13. Facility Type: Retail

Revised January 2008

13.1 Challenges and Opportunities

There are approximately 657,000 retail buildings in the U.S., a number that represents about 13.5 percent of all U.S. commercial space. These buildings include stand-alone facilities, strip malls, and enclosed malls. Together, they consume approximately $21 billion worth of energy annually. The good news is that energy is one of the few expenses that can be decreased without negatively affecting a retailer's operation.

Retailers stand to gain several benefits from building upgrades:

- *Increased profitability.* Energy savings are reflected on a company's profit-and-loss statement as reduced operating costs, which directly increase the profitability of a retail operation.
- *Reduced vulnerability to energy price fluctuations.* Energy prices may be sensitive to numerous external factors, including major weather events and changes in national policies. For some regions, the potential for utility deregulation also lends uncertainty to future energy costs. Reducing a retail facility's total energy consumption can soften the impact of energy price fluctuations from any of these factors.
- *Increased sales.* Improving the energy efficiency of a retail building usually involves upgrades to the lighting and HVAC systems. By creating a more pleasant shopping environment, these upgrades can also attract and retain more customers, leading to an increase in sales.
- *Enhanced public image.* With growing concerns over global warming and other environmental issues, many retailers want to demonstrate to potential customers that they are responsible environmental stewards. Retailers can upgrade their buildings to be more energy efficient as a way to achieve this goal.

13.2 Energy Use Profile

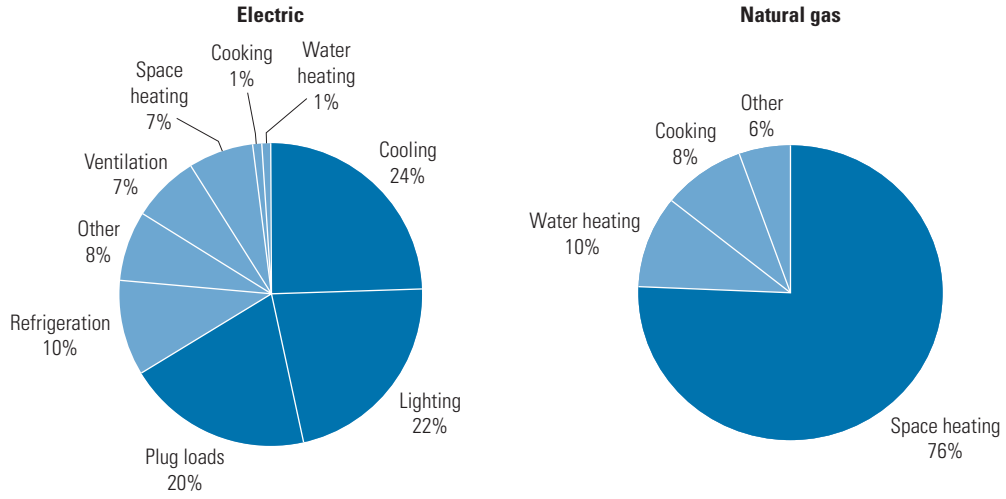
When planning a building upgrade, consider a retail establishment's largest energy loads. Typically, space heating and cooling, lighting, and plug loads such as computers and cash registers together account for nearly 70 percent of retail energy use (see **Figure 13.1**).

Energy intensity in retail establishments varies widely and is influenced by both weather conditions and the specific operations at the retail store, including the hours of operation, the number of workers, the number of cash registers, and the types of refrigeration required. On-site energy intensity in retail establishments can range from less than 10,000 Btu per square foot (ft^2) to more than 200,000 Btu/ft^2 (**Figure 13.2**). Given this large variation and skewed distribution, it can be misleading to assess a retail building's performance just by looking at its average energy intensity.

The EPA's national energy performance rating system is designed to provide a meaningful benchmark for retail facilities. The rating system is accessible online as part of the EPA's free Portfolio Manager tool (www.energystar.gov/benchmark). It evaluates a retail facility's energy intensity, normalizing for weather and operating characteristics. The rating is expressed on a scale of 1 to 100, signifying the percentile of performance. Retail facilities that achieve a rating of 75 or higher are performing in the top quartile and may be eligible to earn the ENERGY STAR label. The rating serves as a standard of comparison against other retail sites, and it provides a way to measure progress after upgrades are implemented.

