

Managing Energy Costs in Retail Buildings

Retail buildings in the U.S. spend an annual average of \$1.21 per square foot on electricity and 14 cents per square foot on natural gas. In a typical retail building, lighting, cooling, and heating represent between 69 and 84 percent of total use depending on climate, making those systems the best targets for energy savings (see illustration, next page).

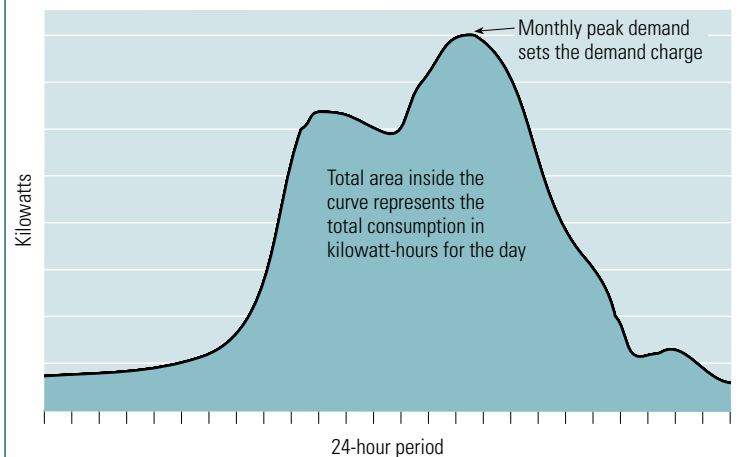
When trying to better manage your building's energy costs, it helps to understand how you are charged for those costs. Most utilities charge commercial buildings for their natural gas based on the amount of energy delivered. Electricity, on the other hand, can be charged based on two measures: consumption and demand (**Figure 1**).

The consumption component of the bill is based on the amount of electricity in kilowatt-hours (kWh) that the building consumes during a month. The demand component is the peak demand in kilowatts (kW) occurring within the month, or, for some utilities, during the previous 12 months. Demand charges can range from a few dollars per kilowatt-month to upwards of \$20 per kilowatt-month. Since it can be a considerable percentage of your bill, care should be taken to reduce peak demand whenever possible. As you read the following energy cost management recommendations, keep in mind how each one will impact both your consumption and demand.

Quick Fixes

Many stores can benefit from quick low cost/no cost energy-saving solutions, such as turning things off, turning things down, and keeping up with cleaning and maintenance.

Figure 1: Diagram of a hypothetical daily load shape



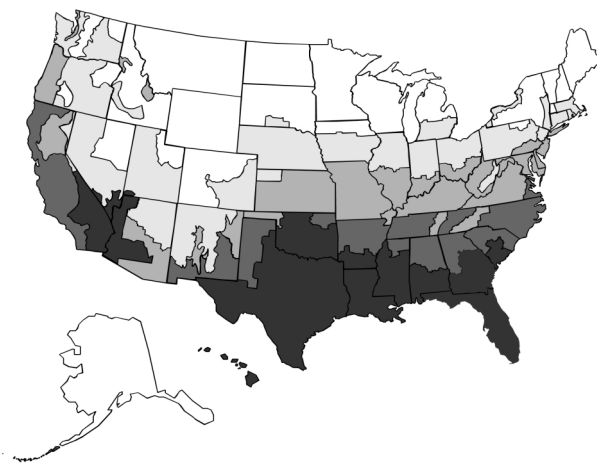
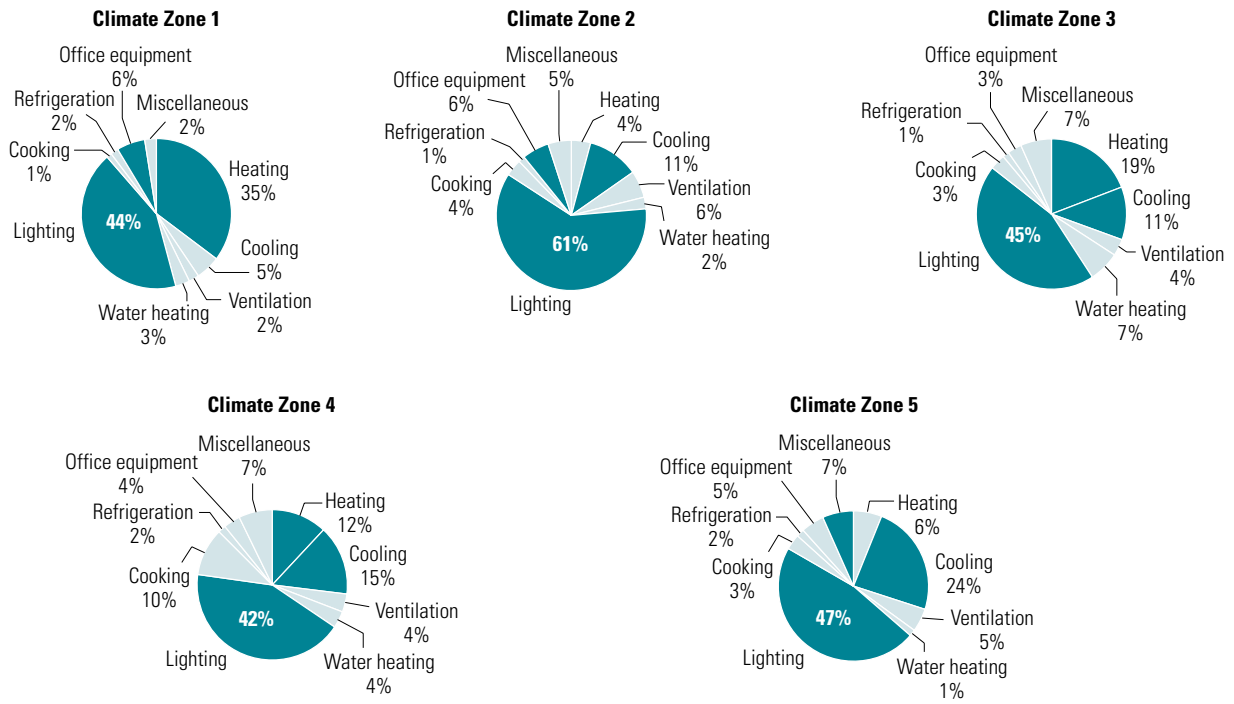
Turning Things Off

