

2006 Public Good Report

Sacramento Municipal Utility District

Sacramento Municipal Utility District,
6201 S St.
Sacramento, Calif. 95817
SMUD.org

May 1, 2007

SMUD Public Good programs 2006

The Sacramento Municipal Utility District's Public Good programs benefit our customers and the Sacramento-area community every day. Shade trees cool and beautify our neighborhoods; customers take advantage of SMUD rebates on energy-saving appliances and commercial equipment to help lower their electric bills; programs help low-income customers make ends meet; while other programs turn sunlight into electricity.

Together, these programs form an important part of the dividends our customers receive from a customer-owned utility governed by an elected Board of Directors.

Long before a legislative mandate required Public Good programs, SMUD built a national reputation as a leader in many of these areas, including energy-efficiency, clean-energy projects and research and development.

The investment in Public Good programs for municipal utilities must equal at least 2.85 percent of 1994 revenues, according to state mandate. However, each year, SMUD has budgeted significantly more than the minimum required. In 2006, SMUD committed more than \$46 million to Public Good programs, including more than \$3 million from resource acquisition funds to supplement or implement additional energy-efficiency programs for customers.

This report details the broad Public Good programs that SMUD carried out in 2006. For more information about any of the programs, call the phone number listed at the end of each section, or visit www.smud.org.

About Public Good programs

California law requires utilities to preserve specific programs that contribute social and environmental benefits to the state. These Public Good programs may include:

- Cost-effective, demand-side management services to promote energy-efficiency.

- New investment in renewable energy resources and technologies consistent with existing statutes and regulations that promote those resources and technologies.
- Research, development and demonstration programs for the public interest, to advance science or technology that is not adequately provided by competitive and regulated markets.
- Services provided for low-income electricity customers including, but not limited to, targeted energy-efficiency services and rate discounts.

Energy-efficiency

Total 2006 Expenditures: \$19.15 million

As a national leader, SMUD has made "energy-efficiency" a catchphrase in the Sacramento region. SMUD programs help customers get the most power for their energy dollar and reduce their demand for electricity. Through its energy-efficiency programs, SMUD has shown customers how energy-efficiency and comfort can go hand-in-hand.

Residential

Residential Energy Advisory Services Program: \$973,758

To help improve efficiency in single-family homes, SMUD performed more than 600 on-site energy assessments and provided advisory services to more than 35,000 customers in the form of compact discs, on-line and paper audits, as well as through telephone assistance.

Residential Equipment Efficiency Program: \$3.11 million

Rebates and energy-efficiency loans for home-improvement projects designed to provide energy savings primarily from building shell and heating and cooling efficiency improvements were offered by SMUD to customers. SMUD financed and/or provided rebates for approximately 3,800 high-efficiency central air conditioners and heat pumps, and provided financing for more than 2,000 homes to replace their old inefficient

windows with high-performance windows. In addition, nearly 290 duct systems were sealed using the Aeroseal[®] duct-sealing process and rebates were provided for the installation of approximately 1,500 whole-house fans to help cool homes during evenings and nights in lieu of using central air-conditioning.

Residential New Construction Program: \$499,181

California's minimum cooling energy standards are among the most stringent in the nation, and SMUD, through its Residential New Construction program encourages builders to construct homes that go beyond these standards. Homes that earn the SMUD Advantage Homes label are designed to beat the 2003 Title 24 energy cooling requirements by 25 to 50 percent. In 2006 nearly 2,500 new homes earned the SMUD Advantage Home label with more than 300 earning the Gold Advantage label.

Residential ENERGY STAR[®] Retail Lighting Program: \$2 million

Through marketing partnerships with SMUD, retailers and lighting manufacturers sold nearly 1 million energy-efficient compact-fluorescent light bulbs and 2,500 energy-efficient lighting fixtures. These partnerships were also accompanied by marketing campaigns designed to increase customer awareness of energy-efficient ENERGY STAR[®] lighting products.

Residential Appliance Efficiency Program: \$951,695

Customers who purchased or replaced refrigerators, room air conditioners and clothes washers or dishwashers were able to take advantage of SMUD rebates on ENERGY STAR[®] rated high-efficiency models. Rebates for more than 6,200 refrigerators, 500 room air-conditioners, 550 high-efficiency clothes washers and nearly 200 dishwashers were provided through this program in 2006.

