Putting Energy Into Profits:

ENERGY STAR® Guide for Small Business

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GETTING STARTED

Virtually any small business can improve its energy efficiency easily and cost-effectively, using the numerous resources that are available both from ENERGY STAR, as well as a wide variety of other organizations. These resources are available to help you through the process of completing an upgrade. This process can be broken into major activities that are involved in carrying out an energy improvement project.

Major activities

Identifying Projects

Finding Funds

Selecting Contractors

Prioritizing Projects

Managing Projects

GETTING STARTED: IDENTIFYING PROJECTS

As the saying goes, "time is money" and that can be particularly true for small businesses. However, not taking time (to save energy) can mean big money – lost.

Reduction in daily energy costs and monthly utility bills for the lifetime of your business can make it well worth the time needed to pursue effective-efficiency upgrades. Here are some strategies to jump-start your energy savings:

- Ask your utility if they offer free or inexpensive energy audits and/or rebates for energy-efficiency upgrades. A good place to start is the Energy Crossroads Web site **(EXIT>)** - a consolidated listing, by state, of many of the utility energy-efficiency programs available for small businesses. Small manufacturers who are interested in a facility audit may also want to check out the following:

  DOE's Industrial Assessment Centers (IAC) **(EXIT>)**

  Department of Commerce's National Institute of Standards and Technology's (NIST) **(EXIT>)**

  Manufacturing Extension Partnership (MEP) **(EXIT>)**
- Invite contractors to your facility to suggest upgrades and provide free estimates.
- Contract with an energy professional to coordinate and manage your project.
- Leverage your time by drawing on the expertise of ENERGY STAR by visiting its Small Business Web site.

GETTING STARTED: FINDING FUNDS

Access to capital for an energy-efficiency upgrade need not be an issue. Some upgrades require little funding. For those that do require investment, don't worry; there are many traditional and non-traditional financial resources available. A well-designed upgrade can provide your business a positive cash flow from energy savings while paying off the capital investment for new equipment.

For small, inexpensive projects, you may want to use your own internal funds to pay for the upgrade in order to keep your payback period low and return on investment high. For larger jobs, financing might be the only way to pay for the upgrade. Fortunately, a variety of sources and mechanisms exist for small businesses to finance energy-efficiency improvement projects.

Did You Know?

Energy-efficient upgrades typically save you money that can be used to pay for the cost of projects.

It's your business decision to weigh your competing needs for capital versus continuing increases in operating costs for energy. Remember – even a longer return-on-investment on energy efficiency results in affordable comfort, and new, more reliable equipment that will pay for itself with energy savings. Strategic energy efficiency investments are your hedge against the certainty of higher utility bills that you cannot control.

The following resources can help you find funding information and opportunities for your upgrade:

To help you locate special offers and rebates in your area, ENERGY STAR provides an online zip code driven tool.

The Office of Small Business Development Centers (SBDC) **(EXIT>)** is affiliated with the U.S. Small Business Administration (SBA), and has offices in all states offering free services to help small firms develop conventional loan applications for loans backed by the SBA. SBA loan programs include business start-up, expansion, property and major equipment purchases, and disaster recovery. For SBA loan information please visit http://www.sba.gov/financing/index.html **(EXIT>)**

ENERGY STAR's Resources: Finance, Products & Services Web page

ENERGY STAR's Directory of Energy Efficiency Programs (DEEP)

EPA's Small Business Gateway

ENERGY STAR's Buildings Upgrade Manual - Financing Section **(PDF)**

Energy Crossroads **(EXIT>)**

Small Business Administration's Financing Your Business **(EXIT>)**

DOE's Energy Efficiency and Renewable Energy's Financing Solutions & Incentives **(EXIT>)**

National Association of State Energy Officials' "State and Territory Energy Offices" Web page**(EXIT>)**

Alliance to Save Energy's Financing Energy Efficiency Web page **(EXIT>)**

Local Government Commission's Funding Opportunities **(EXIT>)**

Another aspect of funding energy-efficiency is group purchasing with business association members, other franchisees, etc. to achieve lower unit prices on efficient equipment with volume purchases. Read more about this strategy in ENERGY STAR Small Business' Group Purchasing Fact Sheet **(PDF)**

The Small Business Association of Michigan operates a group purchasing Web site at www.sbam.org (EXIT>) that is open to all small businesses throughout the United States.

GETTING STARTED: SELECTING CONTRACTORS

The selection of experienced, competent contractors and other energy professionals is critical to the success of your energy-efficiency project(s). Here are some guidelines to aid you in choosing a contractor:

- Ask for multiple current references that you can contact about work the contractor performed.
- Ask the contractor to provide a cost-estimate in writing for any work they will do.
- Make sure they are licensed and insured contractor.
- The contractor should certify that their work conforms to state and local regulations and codes.
- Verify that the contractor carries workers' compensation insurance.
- Make sure the contractor has experience and will use energy-efficient equipment.

Did You Know?

Many contractor associations offer valuable information and advice on selecting a contractor, and a directory of listings. For example, visit the Air Conditioning Contractors of America **(EXIT >)** Web site.