Figure 13.1: Electric and natural gas end-use profiles for retail facilities

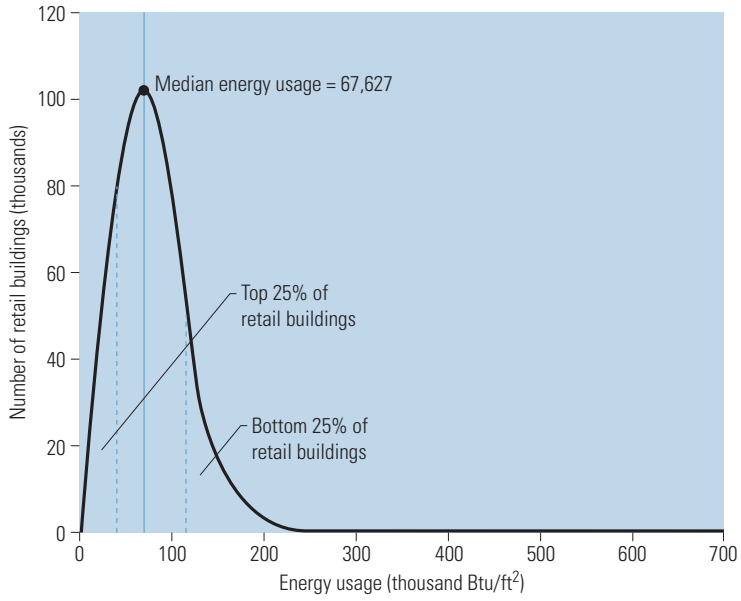
Most of the electricity consumed by retail facilities is used for cooling, lighting, and plug loads such as cash registers, computers, and copiers; most of the natural gas is used for space heating. Each retail establishment's energy profile is different, so these charts are not representative of all retail spaces.



Courtesy: E SOURCE; from Commercial Building Energy Consumption Survey, 1999 data

Figure 13.2: Distribution of energy intensity in retail facilities

This curve shows the overall distribution of energy use intensity among a national sample of retail buildings. The median retail store uses approximately 70,000 Btu per square foot (ft^2) from all energy sources. Many retail facilities, however, are significantly more energy-intensive than that.



Courtesy: E SOURCE; from Commercial Building Energy Consumption Survey, 2003 data

Retail establishments should begin all upgrade projects by establishing a benchmark rating. The relative ENERGY STAR ratings can help an organization identify their best- and worst-performing facilities. Although any retail establishment may benefit from retrocommissioning, operational improvements, and retrofits, low-scoring facilities stand to benefit the most.

For more information, visit ENERGY STAR for Retail at www.energystar.gov/retail. For descriptions of retail facilities that have earned the ENERGY STAR, visit www.energystar.gov/index.cfm?fuseaction=PARTNER_LIST.showPartnerResults&leaders_yn=N&poy_yn=N&success_yn=N&partner_type_id=CIR&s_code=ALL.

13.3 Technical Recommendations

Although building systems in retail establishments vary, common reasons for initiating energy-related upgrades include:

- Equipment that malfunctions frequently or experiences shortened lifetimes due to years of deferred maintenance
- Piecemeal additions to buildings or internal changes to existing spaces made without corresponding changes to heating and cooling systems
- Previous attempts to reduce energy consumption that used inappropriate measures such as blacking out windows or covering vents
- Public spaces with inadequate ventilation systems, high levels of indoor air pollutants from products, or poor acoustics

RESOURCES: Retail organizations

The following organizations offer resources that can help owners and operators of retail facilities manage energy use.

National Association of Convenience Stores
www.nacsonline.com

The National Association of Convenience Stores is an international trade association representing 2,300 retail and 1,700 supplier company members.

National Association of Store Fixture Manufacturers
www.nasfm.org

Member companies offer a full range of products and services for retail environments and include store fixture suppliers, retail design firms, suppliers of visual merchandising products, and suppliers of materials and equipment for the retail environment industry.