Refrigerator Recycling Program : \$538,744

Old and inefficient residential refrigerators consume significantly more energy than newer models. Through this program, SMUD provides customers with a nominal incentive to have their old working refrigerators picked up and disposed of through a process that recycles the components in an environmentally sound manner. In 2006, more than 3,250 old refrigerators were recycled.

Residential Pool/Spa Efficiency Program: \$239,223

SMUD added more than 1,500 new pool owners to the program in 2006. Customers with pools and spas are encouraged to operate pool pumps and sweeps during off-peak hours through educational materials and promotional messages. In addition, customers replacing old pool pumps or installing new pools could take advantage of rebates to install high-efficiency single- or two-speed motors; in 2006, rebates were provided for nearly 150 such pump motors.

Residential Shade Tree Program: \$1.36 million

Properly placed shade trees can help reduce a home's cooling costs. In cooperation with the Sacramento Tree Foundation, SMUD provided more than 14,400 free shade trees for planting near homes, schools and in public areas.

Commercial

Commercial Retrofit Program: \$3.27 million

SMUD provided incentives and financing, energy surveys and advice on new technology and installation support for all its commercial, industrial and agricultural customers. Incentives were provided for more than 150 projects for the installation of high-efficiency lighting and HVAC systems, motors, refrigeration systems and process equipment in medium and large commercial and industrial facilities. In addition, SMUD continued to work with school districts and facility managers to implement projects and operation and maintenance measures designed to save energy and reduce the use of non-renewable resources and waste streams within these facilities.

Commercial New Construction Program: \$771,241

Design assistance and rebates, as well as owner rebates and incentives, were provided for 18 construction projects targeted to maximize energy efficiency in newly constructed commercial buildings in 2006.

Prescriptive Lighting Incentive Program: \$2.83 million

More than 770 lighting retrofits were performed by local contractors for small- and medium-sized commercial customers to replace or upgrade old inefficient lighting systems and bulbs with new high-efficiency fluorescent or high-intensity discharge lamps and fixtures, as well as occupancy sensors and other lighting controls to reduce energy usage and costs for customers.

Commercial Upstream/Distributor Incentive Program: \$613,664

Working with local suppliers and dealers of motors and HVAC equipment in Sacramento, SMUD implemented a program that provides incentives to these market players to stock and provide high-efficiency equipment for contractors and installers for use in commercial projects constructed in our service area. In 2006, high-fficiency equipment for nearly 250 installations was supplied for local projects through this program.

For more information about SMUD's energy efficiency program, Residential customers can call 1-888-742-7683 while Commercial & Industrial customers can call 1-877-622-7683.

Services for low-income and special needs customers

Total 2006 expenditures: \$19.2 million

Different customers have different needs. Through the Public Good program, SMUD provides help for two specific groups of customers -- those with low incomes and those who depend on electrically powered medical equipment.

Qualified low-income customers can receive a discount on their electric bill through SMUD's Energy Assistance Program Rate (EAPR). Low-income customers also can qualify for free weatherization improvements and other energy-efficiency improvements for their homes.

With certification from a physician, customers who use electrically powered medical equipment or have special medical conditions are eligible for the Medical Equipment Discount (MED) Rate.

Energy Assistance Program Rate credits: \$12.71 million*

More than 49,000 low-income customers benefited from the subsidized EAPR rate. Each of these customers met specific income criteria.

Medical Equipment Discount Rate Credits: \$3.28 million*

Almost 8,500 customers qualified for the MED Rate discount. The program is available to homes with a full-time resident requiring use of an electric medical device..

Low-income Weatherization: \$1.24 million

Slightly more than 900 low-income households benefited from SMUD's free weatherization program. To help customers of modest means make their homes more energy-efficient, comfortable and safe, SMUD provided free attic insulation, weather-stripping, shade screens, compact fluorescent bulbs, low-flow showerheads, faucet aerators, water heater wraps, pipe wrap and minor home repair. Customers with unsafe and energy-consuming halogen floor lamps exchanged them for energy-efficient fluorescent torchiere lamps. Some low-income homeowners qualified to have their old refrigerators replaced.