Visit ENERGY STAR's online "Service and Product Provider Directory" and search for contractors and energy professionals in your area to help you with your upgrade(s).

Check the following sources for additional tips on selecting a contractor:

ENERGY STAR's 10 Tips for Hiring a Heating and Cooling Contractor

California Energy Commission's How To Hire An Energy Services Company Handbook **(PDF) (EXIT>)**

California Energy Commission's How To Hire An Energy Auditor To Identify Energy Efficiency Projects Handbook **(PDF) (EXIT>)**

State of Oregon Construction Contractors Board Consumer Help **(EXIT>)**

If you have a home-based business, you may also find the following resources useful:

ENERGY STAR's Recommendations for Finding a Contractor

Lawrence Berkeley National Laboratory's Home Energy Saver **(EXIT>)**

GETTING STARTED: PRIORITIZING PROJECTS

You may wonder, "Where should I start?" Do I replace one piece of equipment or system at a time? Or, should I do a comprehensive upgrade of my entire facility? The answer will vary depending on each individual business' situation. The age of your current equipment and facility systems, your type of business, your local utility rates, your hours of operation, and your access to capital are all key factors in what level of upgrade makes business sense. One place to start is with low-cost and no-cost changes such as those listed in the Sure Energy Savers section of this guide.

If cash flow is an issue, you may want to wait until a piece of equipment or system fails or is a certain number of years old before replacing it with an energy-efficient model. However, if you are building a new facility or doing a major remodel, you should incorporate energy-efficient upgrades into your design due to the lower incremental cost of "doing it right the first time." For an existing facility, it may come down to what is financially feasible for your business at a particular time. Ask your contractor if they can assist you in prioritizing your energy-efficiency projects.

In addition, the following resources may be helpful to you:

ENERGY STAR's Cash Flow Opportunity (CFO) Calculator

ENERGY STAR's Building Upgrade Manual's Business Analysis Section **(PDF)**

Rebuild America's Project Planning Tools **(EXIT>)**

DOE's Building Technologies Program's Planning and Financing Your Project **(EXIT>)**

GETTING STARTED: MANAGING PROJECTS

The size and complexity of the energy-efficiency project your business undertakes will most likely be the main factor in deciding who will manage the project. For something as simple as replacing HVAC filters or replacing incandescent lamps (light bulbs) with ENERGY STAR compact fluorescent lamps (CFLs), you or your staff could do it yourselves. Depending on the skills on your staff, installing caulking and weather-stripping, ceiling fans, occupancy sensors for lights, LED exit signs, and programmable thermostats may be "do-it-yourself" projects not requiring outside help.

A more complex project, such as designing and replacing your facility's entire lighting system, will require the help of someone who has experience managing that type of project. Here are some resources to assist you in the process of managing your energy-efficiency projects:

ENERGY STAR's Create Action Plan

ENERGY STAR's New Building Design

Rebuild America's Solution Center Services **(EXIT>)**

California Energy Commission's How to Hire a Construction Manager For Your Energy Efficiency Projects Handbook **(PDF) (EXIT>)**

As your business implements energy-efficient projects it is good practice to continuously assess energy performance to ensure that savings are being achieved. ENERGY STAR offers tools to help you understand and assess your facility's energy performance.

SURE ENERGY SAVERS

It's easy to get started improving the energy efficiency of your facility with little expertise or money. There are many reliable, low-risk, high-return actions that you can do, and are relatively simple! If resources permit, undertaking a comprehensive energy efficiency program, with the assistance of a professional if needed, would yield even greater savings. However, while you are considering a comprehensive program at least implement as many of the actions from the following list that you can to start saving now! Further information on these topics can be found in the Larger Opportunities section of this guide.

Don't let this discourage you, or delay your taking simpler actions for sure savings. There are many reliable, low-risk, high-return upgrades that you can implement with limited or no technical support. So, if you don't do anything else, at least implement as many actions from the following list as you can. More detailed information on these topics can be found elsewhere in this guide.

Lighting

- Turn off lights (and other equipment) when not in use. High utility costs often include paying for energy that is completely wasted by equipment left "on" for long periods while not in use.
- Replace incandescent light bulbs with ENERGY STAR qualified compact fluorescent lamps (CFLs), wherever appropriate. CFLs cost about 75% less to operate, and last about 10 times longer. Their prices are dramatically lower now than when first introduced.
- Install switch plate occupancy sensors in proper locations to automatically turn lighting off when no one is present, and back on when people return. Even good equipment can be installed wrong, so don't install the sensor behind a coat rack, door, bookcase, etc. It must be able to "see" an approaching person's motion to turn on the light before, or as they enter an unlit area.
- Adjust lighting to your actual needs; use free "daylighting."
- To prevent glare, eyestrain, and headaches, do not "over-light." Too much light can be as bad for visual quality as too little light – and it costs a lot more.
- Install ENERGY STAR qualified exit signs. These exit signs can dramatically reduce maintenance by eliminating lamp replacement and can save $10 dollars per sign annually in electricity costs while preventing greenhouse gas emissions.
- Consider upgrading from older T12 (1.5" diameter) tubes with magnetic ballasts to more efficient T8 (1" diameter) fluorescent lamp tubes with solid-state electronic ballasts.

