



PG&E and IKEA – Assembling Cost-Effective Energy Management



A Successful Merger of Innovation and Energy Conservation

Founded in 1943, IKEA is a global home furnishings retailer with more than 300 stores in 37 countries which served 590 million customers in 2009. Privately held IKEA employs 130,000 people and generates annual sales of more than \$31 billion worldwide. The Swedish company is now the world's largest furniture retailer.

IKEA has a deep corporate commitment to environmentalism. The company adopted an Environmental Action Plan in 1992 that includes an innovative recycling system, and recently launched IKEA GreenTech, a venture capital fund focused on companies innovating solar panels, alternative light sources and water purification technologies. IKEA also has a vision of shifting towards renewable energy usage whenever and wherever possible.

IKEA requires all its U.S. locations (37 stores, five distribution centers, one office) to conduct annual internal energy audits and encourages them to pursue and share energy savings initiatives in cooperation with local energy providers. The four IKEA facilities in the Pacific Gas and Electric Company (PG&E) service area – retail stores in West Sacramento, Emeryville and East Palo Alto and a distribution center in Tejon – work closely with PG&E to find ways to reduce their energy requirements.

Original Thinking in West Sacramento

The IKEA West Sacramento store covers 265,000 square feet. Within months of the store's opening in 2006, PG&E funded a retrocommissioning energy audit by ADM Associates that produced a list of no-cost, low-cost and capital-cost measures for the store to reduce energy consumption.

The store quickly implemented most of the no-cost measures, chiefly changes to the heating, ventilation, and air conditioning (HVAC) system. An optimum start/stop system was installed to stagger the startup function of the building's 38 air conditioning units, thus drawing fewer amps than would a simultaneous startup of all the units. An economizer function was added to bring in outside air when outdoor temperatures are sufficiently cool, helping the HVAC system to cool the building and provide night ventilation. The cooling temperature setpoint was raised by a couple of degrees, and the heating setpoint lowered.

IKEA West Sacramento delamped selected lighting in administrative offices and restrooms, converting two- and three-lamp fixtures into single-lamp fixtures with 25 watt fluorescent T8 bulbs. An additional low-cost measure involved replacing incandescent bulbs with more efficient compact fluorescent lamps (CFL).

These retrofit measures saved nearly 600,000 kilowatt hours (kWh) a year, slashing annual energy costs and reducing the store's carbon footprint by more than 470,000 pounds of CO₂ every year – the amount that it would take to power 85 homes.

The store also implemented capital cost measures like installing occupancy



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“The IKEA mission is to lower environmental impact with or without rebates, but we find that rebates do tend to speed our project approval cycle at the corporate level. So I come to Ann with a vision for a new way to achieve energy savings, and she works closely with my team to find the rebates that generally wind up covering the cost of the implementations. I couldn’t ask for a more responsive and supportive PG&E partner.”

**Alex Chaney,
Facilities Manager,
IKEA
West Sacramento**

sensors in the administrative areas, cafeterias, restrooms and storage areas. The sophisticated sensors detect both movement and sound, and shut down the lights when they detect neither. Warehouse lighting controls were put on a time schedule to turn off 33 percent of the lights during the middle of the day, when skylights provide substantial illumination. These projects were supported by a PG&E rebate.

IKEA West Sacramento is a participant in PG&E’s Demand Response (DR) program, reducing its energy usage during peak periods to ease the stress on the electrical grid. When the store signed up for AutoDR, in which a computer automatically lowers demand in response to a signal from PG&E, the standard system for accomplishing the cutback was to shut down the air conditioning system to increase the store temperature about two degrees.

Store facilities manager Alex Chaney believed this system could be improved for his store, because the economizers on those 38 HVAC units would automatically begin importing outside air, which on a summer afternoon can reach temperatures of 110 degrees Fahrenheit. Chaney and his engineers innovated a new solution called “duty cycling” the HVAC system, where the PG&E signal causes the computer to switch to a secondary schedule that shuts off half the store’s units on a staggered cycle. Every two hours during a DR event, half the units close down while the other half click on. The all-clear signal from PG&E causes the computer to switch back to the normal operations schedule.

This system works exceptionally well. During a single DR event, IKEA reduced its load an average of 235 kilowatts (kW) – over four hours in an afternoon peak period – and the store collected another sizable rebate from PG&E for the project.

In partnership with PG&E’s Emerging Technologies program, the West Sacramento store is studying future initiatives that include parking area light emitting diodes (LED) lighting and a rooftop solar installation that is projected to provide one-third of the store’s electrical usage. The facility has also signed up for ClimateSmart™ and contributes nearly two percent of its monthly electric bill to fund ClimateSmart projects.