The Community Partners Program is an extension of SMUD's Low-Income Program, allowing the utility to work with other agencies and community-based organizations to offer additional services. By partnering with SMUD, gas-heated customers benefited from the same services as electric-heated customers, plus they received combustion testing and repairs on their gas equipment. SMUD was able to leverage funding and secure \$182,000 in extended services for our customers. These services included major home repair, including roof and plumbing repair; home modifications for disabled and elderly customers; and appliance replacement such as clothes washers and microwaves.

During summer months, portable evaporative coolers were loaned by SMUD to customers whose health was being affected by excessive heat. The units were loaned to customers until their central systems could be repaired or until they no longer required them for the health and safety of a family member.

Bill Assistance: \$593,245

SMUD's low-income bill assistance activities help with payments on electricity bills for customers facing tough financial times. Bill assistance is provided from either local community organizations or through customer donations.

For more information about SMUD's low-income and special-needs programs call 1-888-742-SMUD (7683).

Although not considered an expense on SMUD's financial statements, SMUD includes discount rates to low-income and MED Rate customers in the total Public Good commitment.

Renewable energy resources and technologies

Total 2006 Expenditures: \$1.62 million

SMUD's renewable energy programs continued their focus on the development and deployment of photovoltaics. Ongoing success in the deployment of grid-connected PV

systems has maintained SMUD as a leader in solar-electric generation. SMUD's established programs serve as models for other utility programs throughout the state.

To facilitate development of local PV installation contractor skills, SMUD hosted technical training at the Hedge Lineman Training Facility. This training was comprised of a three-day hands-on course that covered all aspects of designing and installing code-compliant PV systems. The training program qualified for continuing education credits for North American Board of Certified Energy Practitioners certified PV installers.

SMUD also hosted two NABCEP certification examinations in 2006. More than examinees sat for the exams, with representatives attending from many parts of Northern California.

SMUD sponsored a series of workshop for local building officials to improve knowledge and understanding of new equipment and code requirements for proper PV system design and installation. A total of five workshops were held in 2006.

In addition, SMUD participated in two major fund-raising efforts for regional non-profit organizations serving Sacramento's homeless population and children's arts programs. SMUD's PV technicians offered demonstrations of solar technology to attendees, building awareness of SMUD's solar programs and the principles of renewable energy. The solar trailers were also used to power various events at the local Earth Day celebrations at California State University, Sacramento.

Residential Retrofit PV Program: \$792,427

Nearly a decade ago, SMUD initiated its PV Pioneer I program by designing and installing PV systems on residential structures in the Sacramento area. SMUD owned these systems, received the electrical output and took full responsibility for operation and maintenance. Since 2001, SMUD has introduced the PV Pioneer II program, through which the customers rather than SMUD own the systems. As a result, homeowners are able to take advantage of "net metering," where SMUD pays retail prices for energy produced by the PV system.

In 2006, the program continued the success of its first years by installing approximately 218kW of PV arrays on 52 houses. This brings the total number of customer-owned residential retrofit systems to nearly 450, representing more than 1300 kW AC of PV.

Residential New Construction: \$400,247

One of the unique PV programs at SMUD targets the residential new construction market. This program solicits builders to work as partners with module manufacturers in the installation of Building Integrated Photovoltaics (BIPV) products during the construction of new homes. To date, the program has coordinated the installation of more than 230 PV systems on new homes for a total of 480 kW of PV.

In 2006, SMUD continued its work with local builders on Zero Energy Homes by partnering with Treasure Homes, the U.S. Department of Energy, the National Renewable Energy Laboratory and ConSol to build the next generation ZEH community at Fallen Leaf at River Bend. Fallen Leaf is a 32-home in-fill subdivision designed for first-time, entry-level buyers located in South Natomas just north of downtown Sacramento. The homes exceeded the 2005 Title-24 building standards by 40 percent (the 2005 Title-24 standards were 15 percent better than the 2001 Standards) and incorporate night ventilation with high-efficiency air conditioning with a new roof-mounted solar electricity system.