Heating and Air Conditioning

- "Tune-up" your heating, ventilating and air-conditioning (HVAC) system with an annual maintenance contract. Even better, have your HVAC serviced prior to both heating and cooling seasons. Even a new ENERGY STAR qualified HVAC system, like a new car, will decline in performance without regular maintenance. A contract automatically ensures that your HVAC contractor will provide "pre-season" tune-ups before each cooling and heating season. You save energy and money, and your system may last years longer with reasonably priced yearly maintenance fees. Your chances of an emergency HVAC break-down also become very remote with regular maintenance.
- Regularly change (or clean if reusable) HVAC filters every month during peak cooling or heating season. New filters usually only cost a few dollars. Dirty filters cost more to use, overwork the equipment, and result in lower indoor air quality.
- Install an ENERGY STAR qualified programmable thermostat to automate your HVAC system. This solid-state, electronic device optimizes HVAC operation"24/7" based on your schedule, and can be "overridden"

as needed for unscheduled events. So consumers and staff always enter a comfortable facility, this "smart thermostat" can turn on the HVAC one hour before arrival instead of heating or cooling unoccupied space.

- Control direct sun through windows depending on the season and local climate. During cooling season, block direct heat gain from the sun shining through glass on the east and especially west sides of the facility. Depending on your facility, options such as "solar screens," "solar films," awnings, and vegetation can help. Over time, trees can attractively shade the facility, and help clean the air. Interior curtains or drapes can help, but it's best to prevent the summer heat from getting past the glass and inside. During heating season, with the sun low in the South, unobstructed southern windows can contribute solar heat gain during the day.
- Keep exterior doors closed while running your HVAC. It sounds simple but it will help to avoid wasteful loss of heated or cooled air.
- Use fans. Comfort is a function of temperature, humidity, and air movement. Moving air can make a somewhat higher temperature and/or humidity feel comfortable. Fans can help delay or reduce the need for air conditioning, and a temperature setting of as much as 3 to 5 degrees higher can feel just as comfortable with fans, and each degree of higher temperature can save about 3% on cooling costs. When the temperature outside is more comfortable than inside, a "box fan" in the window, or large "whole facility" fan in the attic, can push air out of the facility and pull in comfortable outside air. Fans can improve comfort and save energy year round.
- Plug leaks with weather stripping and caulking. This will help prevent the escape of heated or cooled air from your facility. Caulking and weather stripping also let you manage your ventilation, which is the deliberate controlled exchange of stuffy inside air for fresher outdoor air. To learn more about indoor air quality in your facility visit EPA's "Indoor Air Quality" Web page.

Office Equipment

- Always buy ENERGY STAR qualified products for your business. The ENERGY STAR mark indicates the most efficient computers, printers, copiers, televisions, windows, thermostats, ceiling fans, and other appliances and equipment.

Water – Hot and Cold

- Fix leaks. Small leaks add up to many gallons of water and dollars wasted each month. Water conservation saves energy and money, especially when it is hot water.
- Use water-saving faucets, **(EXIT>)** showerheads, **(EXIT>),** toilets and urinals **(EXIT>)** to save water.
- Install an insulation blanket on water heaters seven years of age or older, and insulate the first 3 feet of the heated water "out" pipe on both old and new units.
- If buying a new water heater, always buy the most efficient model possible. In areas of infrequent water use, consider "tankless" water heaters to reduce "standby" storage costs and waste.
- Set water temperature only as hot as needed (110-120 degrees) to prevent scalds and save energy (check local codes for specific temperatures for your business type).
- When landscaping, practice green landscaping (greenscaping or xeriscaping) to preserve natural resources and prevent waste and pollution by using plants native to your climate that require minimal watering and possess better pest resistance. If local code allows, consider diverting "gray water" **(PDF)** for irrigation rather than using fresh water.

Kitchen and Food Service Equipment

- Purchase ENERGY STAR qualified kitchen and commercial food service equipment. For example, qualified refrigerators and freezers can save over 45% of the energy used by conventional models, which equals as much as $140 annually for refrigerators and $100 for freezers; deep fryers can save between $60 and $180 per year; hot food holding cabinets can save up to $280 per year; and steam cookers can save between $450 and $820 per year depending on fuel.

- For existing refrigerators, clean refrigerator coils twice a year and replace door gaskets if a dollar bill easily slips out when closed between the door's seals.
- Have large and walk-in refrigeration systems serviced at least annually. This includes cleaning, refrigerant top off, lubrication of moving parts, and adjustment of belts. This will help ensure efficient operation and longer equipment life.
- Consider retrofitting existing refrigerators and display cases with anti-sweat door heater controls, and variable speed evaporator fan motors and controls.

Funding

- Check the various government entities in your area for tax incentives the may apply to energy-efficiency upgrades you perform in your facility.
- Contact your local utilities to inquire about rebate programs they have that may apply to energy-efficiency upgrades to your facility.

