Creating Energy Efficient Solutions and Strategies for your Building

Energy Efficiency in Office Buildings

Office buildings are the single largest energy user in California’s commercial sector. The benefits of incorporating energy-efficient and sustainable design strategies into office buildings are becoming well documented. For the user, the economic benefit of increased indoor environmental quality resulting in higher employee productivity and satisfaction far outweighs that of energy cost savings. However, numerous energy-efficiency strategies promote both occupant well-being and energy savings.

The following figure is a breakdown of electrical consumption in office buildings by end-use. It illustrates the relative opportunities for increased energy savings.

Electric Consumption in Office Buildings by End-Use.
Based on data from the Department of Energy, Energy Information Administration, Building End-Use Consumption Survey, 1999. Source: www.fypower.org/bpg/
PG&E’s Energy Management Solutions for Office Buildings

Pacific Gas and Electric Company offers design assistance and financial incentives, as well as education and training to support energy efficient, high performance office buildings. Whether you are planning a new facility, retrofitting old inefficient equipment, or implementing demand response capabilities, PG&E’s energy management solutions can be customized to meet the unique needs of your project.

PG&E’s Energy Management Solutions

Energy Analyses

An energy analysis - also referred to as an “energy audit” - is the first step towards a comprehensive energy management plan and can help you identify a no cost, low cost and investment grade action plan. PG&E offers an on-site Integrated Energy Audit that identifies opportunities in demand response and self-generation as well as energy efficiency. To begin the process, visit pge.com/biz/rebates, and click on the appropriate sector for your business. Or contact the Business Customer Service Center at (800) 468-4743.

Energy Efficiency Rebates for Your Business

Rebates are the quickest and simplest way for you to get cash back for your eligible energy efficient purchases. To find out if a product qualifies under the rebate program, go to pge.com/biz/rebates/rebates_assistance or contact the Business Customer Service Center at (800) 468-4743 to request an application and one or more technology catalogs.

Customized Energy Efficiency/Demand Response Incentive Application

For customized energy efficiency projects or projects with a demand response component, PG&E offers design assistance, calculation support, and standardized incentive rates through the Customized Energy Efficiency/Demand Response Incentive. Total incentive payments are based on actual reductions in energy usage. Customers and their consultants may sponsor projects under this approach. Be sure to contact PG&E early in the design process, before you start your project, so that you can schedule optional technical support and the required pre-inspection of your existing equipment.
Customers with an electric demand over 200kW may benefit from participating in a demand response program. These programs help to control California’s large electricity requirements through customer participation. For more information go to pge.com/biz/demand_response

New Construction Design Assistance and Cash Incentives

PG&E’s new construction program – also referred to as Savings By Design – provides owner and design team cash incentives, technical design assistance, and education to support the design and construction of energy efficient new facilities and process systems. Incentives are based on exceeding Title 24 requirements by at least 10% for standard building systems, and on exceeding industry standard practice baselines for process systems. Through both the simple Systems Approach and the more integrated Whole Building Approach, owners and design teams may be eligible for cash incentives. For more information please visit pge.com/biz/rebates/2007_incentive_application

Energy Management Education and Training

You can learn about the latest and best energy-efficiency practices, technologies, tools and more through the hundreds of free classes offered by PG&E every year. To search by market sector, technology, class location (including web-based classes) or target audience, use the Pacific Energy Center’s class search tool at pge.com/education_training/classes/energy_efficiency

The following strategies can assist to create an energy efficient office building. Contact a PG&E representative to see which measures qualify for design assistance, rebates, and incentives for your specific project:

I. Design Strategies:

- **Building Orientation and Layout** – Select building orientation to enhance energy performance. Proper orientation (typically, an east-west axis) can maximize use of daylight and shading, reduce solar heat gain and glare, as well as benefit from the use of natural vegetation and direct breezes.
- **Exterior Shading** – Integrate design elements to provide effective shading of glazed areas throughout the desired times of day and year.
- **Glazing** – Consider using glazing, such as window film, to reduce solar heat gain.
**Natural Light** – Utilize daylight to illuminate common areas such as lobbies and reception areas, as well as perimeter offices and conference rooms. Use daylight to supplement or eliminate the need for electric lighting to reduce energy use while enhancing the luminous environment.

**Interior Design** – Select appropriate partition heights (low to distribute ambient light, high to block potential sources of glare) and interior finishes (lighter colors to reflect more light, matte surfaces to diffuse light) for maximum lighting efficiency.

**Lighting** – Install efficient fluorescent lamps, electronic ballasts (consider lamp-ballast combinations), and fixtures. Use Light Emitting Diodes (LED) in exit signs and compact fluorescent lamps in downlights and for task lighting. Use task-ambient lighting strategies to provide functionally appropriate lighting levels.