Commercial Buildings: \$427,995

In 2006, SMUD transitioned its Commercial PV installation program to a contractor-based program. Under this program, SMUD provides the customer a rebate on the cost of the PV system and ensures that the system is installed and interconnected properly. This was a change from SMUD's previous commercial building PV program, which installed more than 1200 kW of customer-owned PV in approximately four years. The new structure encourages the development of a complete industry for the installation of commercial PV in Sacramento, with contractors taking responsibility for the entire design and construction process. Under the new program, SMUD supplied rebates to four commercial installations, totaling approximately 275 kW.

Utility Scale PV Installations

There were no new utility scale installations in 2006 as SMUD focused its efforts and investments in customer-owned applications.

Renewable energy resources and technologies

Total 2006 expenditures: \$3.88 million

The sweeping climate change related programs publicly evaluated and signed into law made 2006 notable. SMUD's long and specific experience in greenhouse gas accounting methods and publicly available entity-wide accounting record was tapped often by utilities, non-governmental agencies and policy-makers during emission reduction program evaluations.

SMUD staff worked with a broad range of stakeholders in public meetings to educate and council public discussion on the accuracy, verifiability and accounting cost experience gained; particularly in regard to development and execution of the California Climate Registries Power Utility Protocol.

Energy Efficiency Customer Research & Development: \$2.09 million

The Energy Efficiency and Customer Research and Development group was formed in 2003 to support research and development in the areas of energy efficiency, load management and transportation. EECRD also provides advocacy for energy efficiency and transportation through active participation on boards and committees; promotion of legislation and improved codes and standards; and presentations and briefings at various conferences and forums.

SMUD has long been a leader in energy efficiency, renewables, load management and other environmental programs. In order to maintain and enhance that leadership, the SMUD executives commissioned the LEEDERS project -- Leadership in Energy Efficiency, Demand and Environmental Resource Solutions. The LEEDERS team

reviewed best practices at other utilities and energy efficiency organizations, evaluated the information and developed over 150 recommendations for SMUD to consider.

Electric Vehicle Technology: \$27,726

More than 12,000 lbs of Nitrogen Oxide emission reductions were achieved were reduced through SMUD's Mobile Emission Reduction Projects in 2006. NOx is the primary ozone precursor pollutant that leads to SMOG and harmful breathing conditions in our area. Below are highlights from the individual projects areas.

Plug-in Hybrid Electric Vehicle Technology

In 2006 SMUD took possession of a Plug-in Prius conversion vehicle from Energy CS, the conversion contractor. Basic operational testing of the vehicle commenced in April and numerous development and operational problems were uncovered. Significant road testing began in mid-July. SMUD confirmed that the vehicle is achieving 100 miles per gallon average fuel economy. This includes all driving modes (freeway, city and urban) while the battery is still supplying energy, (approximately 45 miles). After the battery is depleted, the vehicle gets the same fuel economy of a standard Prius until the battery is recharged at night.

Side-by-side testing with a non-converted Prius confirmed that on average the plug-in version gets double the gas mileage of the conventional hybrid Prius model. Testing also confirmed that both cars get worse gas mileage for extremely short trips due to emission control requirements that force the engine to turn on to keep the catalyst system warm. SMUD has subsequently been invited to present these test results at three separate forums and continues to receive requests for additional briefings. The EECRD group acquired two more Toyota Prius vehicles at the end of 2006. These vehicles are slated for conversion to plug-in mode in 2007.

SMUD is supporting the EPRI/DaimlerChrysler Plug-in Sprinter Van development program. As part of this effort SMUD will be participating in Phase 2 of the development program by testing one of 22 plug-in Sprinter vans built for testing on a nationwide basis with other utilities and government agencies.

SMUD signed on to EPRI's Plug-in Sprinter Van development program being conducted by Daimler Chrysler. As part of this program SMUD will be participating in Phase 2 of the development program by testing one of 30 plug-in Sprinter vans built for testing on a nationwide basis with other utilities and government agencies.

In support of market development, SMUD signed on to the "Plug-in Partners" campaign that is promoting market development for PHEV's on a national basis. More than 450 utilities, cities, states, government agencies, businesses and environmental groups have signed on to this campaign.