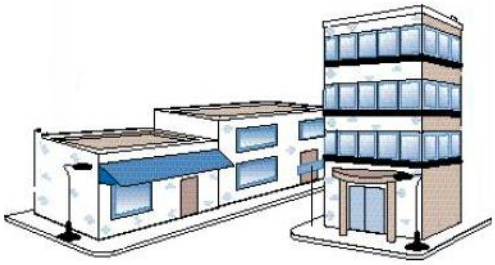
LARGER OPPORTUNITIES

LARGER OPPORTUNITIES: BUILDING SHELL

Building shell improvements are one of the first places you should focus on when upgrading your existing facility. Start with the low cost/ no cost opportunities. Like the lighting system, these factors are key to properly sizing the heating and cooling system during new construction or major upgrades.

These elements of the building are a major investment that should be purchased on a "life-cycle costing" or return-on-investment basis, rather than lowest initial cost. Over the life of the building, the operating savings in energy alone will far outweigh the initial cost of these items. Plus, in the case of new construction, it will be less costly to "do it right the first time," than to make even more costly upgrades to insulation, windows, walls or roofing material later.

The sections below will help you learn how to make your facility more energy efficient through improvements to your building shell. For additional information that may be applicable to your small commercial facility please visit the ENERGY STAR Home Sealing Web page.



- Insulation
- Roofing
- Walls
- Windows
- Slabs and Foundations
- Tightening An Existing Building
- Passive Solar Design and Orientation

Insulation

Insulation is a critical component of every facility, helping to keep you cool in the summer and warm in the winter. Always insulate your new facility to model building codes, which are discussed in the "New Building Design" section of this Guide. For retrofits, use these codes as guidelines to ensure that you get the amount of insulation that will save you energy and be cost effective.

DOE's Insulation Fact Sheet **(EXIT>)**

Flex Your Power's Commercial Product Guide - Insulation **(EXIT>)**

National Insulation Association **(EXIT>)**

American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) **(EXIT>)**

Project Suggestion

To determine the correct amount of insulation for your project consult the following:

- Local energy codes and officials
- State energy offices
- Model energy codes such as the International Energy Conservation Code and those published by ASHRAE.

Roofing

Energy-savings opportunities can be achieved by carefully choosing roofing materials and by purchasing ENERGY STAR qualified roof products when possible. Some areas that should be considered when upgrading your roof include:

- **Insulation:** When specifying or replacing a roof, insulation can be placed under the roof.
- **Radiant Barriers:** In addition to traditional insulation, radiant barriers save energy both in the summer and winter by re-directing radiant energy in the facility.
- **Cool Roofing:** These systems lower heat gain for facilities by reflecting the sun's radiant energy, saving energy on air-conditioning. Consult your roofing and HVAC professionals to learn if cool roofing is an option for your facility.

To learn more about energy-efficiency opportunities for roofing visit:

ENERGY STAR's Qualified Roof Products

Lawrence Berkeley National Laboratory's Cool Roofing Materials Database **(EXIT>)**

Walls

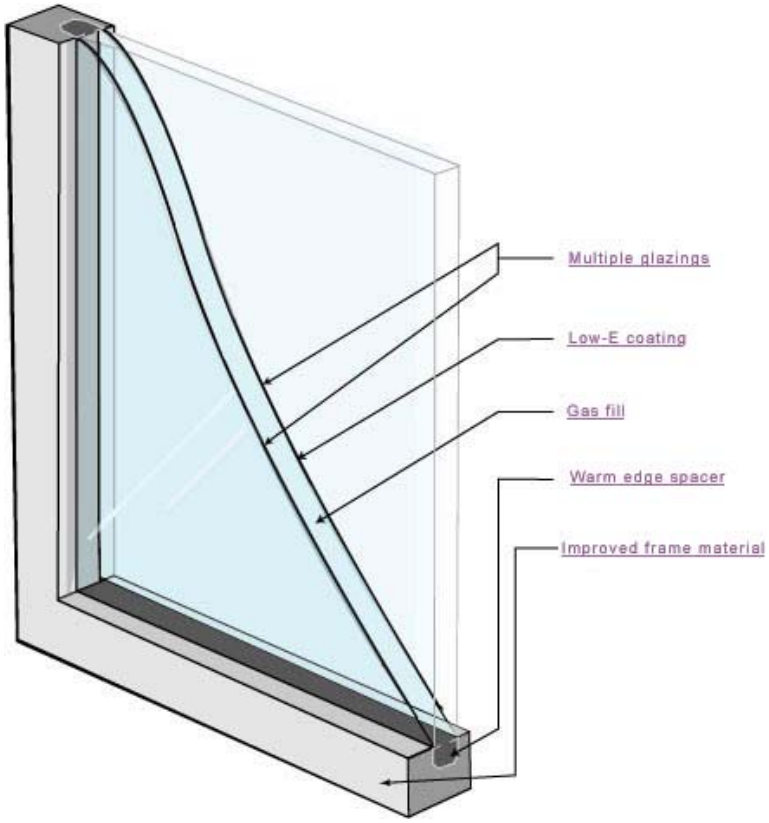
Exterior walls (and those connected to unconditioned spaces) should be insulated. When exterior walls are being constructed or are bare during a renovation, consider a quality building wrap. These materials have a low cost per square foot of material and can help drastically reduce air and moisture infiltration into the conditioned space.