Turning things off seems simple, but remember that for every 1,000 kWh you save by turning things off, you save \$100 on your utility bill, assuming an average electricity cost of 10 cents per kWh.

Lights: Turn off lights when they are not in use. Occupancy sensors and timers can help, but a less expensive alternative would be to develop a standard store-closing protocol for shutting off lights during closed hours.

Electronic displays: Many stores have electronic displays that get left on even when the store is closed. Consider shutting off the displays during closed hours either manually or with simple timers.

Energy consumption in retail buildings by end use for five U.S. climate zones



- Climate Zones**
- Zone 1 is less than 2,000 CDD and greater than 7,000 HDD.
 - Zone 2 is less than 2,000 CDD and 5,500–7,000 HDD.
 - Zone 3 is less than 2,000 CDD and 4,000–5,499 HDD.
 - Zone 4 is less than 2,000 CDD and less than 4,000 HDD.
 - Zone 5 is 2,000 CDD or more and less than 4,000 HDD.

Note: CDD = cooling degree days; HDD = heating degree days

Source: U.S. Energy Information Administration

Turning Things Down

Some equipment cannot be turned off entirely, but turning it down to minimum levels where possible can save energy.

HVAC temperature setbacks: During closed hours, turn

temperature settings down in warming seasons and up in cooling seasons.

Peripheral and back rooms: Make sure that HVAC settings in stockrooms, offices, and other peripheral rooms are at minimum settings.



Cleaning and Maintenance

Making sure that your HVAC system is regularly cleaned and serviced can help to prevent costly heating and cooling bills.

Check the economizer: Many air-conditioning systems use a dampered vent called an economizer that draws in cool outside air when it is available to reduce the need for mechanically cooled air. If not regularly checked, the linkage on the damper can seize up or break. An economizer that is stuck in the fully open position can add as much as 50 percent to a building's annual energy bill by allowing hot air in during the air-conditioning season and cold air in during the heating season. Have a licensed technician check, clean, and lubricate your economizer about once a year, and repair it if necessary. If the economizer is still operating, have the technician clean and lubricate the linkage and calibrate the controls.

Check air-conditioning temperatures: With a thermometer, check the temperature of the return air going to your air conditioner and then check the temperature of the air coming out of the register that is nearest the air-conditioning unit. If the temperature difference is less than 14 degrees or more than 22 degrees, have a licensed technician inspect your air-conditioning unit.

Change the filters: Filters should be changed on a monthly basis, and more often if you are located next to a highway, construction site, or other site where the air is dirtier than usual.

Check the cabinet panels: On a quarterly basis, make sure the panels to your rooftop air-conditioning unit are fully attached, with all screws in place and all gaskets intact so that no air leaks out of the cabinet. Chilled air leaking out can cost \$100 per rooftop unit per year in wasted energy.