National Retail Federation
www.nrf.com

The National Retail Federation represents more than 100 state, national, and international trade organizations.

- Multiple rooftop air-conditioning units that are hard to control individually
- Major capital equipment or building infrastructure, such as a boiler or a roof, that is nearing the end of its useful life

In addition, following the staged approach that is advocated throughout this manual can reveal opportunities for saving on capital costs by "right-sizing" major equipment. After lighting and load-reduction measures have been implemented, it may be possible to specify smaller heating and cooling equipment.

Many of the following recommendations provide not only energy savings but also maintenance savings. Please note that this should not be considered an exhaustive list of measures appropriate for retail spaces. Facility directors for retail establishments are encouraged to refer to the full guidelines presented throughout this manual when planning and managing a building upgrade.

Retrocommissioning

Energy savings and other benefits. Most of the opportunities that are identified during retrocommissioning concern HVAC systems and, in particular, air-distribution systems. The amount of savings achieved will depend on the types of problems that are identified and the remedies that are implemented.

Retrocommissioning can also produce non-energy benefits. It can reduce equipment downtime and keep maintenance expenditures in check. Retrocommissioning may also create a more pleasing shopping environment by identifying poorly performing ventilation systems, which can be a culprit in poor indoor air quality. Problems with low-voltage electrical systems such as lighting, alarm, and building management systems are frequently identified during retrocommissioning.

Best practices. If a retailer's staff has sufficient expertise and familiarity with a building's systems, they may carry out the retrocommissioning work. However, retail facilities are more likely than other building types to outsource this work. Regardless of who does the work, training and documentation are crucial to successful efforts, as described in Chapter 5, "Retrocommissioning."

Tune-up opportunities. There are a number of easy measures that can reduce energy use in various store areas:

- *Storewide.* Turn HVAC temperature settings down in heating seasons and up in cooling seasons, while still maintaining comfortable conditions, and turn lights off when they are not in use. Occupancy sensors and timers can help with the latter, but a less-expensive alternative would be to develop a standard store-closing protocol for shutting off lights during closed hours.
- *Displays.* Many stores have electronic displays that remain on even when the store is closed. Consider shutting off the displays during closed hours either manually or with simple timers.
- *Peripheral rooms.* Make sure that HVAC settings in stockrooms, offices, and other peripheral rooms are at minimum settings.

Integration with facility planning. For retailers with multiple buildings, the complete retrocommissioning of select facilities as well as an assessment of the condition of their remaining buildings can be used to develop a multiyear facility management plan. The retrocommissioning programs could provide a model to follow for planning and prioritizing projects at other similar stores, while keeping the longer-term impact of those decisions in perspective. A typical facility assessment includes reviewing the age and condition of building components

RESOURCES: Retrocommissioning

The following organizations offer resources that help owners and operators of retail facilities to assess how effectively they currently use energy and to investigate efficient alternatives.

Building Commissioning Association
www.bcxa.org

The Building Commissioning Association aims for diverse and creative approaches to building commissioning by focusing on identifying critical commissioning attributes and elements, rather than attempting to dictate a rigid process.

California Commissioning Collaborative
www.cacx.org

The California Commissioning Collaborative is a non-profit organization made up of government, utility, and building services organizations and professionals, and provides commissioning information and resources for providers and building owners.

Edison Electric Institute, National Accounts Program
www.eei.org/industry_issues/retail_services_and_delivery/National_Accounts/about/index.htm

The Edison Electric Institute's National Accounts Program focuses on the unique needs of those commercial customers with multiple sites or outlets, including chains and franchise operations.

Food Marketing Institute
www.fmi.org/energy/

The Food Marketing Institute is a nonprofit association that conducts programs in research, education, industry relations, and public affairs on behalf of its members and their subsidiaries, which include food retailers and wholesalers and their customers in the United States and around the world.

Portland Energy Conservation Inc.
www.peci.org

Portland Energy Conservation Inc. provides commissioning guidelines and services and promotes energy-efficient practices and technologies for businesses and individual consumers.

Professional Retail Store Maintenance
www.prsm.com

Professional Retail Store Maintenance is a member organization promoting the awareness of retail facilities management and its impact on the success of retailers.

and then estimating their remaining expected lifetime and replacement costs. A number of resources are available to help operators of retail facilities assess their current operations and begin their investigation of energy-saving alternatives (see sidebar).