To learn more about building wraps visit DOE EERE's Consumer's Guide Combination Air Barriers/Vapor Diffusion Retarders Web page. **(EXIT>)**

Windows

A single-paned window has an R-value (measure of the ability to prevent heat flow) of 1, making it little more than a hole in the wall. Fortunately, in recent years, double-paned windows, along with other energy-efficient features, have become more standard. Older facilities can likely benefit from improvements to windows. Improvements you should consider when upgrading your windows and frames include:

- Purchase ENERGY STAR qualified windows, which feature a combination of new technologies that save you energy and money
- Double or triple-paned glass
- Inert gas (e.g., krypton, argon, or nitrogen) fill
- Low-emissivity, advertised as Low-E, glass/film or other advanced coatings/films
- Window tinting appropriate for your region and facility orientation
- Insulated frames, low-conductivity materials



Many vendors are now promoting the advantages of window films – ranging from simple tints that block incoming light, to films that provide performance similar to Low-E glass, and advanced coatings that block specific wavelengths of light.

To learn more about windows visit:

ENERGY STAR's Qualified Residential Windows, Doors, and Skylights

DOE EERE's Consumer's Guide Windows Web page **(EXIT>)**

Advanced Buildings Technologies & Practices' Spectrally-selective Glazings **(EXIT>)**

Advanced Buildings Technologies & Practices' Low-conductivity Window Frames **(EXIT>)**

Advanced Buildings Technologies & Practices' Inert Gas Window Fills **(EXIT>)**

Slabs and Foundations

Slabs and foundations are frequently overlooked areas where energy savings can be realized. Just like walls and roofs, there are insulation opportunities for these areas that will save you money. For new facilities, you should consider a vapor retarder between the foundation and the slab or earth. Vapor retarders reduce the

amount of moisture, and other potentially harmful vapors, that can pass through slabs and foundations and add to discomfort and indoor air-quality issues in your facility.

Learn more about vapor barriers by DOE EERE's Consumer's Guide Combination Air Barriers/Vapor Diffusion Retarders Web page **(EXIT>)**

Tightening An Existing Building

There are many low-cost/do-it-yourself actions you can take to help your facility reduce air leakage and costs. These actions include:

- Filling gaps around doors and window frames with caulk, spray foam, and insulative batting.
- Checking window and door weather stripping. If weather stripping is missing, hard, or cracked, it should be replaced.
- For exterior doors with a gap underneath, (e.g., if you can see daylight) install door sweeps.

Passive Solar Design and Orientation

The orientation of a facility can affect energy consumption, particularly the energy used for heating and cooling. For a new facility, consider passive solar design, or the practice of positioning a facility to take advantage of the sun's natural heating and light energy, and to shade a facility from the sun where desirable.
You can learn more by visiting the Advanced Buildings Technologies & Practices' Passive Solar Heating Web page. **(EXIT>)**

Larger Opportunities: Lighting

Lighting is a critical component of every small business. Employees must be able to see to perform their jobs, and objects and spaces must be aesthetically pleasing to encourage sales.

Depending on the type of business you operate, lighting accounts for 20% to 50% of electricity consumption. This means that significant cost savings can be achieved with energy-efficiency improvements, and due to continually improving equipment, lighting usually provides the highest return-on-investment of major upgrades.

Did You Know?

Upgraded lighting can save money through reduced energy use, and result in increased occupant comfort and sales.

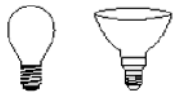
Additional Lighting Links and Information

The Formula for Lighting Energy Efficiency

Technology + **Effective Design** = **Performance and Energy Savings**

Lighting Technology	Lighting Design
Make the decision early in your project to select energy-efficient lighting technology. The following pages discuss lighting technologies, their efficiency, and what might be right for your facility. ▸ Incandescent Lighting Technology ▸ Compact Fluorescent Lamps (CFLs) ▸ Improved Halogen Systems ▸ Fluorescent Lighting ▸ High-Intensity Discharge (HID) Lighting Systems ▸ Exit Signs ▸ Fixtures ▸ Lighting controls ▸ Daylighting ▸ Future Lighting System Technologies	High-quality lighting design includes the coordinated selection of lighting, fixtures, fixture placement, and room finishes (e.g., high-reflectivity paint) to result in improved lighting quality. To achieve the best quality and efficiency from any new lighting system you install, consult a lighting professional with experience in energy efficiency. ▸ Efficient Lighting Technology Selection Design Guide

Incandescent Lighting Technology



Thomas Edison invented the first commercialized electric lighting technology in 1879, the incandescent lamp. This simple, yet inefficient, technology has dominated lighting applications ever since. Incandescent lamps come in two common type varieties:

Did You Know?

