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 megamarketing 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.
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.
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 (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.

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

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.

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.

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.

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.
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.

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 (SCE). The research applies specifically to supermarkets but findings should be similar for convenience store display cases.