Lighting

Energy savings. Lighting represents about 22 percent of the electricity consumption in a typical retail establishment, not including its effect on cooling loads. Lighting retrofits can save 30 to 50 percent of lighting energy as well as 10 to 20 percent of cooling energy.

Best practices. Lighting is of critical importance to retailers because it can drive higher sales revenues. Products need sufficient illumination to attract attention from consumers, yet care is needed to protect some products from being overheated. Many retailers may not realize that contrasting light levels, not total light levels, make products stand out from their surroundings. Therefore, only key product areas should be highlighted—too much accent lighting not only uses more energy but negates contrast. Accent light levels can also be lowered when general illumination levels are kept lower. Although window display lighting levels may need to be high during the day to provide contrast in sunlit spaces, they can be lowered at night because contrast will be easier to achieve.

The Illuminating Engineering Society of North America (IESNA) sets illumination standards by task. Keep in mind that the IESNA guidelines do not heavily emphasize energy savings or daylighting. When daylighting is incorporated into a retail lighting strategy, the range of illumination levels can vary much more widely than with electric lighting alone.

Daylighting. Natural daylight offers two benefits over electric lighting in retail spaces. First, it can save energy by reducing the need for electric lights. For example, the Costco chain of discount stores began installing skylights and daylighting controls into its stores in the 1980s, and it now includes them as standard items in new stores. The payoff: projected annual energy savings of 1.5 kilowatt-hours/ft^2 per facility (approximately $23,000).

Second, there is some evidence that natural daylight can improve retail sales. A study sponsored by the California Energy Commission, published in 2003, looked at sales in 73 of one retailer's stores, 24 of which had a significant amount of daylighting. It calculated that the average effect of daylighting was to increase sales by up to 6 percent. The study also found that stores in areas that had more hours of useful daylight per year showed a greater daylight effect on sales.

Electric lighting. A mixture of light sources can create a pleasing and comfortable environment that is energy efficient and suitable for a variety of tasks. Electric lighting should be coordinated with a daylighting scheme or adjusted in response to it. A blend of direct and indirect electric lighting can provide soft and uniform illumination.

For general illumination in retail establishments, fluorescent lighting provides an efficient option with good color quality. If a facility uses T12 fluorescent lamps and magnetic ballasts, relamping with high-performance T8 lamps and electronic ballasts can reduce lighting energy consumption by 35 percent. Adding specular reflectors and new lenses can create additional savings. For big-box stores with high ceilings, ceramic metal halide (CMH) lamps and high-output

CASE STUDY: Hardware Store Cuts Costs with Lighting Upgrade

The owner of an Ace Hardware store in Martinez, California, sought to improve the quality of light in the store and reduce operating costs through a lighting upgrade. This was accomplished in part by using solar-tracking skylights instead of conventional ones. This technology uses multiple reflectors to track the sun and direct its light into the building through a diffuser, thereby achieving natural lighting of greater coverage, consistency, and duration than attainable with conventional skylights. In addition, the store's existing T12 fluorescent lamps and magnetic ballasts were replaced with T8 lamps and electronic ballasts. A light sensor in a skylight well turns on the electric lights when needed. Short-term monitoring revealed a 65 percent energy savings; for the 14,400-ft^2 facility, that worked out to be about 4.9 kilowatt-hours/ft^2.

CASE STUDY: Staples Store Lighting

Staples has made lighting efficiency a top priority throughout its national chain of retail office-supply stores. In 2003, it retrofitted 647 stores with single-lamp T8 fixtures, replacing two-lamp T8 fixtures except around the store perimeter. Though this change resulted in lower light levels, the stores appeared brighter because they used lamps with a higher color temperature (4,100 versus 3,500 kelvins) that gave off more blue light. The lighting upgrade resulted in a 6-million-watt annual reduction in energy use across all the stores.

Although some research has shown that visual acuity improves under light that emits more intensely in the blue part of the spectrum, the lighting community is not unanimous on the subject. However, Staples' experience seems to support the claim.