An incandescent lamp is a better heater than a light, with nearly 90% of the input energy being converted and lost in waste heat rather than light.

- **Standard Incandescent Lamps:** Inefficient lamps used in many applications throughout a facility.
- **Halogen Lamps:** Halogen Lamps are a more advanced incandescent lamp technology commonly used to highlight merchandise and architectural features due to their white light and "sparkle". To learn more about incandescent lamps visit:

  DOE's Building Technologies Program's Building Toolbox - Incandescent Lamps **(EXIT>)**

Where can you find incandescent lamps in your facility?

- Recessed "can" fixtures
- Wall sconces
- Suspended fixtures
- Lamps and task lighting
- Accent lighting and "track" lighting
- Illuminated exit signs
- Exterior lighting

Compact Fluorescent Lamps (CFLs)

CFLs are fluorescent lamps that have been specifically made in a compact form to replace incandescent lamps in traditional screw-in fixtures. These energy-efficient lamps come in a variety of styles and sizes and are suitable for a variety of applications. ENERGY STAR qualified CFLs use 75% less energy than a standard incandescent bulb and last up to 10 times longer. Replacing a 100-watt incandescent with a 32-watt CFL can save approximately $30 in energy costs over the life of the bulb.

Did You Know?

Compact fluorescent lamps come in a wide variety of shapes and sizes to accommodate most applications, even models that resemble incandescent lamps.

The long life of CFLs makes them ideal to use in hard-to-reach places due to their reduced need to be replaced as often. In addition, CFLs are cool to the touch, making them safer than incandescent and halogen lamps. To learn more about CFLs visit:

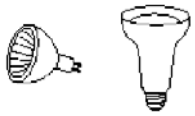
ENERGY STAR Qualified Compact Fluorescent Light Bulbs

DOE EERE's Consumer's Guide Compact Fluorescent Lamps **(EXIT>)**

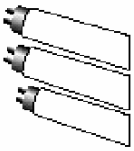
National Lighting Product Information Program's Screwbase Compact Fluorescent Lamp Products Report **(PDF) (EXIT>)**

Improved Halogen Systems

Many incandescent lamps can be replaced with halogen lamps for a gain in efficiency and service life. Many standard halogens (aside from some specialty applications) can be replaced with high performance "Infrared" (IR) halogen lamps. These lamps work by increasing the operating temperature of the halogen lamp, increasing efficiency. Though more efficient than other incandescent and halogen lamps, these lamps are still inferior in efficiency to fluorescent and HID lighting systems.



Fluorescent Lighting



Fluorescent lighting is the "standard" technology for lighting spaces such as offices and classrooms, and is up to four times more efficient than the incandescent lamp. However, older, obsolete fluorescent lighting systems can result in poor light quality and flicker. Advancements in fluorescent lighting systems have resulted in the introduction of new systems that provide improved energy efficiency, lighting quality, and design flexibility.

The primary components of standard fluorescent lighting systems are the ballast, which modifies incoming voltage and controls electrical current, and the lamp (bulb or tube), the source of artificial light.

Traditional Systems:

- **T12 Fluorescent Lamps:** One of the most common, but least efficient fluorescent systems. T12 lamps can be identified by their 1.5-inch diameter.
- **Magnetic Ballasts:** Magnetic ballasts are common and still used extensively today due to their low initial cost. However, these ballasts are considerably less efficient than new electronic ballast designs and are prone to flicker and humming (particularly as they age).

Did You Know?

Magnetic ballast fluorescent lighting systems are vintage technology dating back to 1939.

Standard fluorescent lamps are commonly used in a variety of places in a facility. Some common applications include:

- Suspended and recessed "troffer" fixtures
- Recessed "can" fixtures
- Wall sconces
- Suspended fixtures
- Lamps and task lighting
- Accent lighting and "track" lighting
- Illuminated exit signs
- Exterior and facade

What energy-efficient technologies can replace T12 fluorescent lighting system?

Energy-Efficient Fluorescent Lighting Systems: These systems, using T8 (1" in diameter) and T5 (5/8" in diameter) lamps, offer improved efficiency, higher intensity, and potentially longer life due to reduced degradation in light output over time. T8 and T5 lighting systems are constantly increasing in flexibility and are now applicable to a variety of task and accent lighting applications, as well as general lighting of larger spaces.

To learn more about T8 and T5 lamps visit:

ENERGY STAR Qualified Products

National Lighting Product Information Program's Lighting Answers: T8 Fluorescent Lamps Fact Sheet **(PDF) (EXIT>)**

National Lighting Product Information Program's Lighting Answers: T5 Fluorescent Systems **(EXIT>)**

Energy-Efficient Electronic Ballasts: When specifying a fluorescent lighting system, always specify electronic ballasts. These ballasts provide near flicker-free operation while using up to 30% less energy than magnetic ballasts.

Project Suggestion

You may be able to "de-lamp" or remove some of the lamps in your system and still have acceptable light levels, especially in concert with a T8 retrofit. Consult your lighting professional to see if this is an option for your facility.

