

SEDAC ENERGY SMART TIPS



Convenience Stores



Convenience stores are a ubiquitous part of the American retail landscape. Everyone has experienced the unique combination of the old hometown general store and modern mega-marketing typified by convenience stores.

Convenience stores that sell gasoline have become the largest retail outlet of gasoline in the United States. Yet, paradoxically, because of the relatively small profit margin on gasoline sales (an average of about 12.4 cents per gallon) in-store sales account for a significant portion of overall convenience store revenue (between 40 to 50 percent of total store revenue). Typical in-store sales volume is approximately \$400 per square foot of floor space per year and account for a larger proportion of profit because margins are greater on

in-store sales than on motor fuel sales.

In addition to gasoline sales, some convenience stores may be co-located with fast food chains and others are part of travel plazas that include vehicle washing, truck servicing and parking, shower facilities, game rooms, and full service restaurants.

Convenience stores provide such a wide variety of services that their energy consumption profile is actually a composite of several building types including retail, restaurant, supermarket, and vehicle service. The overall energy consumption profile is dependent on the mix of these types in a given store. Some stores may lean more to the grocery end of the spectrum with greater refrigeration energy usage, while others may have more extensive food service and

food preparation and therefore have greater energy consumption in these areas. However, interior and exterior lighting and refrigeration are usually the greatest energy consumers at convenience stores and should be targeted for efficiency improvement.

Consistent with the significant revenue generation per square foot, convenience stores also have the highest per square foot annual energy costs of any business type served by SEDAC to date, ranging from \$6 to \$14 per square foot. This compares with costs of about \$2 per square foot for building types such as commercial offices. The following tips will help you determine how you can save in energy costs at your convenience store and run a more efficient building.

The Smart Energy Design Assistance Center performs energy assessments on various building types. Each building type has different energy requirements. SEDAC's Energy Smart Tips help building operators identify energy cost reduction measures.

SMART ENERGY DESIGN ASSISTANCE CENTER
PROVIDING EFFECTIVE ENERGY STRATEGIES FOR PUBLIC AND PRIVATE BUILDINGS IN ILLINOIS

ENERGY STAR®'S 7 STEPS OF ENERGY MANAGEMENT

1 Make a Commitment

Recognize that the economic, environmental and political impacts of energy consumption are sufficient motivation to change our energy use patterns.

2 Assess Performance

Make a personalized accounting of energy use and costs. Benchmark your facility by comparing its energy performance with similar sites.

3 Set Goals

Review your objectives and constraints. Establish priorities and set measurable goals with target dates.

4 Create an Action Plan

Define the technical steps. Apply proven methods to increase energy efficiency or get specialized guidance. Assign roles and resources. Consider rolling savings from earlier efforts into future, more complex initiatives.

5 Implement Action Plan

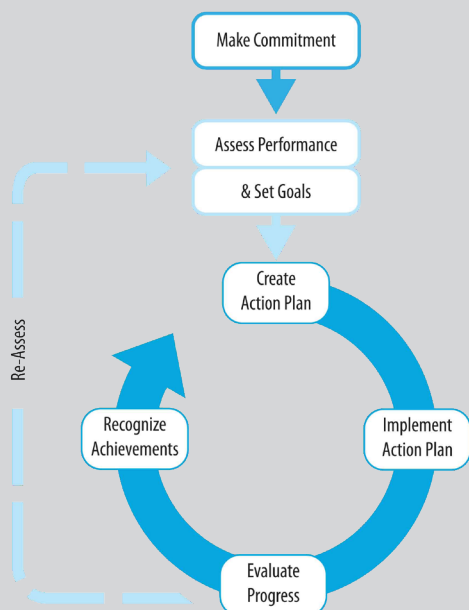
Install equipment and change operational procedures. Establish a maintenance schedule. Train equipment operators and building occupants on the changes. Track and monitor conditions.

6 Evaluate Progress

Compare current performance to established goals. Understand what worked well in order to identify best practices. Adjust procedures and goals, and schedule the next evaluation.

7 Recognize Achievements

Provide internal recognition for the efforts and achievement of individuals, teams, and facilities. Seek external recognition from government agencies, media, or third party organizations.



ENERGY STAR®'s steps for energy management.
Descriptions have been modified by SEDAC staff.