T5 fluorescent lamps are also good high-efficiency options. Office Depot replaced old metal halide lighting with T5 fluorescent lighting and not only cut energy use by about one-third, but increased light levels by 50 foot-candles as well.

For retail accent lighting, low-wattage CMH lamps with electronic ballasts are a good choice. They provide good color, long life, and high efficiency, and are now available in sizes as small as 20 watts to replace commonly used 75-watt halogen lamps. CMHs are available in popular MR16, PAR20, and PAR30 configurations.

For display cases and under-shelf illumination, T5 fluorescent lamps are a good choice. They are small in size and highly efficient, and they also have good color quality.

Another option for accent lighting is fiber optic lighting, in which a single high-efficiency light source feeds multiple remotely placed fixtures. Although installation can be costly, remote-source lighting offers a number of benefits important in retail applications, including minimizing the introduction of infrared and ultraviolet energy, allowing the use of more-powerful and more-efficient light sources, providing better targeting of the light, reducing maintenance requirements, and providing aesthetic appeal.

Light-emitting diodes (LEDs) also have a role to play in retail outlets. Retail accent lighting is a growing area for LEDs because they provide the ability to vary color, create sparkle, and aim the light precisely. The Alessi store in New York City uses LEDs to accent a line of stainless-steel products including coffee makers, containers, and flatware. For stores with refrigerated products, LEDs are a good solution for illumination inside refrigerated display cases because they do not create as much heat as fluorescent or incandescent lamps. If LED exit signs are not already in place, this is one retrofit that is usually a clear winner for any retailer, not only for how much energy it can save but also for maintenance savings. An ENERGY STAR qualified LED exit sign can go 25 years without lamp replacement, compared with less than 1 year for an incandescent sign.

Outdoor lighting is important for maintaining security and shopper comfort, though efficiency improvements can usually be made without impeding these functions. Two types of high-intensity discharge (HID) sources, metal halide and high-pressure sodium, offer efficient operation compared to mercury vapor or incandescent sources. Compact fluorescent lamps have also become viable for outdoor lighting, offering good color quality and better control options than HID sources.

For outdoor lighting and other areas where relamping and maintenance are difficult or hazardous, such as in escalator wells and high-ceilinged spaces (like those found over open mall

areas), induction lighting also offers an attractive alternative to HID lamps. Induction lamp products typically have long lifetimes (up to 100,000 hours, compared to 24,000 hours for HIDs), which means infrequent relamping. Moreover, they offer good lumen maintenance, compact construction, and vibration resistance. Finally, induction lamps can start at temperatures as low as –40° Fahrenheit with no delay, and then operate at those temperatures without significant loss of lumens.

Controls. In the back-room areas of retail operations, occupancy sensors can save energy and also help to reduce maintenance costs by lengthening the relamping interval. In storage rooms, offices, and restrooms, ceiling-mounted ultrasonic occupancy sensors can be used to detect occupants around partitions and corners. For hallways, a recommended strategy is to use a combination of scheduled lighting and dimming plus occupancy sensor controls after hours.

For areas that use daylighting, automatic dimming controls can be used to ensure minimum light levels are met while still saving energy and to adjust light levels gradually so that those adjustments are not perceptible. Where dimming controls are not used, stepped controls that adjust lights over at least three levels can help to minimize noticeable light-level changes.

Load Reductions

Energy savings. Load reduction measures that reduce the operational time or intensity of HVAC equipment in a retail setting while still maintaining a comfortable environment can offer substantial savings. In addition, plug loads present opportunities for savings. Equipment such as cash registers, computers, and copiers represent about 20 percent of the electricity used in retail establishments. Although cooking equipment traditionally has represented only about 1 percent of the total energy used by retail establishments, many retailers are now incorporating food service into their stores, either under their own brand or through partnerships, such as where a McDonald's restaurant operates inside of a Wal-Mart store. For these establishments, ENERGY STAR qualified cooking equipment, which uses 10 to 50 percent less energy than conventional models, can be a good choice.