**Heating and Cooling** – Specify high efficiency mechanical equipment (consider system type, economizers, refrigerant type, minimum SEER and EER, control strategies, fan efficiency, variable speed drives, premium-efficiency for motors and pumps). Select equipment specifications (size, part-load efficiencies, redundancy) that best match estimated loads. Consider the use of evaporative cooling (or night-sky cooling), heat pumps, and/or radiant heating and cooling as appropriate.

**Ventilation** – Use variable-air-volume systems to supply only as much air is needed to meet conditioning or ventilation requirements. Consider delivering a larger mass of air at lower velocities to reduce fan power (a function of the square of the air speed).

**Controls** – Install occupancy sensors in spaces with infrequent occupation to control temperature and lighting settings. Appropriate spaces may include restrooms and hallways. For recurrent building hours, schedule-based control systems also provide considerable energy savings.

**Water Heating** – Consider the use of "demand" or "instantaneous" water heaters particularly in office buildings with low hot water demand. Tankless water heaters can save energy by eliminating standby losses. If traditional tank water heaters are used, insulate the tank and pipes and reduce the water temperature set-point where viable. Note, energy-efficient water heating is most effective when combined with water-efficient appliances and fixtures.

**Office Equipment and Appliances** – Specify ENERGY STAR® office equipment and appliances (i.e. refrigerators, dishwashers) throughout the facility. Highly efficient appliances reduce cooling loads in addition to minimizing plug-load energy consumption.

**Cool Roofs** – Use highly reflective roofing material to reduce the absorption of solar radiation and lower cooling requirements within the facility.

**Commissioning** – Insist on new construction commissioning, retro-commissioning, or re-commissioning to ensure that building systems are built and operate as intended. Commissioning is a process that will help you to optimize the benefit from
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your existing equipment. For more information, please call the Business Customer Center at (800) 468-4743.

II. Savings By Design

This program encourages high-performance nonresidential building design and construction. Sponsored by four of California's utilities, including PG&E, under the auspices of the Public Utilities Commission, the program offers a wide range of services including:

- **Design Assistance** – provides information and analysis tailored to meet the needs of the owner’s project and to help the architect and engineers design the most efficient building possible.
- **Owner Incentives** – helps offset the costs of energy-efficient buildings.
- **Design Team Incentives** – rewards designers who meet ambitious energy efficiency targets.

A complete list of services and incentives are provided at the following web site: savingsbydesign.com

III. Energy Savings Ideas for Property Managers

The following steps can be taken to reduce energy usage in buildings. Please visit pge.com/123 for more no cost, low cost, and capital cost measures that you can implement in your business.

**Steps to Take That Reduce Electric Usage**

- Adjust occupancy sensors.
- Adjust thermostats.
- Upgrade Energy Management System.
- Install occupancy sensors.
- Install variable speed drives on cold water pumps.
- Install reflective window film
- Install light emitting diode (LED) exit signs
- Replace T-12 lamps with T-8 lamps
- Replace Metal Halide lamps with T-5 lamps
- Replace chiller with a high efficiency chiller
- Parking Garages- replace lamps with high bay T-8 lamps
- Enclosed garages- install carbon monoxide sensors
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Steps to Take That Reduce Gas Usage
- Adjust thermostats
- Tune boiler
- Install a heat exchanger
- Replace boiler with a high efficiency boiler

IV. Other Strategies
- Develop Operations and Maintenance (O&M) programs to target energy efficiency and on-going performance.
- Install high-efficiency water faucets and toilets along with control sensors to reduce water use.
- Select building materials that are durable, renewable, and have minimal environmental impact over the life of the product.
- Use natural vegetation around the building perimeter to mitigate water use and minimize maintenance.
- Base design decisions on life-cycle cost assessments rather than first costs.

V. Alternative Energy

Solar Cells or Photovoltaics (PVs) – PVs convert solar energy into electricity. Still relatively expensive, the technology is best suited to supplementing electricity supplied from the utility power grid. Additionally, technological advancements as well as aggressive incentive programs are making this technology more attractive. By using the free and renewable (although cyclical) energy from the sun, on-site PVs avoid transmission losses and provide net metering opportunities. Go to pge.com/solar for more information.

Passive Solar Water Heating - Solar hot water reduces on-site electrical demand. Solar hot water heats water using solar energy and can be used to supplement or meet domestic hot water needs.
VI. Additional Resources on Energy Efficiency for Office Buildings

PG&E’s Self Generation Incentive Program –
www.pge.com/suppliers_purchasing/new_generator/incentive

ENERGY STAR® for Offices –
http://www.energystar.gov/index.cfm?c=business.bus_index

Green California, State of California Resources –
http://www.green.ca.gov/default.htm

Flex Your Power Resources for Commercial Buildings –
www.fypower.org/com/index.html