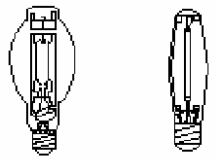
To learn more about electronic ballasts visit:

ENERGY STAR Qualified Products

National Lighting Product Information Program's Electronic Ballasts Fact Sheet **(PDF) (EXIT>)**

National Lighting Product Information Program's Guide to Specifying High-Frequency Electronic Ballasts **(PDF) (EXIT>)**

High-Intensity Discharge (HID) Lighting Systems



Due to their intensity, HID lighting systems are useful for lighting large areas from high ceilings, and range from 50 to 2,000 watts each. Older HID installations are often mercury vapor lamps, an extremely inefficient design. Like fluorescent lamps, HID systems have ballasts, and systems built before 1978 may contain potentially harmful substances such as PCBs (Polychlorinated biphenyls).

HID lamps are commonly used in the following applications:

- Garages
- Warehouses
- Areas with high ceilings
- Exterior safety and security lighting
- Accent lighting

What HID technologies are most efficient for my facility?

For high-ceiling and exterior applications, specify metal halide or high-pressure sodium vapor lamps. In areas you wish to highlight, or accent particular merchandise, use small metal halide spotlights. To learn about HID lighting systems:

Project Suggestion

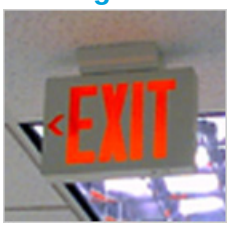
Consult your lighting professional about specifying more energy efficient T5 lighting systems instead of HID lighting systems.

Advanced Buildings Technologies & Practices' HID Electronic Ballasts & Lamps **(EXIT>)**

National Lighting Product Information Program's Lighting Answers: Mid-Wattage Metal Halide Lamps **(EXIT>)**
National Lighting Product Information System's HID Accent Lighting Systems Report **(PDF) (EXIT>)**

In some cases, you may be able to reduce the wattage of your already installed HID lamps by purchasing and installing specially designed reduced wattage metal halide lamps. For example, a special 360-watt metal halide can replace a 400-watt metal halide. Consult your lighting professional for more information.

Exit Signs



Exit signs are an excellent, low-cost, low-labor opportunity to increase the energy efficiency and safety of your facility. Replacing incandescent exit signs that operate at about 40 watts per sign, or fluorescent exit signs that operate between 12 and 20 watts per sign, with an ENERGY STAR qualified exit sign can increase the energy efficiency of your exit signs by 3 to 8 times! Many ENERGY STAR qualified exit signs are based on light-emitting diode (LED) technology, while others are based on photoluminescent and electroluminescent technology. You may also be able to retrofit your exit sign with LED technology while retaining the housing. To learn more about ENERGY STAR qualified and other energy-efficient exit sign technologies please visit:

Did You Know?
ENERGY STAR qualified exit signs use 3 to 8 times less energy than incandescent and fluorescent illuminated exit signs, and reduce maintenance. LED exit signs are also easier to see through smoke and in other emergency situations.

ENERGY STAR Qualified Exit Signs
ENERGY STAR Small Business's LED Exit Sign Fact Sheet **(PDF)**
National Lighting Product Information Program's Exit Signs Report **(PDF) (EXIT>)**

Fixtures

Specifying an energy-efficient lighting technology, such as T8 or T5 fluorescent lamps and electronic ballasts, is a critical step to improving the energy efficiency of your facility and saving money. However, lighting is a system and depends on the quality of the fixture (the apparatus that contain the lamp), combined with the lamp, ballast and placement (the position of fixtures in a room, which affects the amount of usable light that is supplied). Fixtures come in a wide variety of applications. Fixture selection may be guided by:

- Efficient technology
- Ceiling height
- Spacing
- Amount of glare
- Distribution of light
- Task plane height
- Desired light level
- Appearance

For the best energy efficiency and light quality consult a lighting professional or designer when selecting fixtures. To learn more about lighting fixtures and their impact on efficiency visit ENERGY STAR Qualified Products' Lighting Web page.

Lighting Controls

Did You Know?
The most efficient light is the light not used. Many control technologies are available to save money and add convenience to your lighting system.

Controls are a key part of any lighting system. Specify controls that maximize the flexibility of your system while eliminating light usage, often automatically. Common controls include:

- **Bi-level Switching:** Control of a lighting system in groups of fixtures or lamps, for example bi-level switching allows you to turn-half of the lights in a room off when full illumination is not required. Bi-level switching is commonly used in offices, conference rooms, and classrooms.
- **Dimmers:** Dimming lighting systems allow you to control the amount of light and save energy. Dimmers are available for fluorescent and incandescent systems. Daylight dimmers are special sensors that automatically dim room lights based on the amount of free and natural daylight available. Dimmers are commonly used in conference rooms, classrooms, restaurants, and libraries.

- **Occupancy Sensors:** These sensors detect the motion of room occupants, turning off lights in unoccupied areas and turning them back on when movement is detected. Occupancy sensors are commonly used in restrooms, classrooms, and warehouses.
- **Daylight Sensor (Photocells):** A common inefficiency of exterior lighting systems is a tendency to "dayburn." This is when lights are on during the day, wasting energy and money. This problem can be prevented by installing light-sensitive controls that turn the lights on and off automatically based on daylight, thus producing convenient energy savings. Timers can be used, but do not react to changing daylight conditions.