Clean the condenser coils: Check the condenser coils quarterly for either man-made or natural debris that can collect in them. At the beginning and end of the cooling season, thoroughly wash the coils.

Check the airflow: Hold your hand up to the registers to ensure that there is adequate airflow. If there is little airflow, or dirt and dust are found in the register, have a technician inspect your unit and ductwork.

Longer-Term Solutions

Longer-term solutions should also be considered. Although the actions covered in this section require more extensive implementation, they can dramatically increase the efficiency of your facility without compromising the shopping environment. Ask your local utility's representative for more information about initiating such projects.

Commissioning

Commissioning is a process in which engineers check and tune up building systems to ensure that they are operating appropriately and efficiently. Studies have shown that continuously monitoring a building's energy systems can lead to reductions of 10 to 15 percent in annual energy bills. For the typical 50,000-square-foot retail building, that's equal to about \$8,000 in savings per year! Savings typically come from resetting existing controls to reduce HVAC waste while maintaining or even increasing comfort levels for occupants. Commissioning usually costs between 5 and 40 cents per square foot.

Lighting Measures

Lighting is critical, both in creating an ambiance and in making the merchandise attractive to shoppers. High-quality lighting can reduce energy bills and drive higher sales. Consider these lighting changes:

Display lighting: Proper display lighting is critical for driving retail sales and preventing merchandise returns. Quartz halogen lamps are commonly used for accenting merchandise because they provide a bright, focused column of light. Unfortunately, quartz halogen lamps are energy-inefficient. Efficient alternatives to consider for accenting merchandise are compact fluorescent or

metal halide track or spot lights. Have a lighting consultant review your lighting layout to ensure that it provides the appropriate light levels, quality of light, color rendering, color uniformity, and energy efficiency.

Fluorescent lamps: If your facility uses T12 fluorescent lamps, relamping with modern T8 lamps and electronic ballasts can reduce your lighting energy consumption by 35 percent. Adding specular reflectors, new lenses, and occupancy sensors or timers can double the savings. Paybacks of one to three years are common.

Big-box retail stores with high ceilings might want to consider going to a system that uses T5 lamps and indirect fixtures to boost both lighting quality and efficiency. T5 lamps are far more energy-efficient and offer better light quality than the high-intensity discharge lights that are typically found in high-ceiling stores.

Smart lighting design in parking lots: In its *Lighting Handbook*, the Illuminating Engineering Society of North America recommends parking lots be lit at an average of one foot-candle or less of light, but most parking lots are designed with far more lighting than that. Using lower-wattage bulbs can actually increase the safety of your lot: An overlit lot can be dangerous to drivers if their eyes cannot adjust quickly enough in the transition from highly lit to dark areas. When designing lighting for a new parking lot, consider using low-wattage metal halide lamps, instead of high-pressure sodium lamps, in fixtures that direct the light downward. Even with a lower wattage, a retail store could safely use fewer lamps if this choice is made. Metal halide is less efficient than high-pressure sodium in conventional terms, but it puts out more light in the blue part of the spectrum, which turns out to be easier for our eyes to see under low-light conditions.

Demand-Controlled Ventilation

When only a few people are in a store, energy can be saved by decreasing the amount of ventilation supplied by the HVAC system. A demand-controlled ventilation

(DCV) system senses the level of carbon dioxide in the return airstream and uses it as an indicator of occupancy. DCV can save energy during peak cooling periods when many shoppers are at work and occupancy is low. In retail sales applications, DCV works best when a dedicated HVAC system serves the sales floor.

Reflective Building Roof Coating

If the roof needs recoating or painting, consider white or some other highly reflective color to minimize the amount of heat the building absorbs. This change can often reduce peak cooling demand by 15 to 20 percent. For a list of suitable reflective roof coating products, check out the U.S. Environmental Protection Agency's Web site at <http://yosemite1.epa.gov/estar/consumers.nsf/content/roofbus.htm>.

Replace Windows

Modern, specularly selective glazing makes it possible to maintain good visibility through a window while limiting solar gain, which can heat a store and fade clothing colors. If your store is in a warm climate, replacing clear glazing with more sophisticated glazing can be done with short paybacks and can result in increased comfort for shoppers. Specify new glazing carefully—you may need to seek a different solution for each facade. Applying specularly selective window films to existing windows may allow you to achieve some of the same benefits as new glazing, but at a lower cost.

The Bottom Line

Almost all of the conservation measures discussed here represent good investments. Most will not only save you money but will also enhance both the aesthetics of your store and the amount of merchandise it sells.