Best practices. The quickest and easiest load reductions in a retail environment involve making sure that equipment is turned off when it is not needed. Retail, custodial, or other staff volunteers can be recruited for this effort. As an alternative, it may be possible to set some equipment, such as computers, to go into an idle or sleep mode when not in use. Low-power sleep modes can save $10 to $30 per monitor or $15 to $45 per desktop computer annually. Vending machines can also be shut off using occupancy sensors. Retailers that have multiple appliances on display may also benefit from using power strips to control phantom loads: Many power supplies still consume energy even when the appliance is off, particularly those with remote controls. For example, power to home electronics, such as televisions or stereo equipment, could be shut off completely at night using power strips. JC Penney launched a behavior modification campaign called Monthly Utility Mania in an attempt to get its employees to participate in energy reductions in each store. The program saved more than $500,000 in the first month, and that success led to its expansion. By designating a volunteer Energy Captain in each store, JC Penney is making energy efficiency fun, easy, and rewarding. They give employees current information about the energy use in their stores, incentives, and ideas to reduce energy use, all of which has led to significant savings.

For retailers that provide food service, food-preparation equipment should not be turned on for preheating more than 15 minutes before it is needed. Simply reducing the operating time of kitchen appliances can cut cooking-related energy consumption by up to 60 percent. Also, rapid-cook ovens, which combine microwave with other heating technologies, have very low

power draw when idle and can eliminate the energy waste from idle conventional ovens. Hot water waste can be reduced in kitchens and bathrooms with low-flow prerinse spray valves, automatic faucet shutoffs, and single-temperature fittings.

Efficient equipment procurement. A simple way to ensure that purchased equipment is energy efficient is to request that procurement officials for retailers specify products that are ENERGY STAR qualified (www.energystar.gov/purchasing) in their contracts or purchase orders. Additionally, the product recommendations for federal government procurement officials from the U.S. Department of Energy's Federal Energy Management Program (www1.eere.energy.gov/femp/procurement) may be appropriate for items that are not covered under the ENERGY STAR program. Some ENERGY STAR qualified products that are relevant for retailers include:

- Computers and monitors
- Printers, fax machines, mailing machines, and scanners
- Copiers
- Televisions, DVD players, and audio equipment
- Vending machines
- Roofing products
- Commercial refrigerators and freezers (for retailers that offer food service)

For example, replacing three conventional refrigerated beverage vending machines with ENERGY STAR qualified models, which are 40 percent more efficient, could mean annual operational savings of $390. One ENERGY STAR qualified commercial refrigerator can save $140 per year and reach simple payback in just 1.3 years. Purchasing ten 15-inch LCD (liquid crystal display) monitors for check-out stations that meet ENERGY STAR specifications could save $70 annually compared with conventional models.

Retrofits. Many retail establishments have few floors but a large footprint, which means they have a high ratio of roof area to total facility square footage. This makes them good candidates for cool-roof solutions. If a retail building's roof needs recoating or painting, choosing white or some other highly reflective color can minimize the amount of heat that the building absorbs. This change can often reduce peak cooling demand and cooling energy use by 15 to 20 percent, depending on the climate zone in which the facility is located. When a roof requires replacement, adding insulation will reduce heat gain and loss. To see a list of qualifying ENERGY STAR roofing products, visit www.energystar.gov/index.cfm?c=roof_prods.pr_roof_products.

Air Distribution Systems

Energy savings. Ventilation systems consume approximately 7 percent of the electricity used in retail buildings. Savings can be found by installing efficient fan motors and sizing the system to match the load (which may now be lower due to measures adopted in previous stages). Additional savings are possible through the use of energy-recovery equipment and variable-speed drives. If a facility is currently overventilated, then decreasing ventilation levels can produce energy savings both from the air distribution system and from the cooling and heating system. However, if ventilation needs to be increased to reach safe and comfortable levels, energy consumption will likely increase, so ventilation level changes should be combined with other energy-saving measures.

Best practices. A ventilation system must be designed, operated, and maintained to provide adequate fresh-air intake and prevent mold growth from unwanted moisture accumulation. ASHRAE (the American Society of Heating, Refrigerating, and Air-Conditioning Engineers) Standard 62.1, "Ventilation for Acceptable Indoor Air Quality," establishes minimum ventilation levels for several types of retail spaces. Retailers with products that emit volatile organic compounds or other chemicals, such as hardware stores that sell paint or facilities that develop photographs on-site, may need to supply extra exhaust capacity and makeup air to sections of the store to remove these fumes.

