gas and Electric has developed and operated its Energy Center (formerly called the Pacific Energy Center) since 1991 in downtown San Francisco. While its focus is somewhat different than CTAC's, it is a facility similarly geared to host customers and to assist them by educating them about their opportunities for energy efficiency. Like CTAC, the PG&E Energy Center also serves to demonstrate advanced technologies.

Shortly after the opening of CTAC, Southern California Gas announced its plan to open a 50,000 square foot Energy Resource Center in Downey, California and ground breaking for the construction of the center took place in April 1994. San Diego Gas and Electric has been in the process of planning a Energy Technology Center for some years, with a planned opening in the spring of 1995. [R#12,16]

Finally, an association of energy resource centers has been developed that will serve as a means for their directors to share experiences and lessons learned to date, and to work together on tough issues related to these centers such as quantifying their direct and indirect savings impacts. Members of the Western Energy Centers Council include the Lighting Design Lab, the California Energy Commission, Portland General Electric's Energy Resource Center, Southern California Edison, Pacific Gas & Electric's Energy Center, San Diego Gas & Electric's Energy Technology Center, Southern California Gas, and the Center for Renewable Energy and Sustainable Technology. For more information on this association contact its Chair, Ruby Irigoyen at CTAC: (818) 812-7500. ■

The purpose of this section is to discuss the regulatory treatment of the costs of Southern California Edison's Customer Technology Application Center. To do so, a brief review of the regulatory treatment of all SCE's DSM programs is presented to illustrate the overall regulatory context within which CTAC is operated. Following this abbreviated overview the specific regulatory treatment of CTAC is presented. More comprehensive discussions of the regulatory treatment of California's utilities regarding DSM and specific treatment of SCE's programs can be found in Profiles #2 & 28.

UTILITY REGULATORY OVERVIEW

Since 1990 Southern California Edison has been eligible to receive earnings by successfully implementing energy conservation programs, thanks to the California Collaborative which built on California's precedent-setting Electric Revenue Adjustment Mechanism (ERAM) which decoupled sales and utility profits and effectively removed the disincentive for utilities in the state to invest in their customers' energy efficiency. The Collaborative pushed beyond simply removing the disincentives and created a situation in which utilities are allowed incentives for their demand-side management successes.[R#2]

PROGRAM-SPECIFIC INFORMATION

CTAC's costs have been fundamentally divided for both the Federal Energy Regulatory Commission and the California Public Utilities Commission between capital expenditures and expense expenditures. The capital expenditures presented in the first two columns of the cost overview table in the cost section of this profile have been accounted for as corporate general capital, completely separate from the costs of demand-side management programs. Thus these costs have been put in SCE's ratebase and amortized over their appropriate lifetimes earning the company's standard rate of return. (During SCE's last rate case, some of the costs that had been considered capital expenditures were shifted from capital to expenses. These costs included equipment for displays and for customer-specific demonstrations.)[R#12]

CTAC's operating expenses are considered DSM expenses as they represent customer energy efficiency services. Since CTAC is now formally labelled an information program, its operating costs are expensed in their current year rather than being ratebased. (Note that the costs of "resource" and "service" DSM programs are eligible to earn shareholder incentives while expenses are not.)

While CTAC is widely believed to be an important part of SCE's DSM portfolio, with an even more far reaching role as discussed at length in the body of this profile, in 1993 the California Public Utilities Commission hired an independent auditor to examine all of SCE's DSM programs. CTAC was not exempt from this review. The audit revealed that CTAC's costs have been completely legitimate, sparing SCE's shareholders from any liability associated with CTAC's costs. The auditors suggested no disallowance of costs whatsoever. In fact, CTAC was highlighted as one of SCE's DSM programs that had been managed properly.[R#12] ■

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