Emeryville Automates with Demand Response

The 274,000-square-foot Emeryville store was its first in Northern California when it opened in 2000, and the store was among the first to join PG&E’s DR program. The store installed an AutoDR system that enables automatic, computerized HVAC reductions in response to a PG&E alert regarding increased stress on the electrical grid. The system, deployed by the AutoDR team (PG&E, Global Energy Partners, Lawrence Berkeley National Lab, and Akuacom), increases the air conditioning set point from 72 to 74 degrees in the first two hours of an alert, and then up to 76 degrees in the next two hours. The store also participates in Critical Peak Pricing and the Demand Bidding program to collect additional incentives from bidding on energy usage reductions and meeting them. PG&E has delivered substantial DR rebates to IKEA Emeryville.



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IKEA Emeryville also welcomed a PG&E-funded retrocommissioning audit in 2006. The survey by Matrix Energy Services, Inc. recommended a dozen no-cost, low-cost and capital cost measures ranging from HVAC adjustments to occupancy and daylight sensors to re-insulating refrigeration lines, most of which the store implemented.

The largest project was a lighting retrofit for the building's three-story parking garage. Metal halide fixtures were replaced by 180 high bay T8 fixtures, significantly reducing energy consumption. PG&E helped Emeryville gain corporate approval for the project by lining up a lighting vendor willing to front the cost of the new lighting and provided a rebate at the end of the project.

IKEA Emeryville's retrocommissioning measures have saved 14 kW, 200,000 kWh a year, and 5,000 therms a year, equivalent to annual reduced carbon emissions of more than 210,000 pounds of CO₂.

IKEA Emeryville's most recent initiative, completed in March 2009, was the replacement of 40 150 watt metal halide lights used for overnight store cleaning with 30 4-foot T8 lights that allow the store to conduct cleaning operations with much-reduced energy consumption. This project was also supported by a PG&E rebate.

Reducing Demand in East Palo Alto

At 290,000 square feet, the IKEA East Palo Alto store became the largest IKEA store in PG&E's service area when it opened in 2003. Like the Emeryville store, IKEA East Palo Alto joined PG&E's DR pilot program when it launched in 2005, and has remained an active participant. With technical support from the AutoDR team, the facility has a fully-computerized AutoDR system that kicks in to shut down some of the building's 43 rooftop HVAC units when a DR event is declared.

The system increases air conditioning set points two degrees between 12:00 p.m. and 3:00 p.m. and another two degrees from 3:00 p.m. to 6:00 p.m. during DR events, saving over 112 kW on average. During one event in August 2007, the store shed nearly one thousand kWh for the six hour event – cutting its normal load by 15 percent.

IKEA East Palo Alto also carried out a lighting retrofit in its parking garage in 2007, replacing metal halide lighting with more efficient T10 fluorescents. PG&E supported the project with a sizable Customized Retrofit rebate.

Tejon Lowers the Lights

The largest IKEA facility in the PG&E service area is a 1.7 million square-foot storage and distribution facility in Tejon that was built in 2001 and expanded in 2004. Both projects received design input from the PG&E Savings By Design program. The main warehouse is divided into six sections – two high bay sections (with 100-foot heights) where pallets are moved with 15 electric cranes, and four standard storage/shipping areas that employ battery-operated forklifts. Natural light is provided by louvered skylights, but lighting is by far the most significant energy user in the facility because it operates 24/7.

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Through PG&E's Customized Retrofit program, Tejon has carried out multiple lighting upgrades to increase energy efficiency. These projects have reduced electrical usage by more than 1800 kW, saving over 9 million kWh per year and generating enormous savings in rebates from PG&E.

In the largest project, completed in 2005, the facility replaced 1000 watt metal halide fixtures in the high bay areas with 450 watt fixtures, reducing the number of lights by half, and replaced high intensity discharge (HID) metal halides with T5 warehouse lighting in the standard sections. The project was done in conjunction with the installation of a building management system using occupancy sensors and ambient light sensors to automatically turn on the lights only when needed. These measures reduced energy consumption by 1.1 million kWh and had a demand reduction of over 200 kW.

In 2008, Tejon again focused on the high bay areas by eliminating use of the 450 watt metal halides – preserving them for safety lighting only – and installing LED task lighting on the cranes themselves, providing the operators with light where they most need it in the confined space to locate and lift specific pallets. This project alone will save 330,000 kWh and has produced another significant PG&E rebate.

Future projects include a new heating system, LED lighting for administrative and exterior areas, high-efficiency battery chargers for the forklifts, and a solar initiative. Tejon is also looking for ways to better leverage its participation in DR through Critical Peak Pricing, since its energy use is already extremely low during peak hours.

PG&E has also provided educational support to the Tejon facility's efforts to work with employees on reducing their energy use at home. During the 2009 "60 Earth Hour" event, the facility shut down operations and spent the hour educating its work force on energy efficiency with materials provided by PG&E.

Your Next Steps with PG&E

To learn how PG&E can help your business reduce costs and energy consumption, contact your local PG&E account manager or call our **Business Customer Service Center** at **1-800-468-4743**. More information is available at www.pge.com/retail.