Retrofits. Dehumidification is important for shopper and employee comfort. For retail stores in humid climates, dedicated outdoor air systems (DOASs) can improve humidity control and produce energy savings. In retrofit applications, the DOAS airstream can be brought into the building's ductwork through a mixing box or through the existing HVAC system. Either way, desiccant systems used as part of the DOAS can relieve mechanical air-conditioning systems of the duty of dehumidifying outdoor air.

In retail outlets, which generally have an average occupancy that is low relative to their peak occupancy, demand-controlled ventilation (DCV) systems provide a cost-effective way to reduce outdoor air flows and the associated energy consumption during periods of low occupancy. Savings are highest where an establishment's occupancy is highly variable, the store is open for long hours, the climate is characterized by extreme heating or cooling loads, and the existing HVAC system does not use 100 percent outdoor air (such as with evaporative cooling systems). Annual energy savings can amount to as much as $\$1/ft^2$. Because DCV reduces the amount of outdoor air brought in only enough to satisfy maximum carbon-dioxide levels, retailers that carry products that give off chemical gases should take care to provide enough ventilation to remove these fumes.

Heating and Cooling Systems

Energy savings. Together, heating and cooling systems consume approximately 38 percent of the energy used in retail establishments. Installing high-efficiency rooftop units (RTUs), which are frequently used on retail facilities, can save a significant amount of energy. For example, using a high-efficiency 10-ton unit with an energy-efficiency ratio (EER) of 12 versus a standard unit with an EER of 8.9 would generate about $2,200 per year in energy savings in the climate of Boulder, Colorado, at an energy cost of $0.08 per kilowatt-hour.

CASE STUDY: Updating Yorkdale Mall

Starting in 2002, the Yorkdale Shopping Centre in Toronto implemented several building upgrades that have cut its C$2 million energy bill in half. Following a building audit, an extensive lighting retrofit was undertaken that produced about 60 percent of the total savings achieved. The audit also revealed that the rooftop units cooling the mall were nearing the end of their life and that many of them were not properly maintained. In response, new RTUs were installed, along with a central energy management system, which generated the remaining 40 percent of the total savings achieved. The energy management system is used to turn the RTUs off at night and to control temperature setpoints. In addition, the mall implemented an automated electronic notification and tracking system for preventive maintenance. Service personnel automatically receive a notification on their personal digital assistants (PDAs) when it is time to perform regular equipment maintenance and, in turn, can send back to the system a report on what work is actually performed.

Best practices. Humidity control is particularly important for some types of retail establishments. In clothing stores, for example, if humid air inside makes customers feel sticky, they may be less likely to try on clothes. Also, humidity control in stores with refrigeration systems can help to prevent condensation and frost buildup. Desiccant dehumidification and heat-recovery systems can provide efficient and effective strategies for handling large humidity loads.

Retrofits. Commercial packaged RTUs and residential-type central air conditioners dominate the cooling of non-mall retail establishments, serving approximately 82 percent of the cooled floorspace. If packaged equipment is in need of replacement, using high-efficiency units rather than standard-efficiency models can provide attractive savings. Office Depot has adopted this strategy, retrofitting more than 500 RTUs throughout the chain with high-efficiency units.

Several other retrofits can also save energy. Economizers can be added to many systems, though in humid areas they should be used with differential enthalpy controllers. Ceiling fans can also be added to reduce the need for air conditioning. The Target retail chain, for example, uses them in several stores.

Central energy management systems can generate savings by enabling the easy control of multiple RTUs to establish appropriate temperature setpoints, by turning off equipment at night, and by tracking energy use. JC Penney is installing energy management systems in 800 stores to monitor each store's electrical and mechanical systems, to schedule the operation of HVAC and lighting equipment, to track store comfort levels, and to identify opportunities for saving energy.