Airport Electric Ground Support Equipment Program

SMUD continued its work with United Airlines, FMC Corporation and the Electric Transportation Engineering Corporation to develop a new electric pushback tractor. SMUD manages the project for United Airlines as part of an agreement with the California Air Resources Board. The prototype electric was completed in 2006 and delivered to United Airlines. Testing of the vehicle will commence in early 2007 at San Francisco International Airport (where United Airlines has a major operational hub) and a ground support depot repair facility that is not available in Sacramento.

Truck Idle Reduction Through Electricity

In 2006 Truck idle reduction activities focused on On-board Truck Electrification technologies and development versus infrastructure related activities that were the focus of activities in 2003 and 2004. In 2006, 24 trucks received electrification equipment that allows them to turn off their engine while parked overnight and plug into the grid to meet their energy needs for cab comfort while resting.

On-board Truck Electrification

SMUD has one active project in this area and one project being re-proposed.

U.S. DOE / California Energy Commission Clean Cities Grant

This program is in partnership with Sacramento Metropolitan Air Quality Management District and New York State Energy Research Agency. As discussed above, 24 trucks received electrification equipment in 2006, bringing the total number of installs up to 54 since program inception. The program has a target goal of 100 units. Market barriers identified during the program have led to program restructuring to include installation costs for the truckers. A post audit survey of the equipment distributed in 2005 showed that some of the equipment was not being installed and that installation services were a major barrier. To this end, SMUD has arranged to have the 49er Travel Plaza support installation of the remaining equipment which is set to commence in early 2007.

U.S. EPA Region 9 Idle Reduction Program

In late 2005, SMUD won a \$100,000 grant from the U.S. EPA Region 9 Office in San Francisco to continue innovative activities to encourage the adoption of on-board truck idle reduction systems. The project was supposed to team with Caterpillar Trucking to demonstrate their Mor-electric truck system. This system integrates a majority of the on-board electrification equipment into a factory offered truck as an option. Unfortunately Caterpillar backed out of the project just after award and SMUD is now in the process of developing a new project to use the money at the request of U.S. EPA Region 9.

Electric Light Rail Energy Storage Technology

In 2006, SMUD supported Regional Transit in performing a systems analysis to look at operational aspects of an ultracapacitor-based energy storage system. The purpose was to determine whether an energy storage system could help RT stabilize low voltage conditions on its system of D.C. substations along the older Folsom Line, as well as provide demand reduction and energy savings benefits. The stored energy is used to

bolster low voltage conditions that occur when the trains accelerate, or it can be used in place of energy from the grid, thereby saving RT money. The systems analysis was performed by Siemens Transportation Systems. Preliminary results show that the energy storage system will be of more benefit in a voltage regulation mode versus an energy recovery/energy efficiency mode. Results from the study will be used to develop an unsolicited proposal for the California Energy Commission for a Public Interest Energy Research project.

Develop New Renewable Technologies: \$1.76 million

The following is an overview of SMUD programs to develop new renewable technologies:

Local Biomass Program

SMUD's Local Biomass Program converts problem wastes and residues into renewable energy while providing environmental protection and economic development. SMUD is committed to provide an incentive of 13 percent of the capital cost of building anaerobic digesters at local dairies to handle manure on some of Sacramento's 43 dairies. Although the digesters were not built in 2006, SMUD assisted the dairies in obtaining permits to construct their digesters.

The Leftovers to Lights program is helping identify ways to convert local food waste to energy. One of the dairies is interested in incorporating foodwaste with the manure in a heated digester. Although this is common in Europe with more than 3,000 operating in Germany alone, local regulators were not familiar with the technology or its impacts.

SMUD funded research at the University of California, Davis, to perform testing that would provide the data to regulators that would allow them to permit co-digestion.