REFRIGERATION SAVINGS

Typically, walk-in coolers, open shelf, and closed-door display cases in convenience stores are served by exterior pad or roof-mounted condensing units. Open tub display cases, cold drink vending machines, and ice machines are usually standalone units which reject heat to the store interior.

Energy conservation measures include selecting walk-in coolers with adequate insulation, using anti-sweat heater controllers on display case doors, installing energy efficient display cases, using floating head pressure controllers on condensing units, and selecting modern scroll compressor condensers.

No-cost refrigeration tips include considering the following:

- **keep doors shut** to better preserve food and save money.
- **check door seals** to ensure that warm air is not entering the unit and reducing cooling energy. ENERGY STAR's rule of thumb is that if you can slide a dollar bill into the seal, the seal should be readjusted.
- dirt accumulation impairs heat transfer and lowers the efficiency of refrigeration units, so routinely **clean cooling coils**.
- set your **temperature settings** between -14° and -8°F for freezers and between 35° and 38°F for refrigerators.
- regularly **schedule equipment maintenance** and check that evaporator coils are clean and free of ice build-up.

INDOOR & OUTDOOR LIGHTING TIPS

INDOOR ILLUMINATION

Since a large percentage of convenience stores operate 24 hours per day, implementing efficient lighting can quickly reduce energy consumption. For general interior lighting, use Super T8 fluorescent lighting with high efficiency electronic ballasts. Overall lighting power density should not exceed 1.3 watts per square foot.

Low temperature compact fluorescent lamps (CFLs) with a starting temperature of -20°F should be installed in walk-in refrigeration units. CFLs should also be installed in display and accent lighting

OUTDOOR ILLUMINATION

Consistent with the current “light war” in the industry, lamp wattage is often excessive. Some store owners believe that customers choose the most brightly lit fuel canopy and consequently try to be the brightest store on the block.

Savvy operators have learned that using lower wattage lamps combined with painting pump islands a bright color and choosing lighting fixtures which direct light toward the island can have the same effect as high wattage lamps. Fuel canopy lighting power density (LPD) should not exceed 1.25 W/sf and open parking lot lighting should be limited to 0.15 W/sf or 2 foot-candles illuminance.

Probe-start HID lamps should be avoided in canopy and parking lighting because they are inefficient. Over the lamp's life, the starting probe in the HID lamp blackens the bulb, thus reducing the amount of light output per watt. Energy conservation measures for exterior lighting includes replacing these inefficient probe-start HID lamps and ballasts with new, efficient pulse-start lamps and ballasts with high performance reflectors.

(some are available in PAR reflector shapes for use in recessed can or track lighting applications).

Though not as efficient as CFLs, other alternatives for standard metal halide and halogen lamps include ceramic metal halide lamps and Halogen-IR lamps. Exit signage should be lit with LEDs. Consider installing occupancy sensors for lighting in restrooms, game rooms, and mechanical rooms. Occupancy sensors or wall switch timers for walk-in coolers and shower rooms can also reduce lighting costs.

Unlike probe-start HID lamps, pulse-start HID lamps do not have a starting probe, so the bulb does not blacken. The efficiency of the pulse-start HID is further increased by optimized ballasts that provide the appropriate amount of electrical current. High performance reflectors then direct light to where it is needed.

At existing stores, pulse-start lamps and ballasts increase lumen output and allow for the use of lower wattage lamps. In new construction, pulse-start lamps and ballasts result in the need for fewer lamps.

Outdoor lighting should utilize timers or photosensors that respond to daylight levels. These two lighting measures ensure that outdoor lights are only turned on when necessary. Parking area lighting should be zoned to allow multilevel lighting based on available daylight and to allow lights in seldom used or unused areas to be turned off.

Road display signs, channel letter lighting, and fascia bands should use LED lamps. Exterior building lighting should use T8 lamps or low temperature CFLs.

BUILDING ENVELOPE TIPS

INSULATION

Roof insulation should be at least R-25, and wall insulation should be at least R-13.

WINDOWS

Use low-E windows with U-values of 0.3 or less. Solar heat gain coefficient (SHGC) for the windows should be chosen based on whether the store is in the northern or southern portion of Illinois. Use a SHGC of between 0.4 and 0.55 for the mid to northern portion of the state and a value of less than 0.4 for the southern half.