13.4 Financial and Implementation Issues

For retail facilities, especially big-box stores, a big challenge is the fact that funds for building upgrades must compete with funds for new construction. Most energy equipment–related decisions for retail chain facilities are made at the corporate headquarters level. The same people are typically responsible for equipment decisions for all applications. Unlike other sectors, where engineering departments play a major role in decisions, in retail facilities, facility management, maintenance and construction departments, or senior management have the most influence. Decision-making guidelines often focus on both payback and life-cycle cost and can be project-specific for building upgrade projects. In general, big-box retailers look for rapid payback periods of two years or less on projects in existing buildings, largely because the funds needed for these projects compete with the capital required for opening new stores. However, payback periods of as long as five years may be acceptable for specific projects.

For retail spaces located in multiuse buildings, upgrades are likely to need special consideration. The ability to upgrade some or all of the building systems in a particular space will depend on lease agreements, whether spaces are served by their own HVAC or other equipment, whether spaces are submetered, and the building owner's willingness to participate in the process. One way to enable a retrocommissioning or equipment upgrade is to share both costs and savings between the building owner and the tenants. Hines, one of the largest real estate organizations in the world, uses this model to implement building upgrades so that affected tenants do not pay extra during the payback period and after that reap pure savings.

Bibliography

Criscione, Peter, and Ira Krepchin, "Long Live Electrodeless Lamps," *E Source Report, ER-02-6* (May 2002).

Designlights Consortium, "Retail Skylighting Know-how" and "Small Retail Lighting Know-how," www.designlights.org/guides.html (accessed August 2007).

Duff-Gray, Leslie, "Achieving Energy Efficiency," Office Depot, www.businessroundtable.org/pdf/ClimateRESOLVE/Event/38_Duff%20Gray_Presentation%2010.06.pdf (accessed October 2007).

Energy and Environmental Analysis Inc., "National Account Sector Energy Profiles," report prepared for Oak Ridge National Laboratory (April 2003), www.eere.energy.gov/de/pdfs/national_account_energy_profiles.pdf.

Fedrizzi, Rick, and Jim Rogers, "Energy Efficiency Opportunities: Big Box Retail and Supermarkets," report prepared for the Center for Energy and Climate Solutions (May 2002), http://files.harc.edu/Sites/GulfCoastCHP/MarketAssessments/EnergyEfficiencyOpportunitiesBigBox.pdf.

Heschong Mahone Group, "Daylight and Retail Sales" (October 2003), report prepared for the California Energy Commission, www.h-m-g.com/projects/daylighting/projects-PIER.htm.

Innovest Strategic Value Advisors, "Energy Management and Investor Returns: The Retail Merchandising Sector" (February 2003), www.energystar.gov/ia/business/guidelines/assess_value/merch.pdf.

Pacific Gas and Electric Co., "Daylighting Initiative, Retail Application: From Sunrise to Sunset—This Is a Well Lit Place" (1999), www.pge.com/003_save_energy/003c_edu_train/pec/daylight/di_pubs/1487ACE_repaginated.pdf.

Pacific Gas and Electric Co., "Daylighting Initiative, Retail Application: A Cart Full of Energy Savings" (1999), www.pge.com/003_save_energy/003c_edu_train/pec/daylight/di_pubs/1487Coco_repaginated.pdf.

U.S. Department of Energy (DOE), Energy Information Administration (EIA), Commercial Building Energy Consumption Survey (CBECS), "End-Use Consumption by Principal Building Activity" (1999 data; published 2003), www.eia.doe.gov/emeu/cbecs/enduse_consumption/pba.html.

U.S. DOE, EIA, "2003 CBECS (Commercial Building Energy Consumption Survey) Detailed Tables," Tables A5 and B41, www.eia.doe.gov/emeu/cbecs/cbecs2003/detailed_tables_2003/detailed_tables_2003.html.

U.S. DOE, EIA, "1999 CBECS Detailed Tables," Table C2, www.eia.doe.gov/emeu/cbecs/detailed_tables_1999.html.

Wal-Mart, "Overview," http://walmartstores.com/GlobalWMStoresWeb/navigate.do?catg=217 (accessed June 2007).

Wilson, Marianne, "Green Light for Savings," *Chain Store Age* (August 2004), www.energystar.gov/ia/business/retail/Staples_energy_management_csa.pdf.