SMUD also partnered with the Regional Sanitation District to examine the feasibility of increasing the biogas produced at the regional wastewater (sewage) treatment plant by accepting grease trap waste and liquid food processing wastes. SMUD makes renewable

power from biogas generated by the plant which in turn receives the steam for use in their digester operation. A three-phase technical and economic feasibility study is helping determine the costs and benefits of biogas enhancement project, and the next steps to developing this potential. Next steps will be a pilot plant operation using one of the six digesters at the plant. A receiving station, mix tank, pre-heat and monitoring system will be used to control the use of enhancement feedstock to the digester. Conservative estimates predict that this program will result in a 23 percent increase in biogas for grease trap waste and another 20 percent for food processing waste. Incorporating food waste could add another 50 percent, ultimately more than doubling the output of the plant.

Future Wind Development

SMUD has been conducting a Wind Integration Study for its service and control area. The prospect of adding hundreds of MW of wind energy to help SMUD meet its goal of 20 percent renewables by 2011 would present unprecedented challenges to system operators due to the variable nature of the resource and the relative lack of forecasting accuracy. However, wind energy is the most plentiful and usually least expensive renewable option. This study, which will continue through 2007, will model the additions of Solano Phases 2 & 3, and other wind plants in Northern California and Southern Oregon -- 850 MW in total. The models will mimic the operations of the SMUD/WAPA balancing area using historical load and generation production data. The results will provide insights into the operational impacts on our existing fossil and hydro system while determining the integration costs for each scenario tested.

SMUD also has been doing research on possible New Wind Resource Development Sites. After examining recently-developed western wind resource maps, SMUD has secured wind rights-of-way on federal lands north of Susanville in Lassen County and adjacent to Lake Abert in southeastern Oregon. These multi-year leases enable SMUD to install meteorological towers to closely monitor the wind resources in order to assess the viability of developing the sites in the future. SMUD installed two towers at the Lassen site in November. During 2006, SMUD also completed environmental and cultural analyses of the two sites and also began analyzing transmission corridor viability options.

Solar Research and Development

SMUD has been developing a Solar PV Performance Indexing System. Through SMUD's ReGen Program, the Southwest Technology Development Institute developed a new tool to support SMUD's PV Programs. This software product enables SMUD to monitor the monthly performance of every PV system connected to SMUD's system and compares this performance to the expected performance of a well-operating system. Systems that fall below the expected performance range are flagged and a technician is dispatched to identify and fix the problem. As a result of this program, electrical production from SMUD's PV fleet is maximized and the utility has been able to provide useful feedback to manufacturers and system installers to boost reliability.

SMUD also has been developing a Digital Shade Tool. Through a small contract in 2006, SMUD developed a PV system siting tool that employs a digital camera to determine if certain roofs are appropriate for the installation of PV systems. The tool overlays seasonal sun paths on the roof image and detects when and how much shading will occur from trees and other structures. This screening tool will allow SMUD to help our customers make cost-effective decisions on PV system installations.

Another R&D activity has been the development of Roof-Integrated Residential PV Systems. An example is PowerLight's SunTile product, a residential Building Integrated PV product that was developed and brought to commercialization under a ReGen project funded by California Energy Commission Public Interest Energy Research (PIER) program. This PV system was designed to attractively integrate into the concrete tile roofing system on new homes. The product is used in the Lennar 400-home solar subdivision in Roseville. In the last 15 months, PowerLight has installed the SunTile in 30 developments with approximately 600 homes at 2.5kW each.

Combined Cooling Heating and Power

SMUD continued to investigate opportunities for combined cooling, heating and power and heating and cooling applications in 2006. SMUD is assessing these projects as part of its efforts to identify GhG reduction opportunities, improve end-use energyefficiency,

and provide customers with energy-savings strategies. SMUD completed a market assessment for its service territory and determined there is technical potential of 375 MW for traditional heat applications and more if thermally activated cooling technologies are utilized. Even with SMUD's favorable electricity rates, and standby and facility charges, CCHP can work for large gas turbines and reciprocating engines used in high electric and heat utilization applications. The majority of the opportunities that remain are in the commercial, institutional and light industrial sectors including hospitals, universities, colleges, nursing homes, schools, hotels, office buildings, jails, prisons, food processing plating and other similar facilities.