SHADING DEVICES

Use proper shading devices such as overhangs or awnings on south-facing windows to reduce unwanted summer heat gain. Interior shading devices can improve employee comfort and reduce glare but are not as effective as exterior shading with regard to minimizing heat gain.

AIR SEALING

A continuous air barrier should be maintained in new and existing construction. Perform air sealing at the top and bottom of the structure, between attic and occupied space, and between occupied space and slab-on-grade. Use an air-tight drywall ceiling instead of a suspended acoustical ceiling. Replace worn weather-stripping and caulking to ensure windows and doors are airtight.

COOL ROOFS

Upgrade to a “cool roof” to avoid high cooling equipment operation costs: apply a special coating to reflect solar radiation and reduce surface heating. Cool roofs are especially beneficial in cities to reduce the heat-island effect and in hot, sunny climates.



Photograph courtesy of LSI Industries

HEATING, VENTILATION, & AIR CONDITIONING

FURNACES

Select efficient interior and rooftop or slab mounted furnaces. Interior located residential type furnaces are available with efficiencies up to 93 percent, and rooftop and slab mounted furnace systems can be purchased with efficiencies of around 82 percent.

AIR CONDITIONING

The energy efficient ratio (EER) of the air conditioning system should be the highest available and at least EER 12 (seasonal EER 13 or better). Air conditioners should be equipped with economizers to take advantage of natural cooling when outdoor air temperatures permit.

SLAB HEATER CONTROLS

Some stores utilize in-slab heaters for snow and ice melting on sidewalks or around car wash areas. In most cases, these systems are turned on seasonally and heat the slab when temperatures are below freezing. Controls are now available that allow the

system to provide heat only when snow or ice is actually present, and significant savings can be achieved in some cases.

GEOTHERMAL

A ground source heat pump, or energy loop, is an ideal system in a building in which there is both heating and cooling. A convenience store could benefit from a geothermal system since space heating and cooling, refrigeration, and water heating can all occur simultaneously. In this type of loop, heat rejected from the refrigeration system is added to the energy loop and can either be harvested immediately by other appliances or stored for use later in the year.

Another advantage of energy loop systems is that they require smaller compressors on the refrigeration system since liquid cooling is more efficient than with conventional air cooled compressors. By being able to integrate the heating and cooling systems into one system, high energy cost savings can be realized.

SEDAC

WHO WE ARE

SEDAC is sponsored by the Illinois Department of Commerce and Economic Opportunity in partnership with investor-owned utilities to achieve energy efficiency savings in buildings.

SEDAC is an applied research unit of the School of Architecture at the University of Illinois at Urbana-Champaign.

The 360 Energy Group is a collaborative partner working with SEDAC. Support is also provided by the Energy Resources Center at the University of Illinois at Chicago.

SEDAC PROGRAMS

- Energy Assessment
- Public Sector Retro-Commissioning
- New Construction Design Assistance
- Public Sector New Construction Incentive Review
- Public Housing Efficient Living
- Training and Outreach
- Energy Incentive Guidance



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SAVINGS FOR FOOD SERVICE & DISPLAY

Facilities with in-store restaurants or food vending can benefit from a variety of energy efficient equipment options. ENERGY STAR® kitchen equipment should be specified when available. Vent hoods used in food preparation should be chosen to allow adjustable air flow depending on cooking load. Energy efficient ice makers should also be selected. A list of energy efficient ice making products is available at: www.energystar.gov/ia/products/prod_lists/ice_machines_prod_list.pdf. Additional information regarding kitchen equipment can be found in SEDAC's "Energy Smart Tips for Restaurants".

As previously mentioned, refrigeration accounts for one of the largest loads in convenience stores. To reduce heat transfer, we recommend using low emissivity display case shields that reduce power use while simultaneously maintaining food product temperature. These aluminum shields reduce infiltration and radiation heat transfer into the display case.



Display case shields can be used during closed hours or during times of lower occupancy if necessary. Studies have shown that use of display case shields over night can reduce the refrigeration load by 8.5 percent and reduce compressor power by 9 percent during nighttime hours. The shields also help maintain lower product temperatures up to 15 hours after they have been opened.

Additional information and research regarding display case shields can be found in a report written by [Southern California Edison](http://SouthernCaliforniaEdison.com) (SCE). The research applies specifically to supermarkets but findings should be similar for convenience store display cases.

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