In 2006, a number of feasibility studies were initiated. These included a data center, the Railyard Development Project, Sacramento International Airport Modernization Project, Blue Diamond, and Sacramento County Downtown. These studies will be completed in 2007 and recommendations will be made to the SMUD Board of Directors to proceed with projects that are technically and economically feasible. As part of this analysis, SMUD is considering different ownership options including partnering and direct ownership. Additionally in 2007, SMUD will investigate new potential projects in the commercial, institutional and industrial sectors.

Hydrogen as an Energy Carrier

SMUD's specific expertise and long experience in developing environmentally compatible and sustainable technology options has for more than a decade provided advice and peer review function for hydrogen infrastructure and application development. In 2006, SMUD was a founding member of the Hydrogen Utility Group, formed by electric utilities in the United States interested in hydrogen infrastructure and applications that will increase the value of energy service to customers. SMUD staff were also chosen by the U.S. Dept of Energy to provide technical peer review of selected DOE Hydrogen programs. SMUD's technical and policy depth in hydrogen has been important to development of the DOE FuelCell Car demonstration program. SMUD's fleet of Hydrogen powered FuelCell automobiles currently being demonstrated in Sacramento.

Energy Efficiency Technologies

CoolTrol: SMUD worked with four local storeowners to evaluate a refrigeration management system known as CoolTrol®. CoolTrol reduces energy costs by optimizing the operation of walk-in coolers and freezers. Although CoolTrol is relatively new to the West Coast, its manufacturer, National Resource Management, states that more than 3,000 systems are in use throughout the country.

The four SMUD test sites included three food and liquor stores and a natural foods store. Over the six-month test period, CoolTrol reduced energy consumption at the four test sites by up to 24 percent.

Air Conditioner Service Light: Research has shown that residential and small commercial air conditioning systems are usually not tested and adjusted to ensure peak performance, even during installation. Consequently, the majority of these systems operate at 10-35 percent below their design efficiency. Significant energy savings can be realized by assuring that air conditioners are properly installed and maintained.

SMUD and the American Public Power Agency (APPA) worked with the Proctor Engineering Group to design, build, and test a device that continuously monitors the performance of an air conditioner to ensure efficient operation. The device is designed for permanent installation in any residential or small commercial air conditioning system. It performs real-time diagnostics to detect the two most common efficiency detractors: incorrect refrigerant charge and insufficient evaporator airflow. Proper operation is verified every time the air conditioner is turned on.

The device has been successfully tested in the laboratory as well as in the field. Proctor Engineering is currently in discussions with prospective manufacturers.

Coolerado Cooler Update: SMUD is continuing to field test an innovative evaporative cooling system known as the Coolerado Cooler. According to the manufacturer, Idalex,

this compressor-less cooling system offers the same comfort levels as traditional air-conditioning systems at a fraction of the operating costs. Seven Coolerado Coolers have been installed and four were monitored in 2006. While the thermal performance of these units has been good, more work is needed to enhance system reliability. SMUD hosted a seminar in October to provide information about the project to our customers.

LED Hybrid Entry Lighting Fixture: Researchers from the California Lighting Technology Center partnered with Shaper Lighting to develop the LED Hybrid Entry Light. This new lighting fixture combines light emitting diode technology with an occupancy sensor and incandescent lighting to cut operating costs.

Ice Bear Thermal Energy Storage System: Ice Bear is a unique refrigerant-based thermal energy storage system that uses helical copper coils within an insulated tank. During the ice-making mode (usually at night), heat from the water is absorbed into the refrigerant coils and is then rejected to the atmosphere via a conventional air-cooled condensing unit.

During the load-shifting period (i.e. peak hours), the condensing unit is turned off. Cooling is provided by using a low power pump to circulate refrigerant between the indoor (evaporator) coil and the helical heat exchanger coils. In this mode, heat from the conditioned space is absorbed by the refrigerant in the indoor coil and is then transferred to the ice that surrounds the helical condenser coils. This enables the Ice Bear to shift more than 90 percent of the air conditioner's electrical consumption to off-peak hours.

SMUD hired ADM Associates, Inc. to conduct an evaluation of the Ice Bear 50 and its effectiveness in reducing peak load when applied to rooftop and split system air conditioners. Although the study showed that the Ice Bear is not cost effective under SMUD's existing time-of-use rates, the system may be a viable option in the future for commercial applications.