Energy-Savings Potential With Occupancy Sensors

Application	Energy Savings
Offices (private)	25–50%
Offices (open spaces)	20–25%
Rest rooms	30–75%
Corridors	30–40%
Storage areas	45–65%
Meeting rooms	45–65%
Conference rooms	45–65%
Warehouses	50–75%

Note: Figures listed represent maximum energy-savings potential under optimum circumstances. Figures are based on manufacturer estimates. Actual savings may vary.

Source: California Energy Commission/U.S. Department of Energy/ Electric Power Research Institute

To learn more about lighting controls systems visit:

DOE's Building Technologies Program's Building Toolbox Lighting Controls **(EXIT>)**

National Lighting Product Information Program's Occupancy Sensors Report **(PDF) (EXIT>)**

National Lighting Product Information Program's Photosensors Report **(PDF) (EXIT>)**

Lighting Controls Association **(EXIT>)**

Energy Design Resources' Design Brief: Lighting Controls Fact Sheet **(PDF) (EXIT>)**

Daylighting

Save money by harvesting the free light of the sun! Daylight can be harvested by simply not blocking windows, and by dimming/turning off the lights based on available daylight throughout your facility. Common daylighting strategies include:

- Controlling window light through blinds
- Sky lights and "sun tubes"
- Light shelves
- Daytime dimming systems

Did You Know?

Research has shown that daylighting not only saves money but also improves employee productivity and product sales.

To learn more about daylighting visit:

Daylighting Collaborative **(EXIT>)**

DOE's Building Technologies Program's Building Toolbox Daylighting **(EXIT>)**

Energy Design Resources' Design Guidelines: Daylighting Guidelines **(EXIT>)**

Future Lighting System Technologies

LED Lighting

In the last 20 years, light-emitting diode (LED) lamps have advanced from being indicators on consumer electronics, to an increasingly versatile and efficient lighting source. LED lighting has the potential to provide high efficiency, durability, and extremely long life. Currently, LED lighting is largely restricted to specialty uses such as accent lighting, LCD monitor backlighting, exit signs as well as use in traffic signals, vehicle brake lights, and strings of colored holiday lights. However, as the technology becomes more accepted in the market, its uses will expand and costs will become more competitive. A specific kind of LED, the organic light-emitting diode (OLED) promises to make energy efficient and designable light panels that can be used in a wide variety of architectural applications. To learn more about LED technology please visit:

Lighting Research Center's Solid-State Lighting Web page **(EXIT>)**

LED Center **(EXIT>)**

DOE's Building Technologies Program's Solid-State Lighting Web page **(EXIT>)**

Induction or Electrodeless Fluorescent Lamps

An induction lamp is a fluorescent lamp design that eliminates the most failure prone component of the system, the electrode, and produces light by exciting the lamp's gas fill with radio frequencies. The result is improved efficiency over conventional fluorescent designs and extremely long life (upwards of 50,000 hours). Several induction designs are already on the market, but these lamps are best used for applications where extremely long lamp life is desired due to maintenance issues. To learn more about induction lamps visit GE's Consumer & Industrial Lighting web page on Induction Lamps. **(EXIT>)**

Efficient Lighting Technology Selection Design Guide

Many simple upgrades can be made with good results to existing systems and standard specifications. Examples of these include:

- Substituting T8 fluorescent lamps and electronic ballasts for T12 lamps and magnetic ballasts.
- Replacing incandescent lamps with compact fluorescent lamps.
- Installing fluorescent lighting systems in place of incandescent lighting systems.
- Installing metal halide or high-pressure sodium vapor lamps in place of mercury vapor lamps.

Project Suggestion

When selecting a lighting consultant/designer consider selecting one who is certified "LC" by the National Council on Qualifications for the Lighting Professions or "CLC" by the American Lighting Association.

Lighting Technology Guide

Application and Example		Technology: Incandescent	Halogen	HID	Compact Fluorescent	T12 Fluorescent (Linear)	T8 Fluorescent (Linear)	T5 Fluorescent (Linear)	LED
Low-Ceiling	Offices, conference rooms, classrooms	●	●	◎	◎	◎	●	●	
High Ceiling	Warehouses, lobbies	●	●	◉	◉	◎	◉	●	
Exterior Lighting	Parking lots	●	●	◉	◎	◎	●	●	
Accent Lighting	Displays, artwork	●	○	◎	●	◎	●	●	●
Task Lighting	Desk lamps	●	○	◎	●	◎	●	●	●
Exit Sign Lighting	Exit signs	●			◎				●

Key

Not Applicable	Low-Efficiency in Application	Medium-Low Efficiency in Application	Medium Efficiency in Application	Medium-High Efficiency in Application	High Efficiency in Application
	●	○	◎	◉	●

Note: This table is for informational purposes only, always consult your lighting professional before specifying a technology for your facility.

To learn more about lighting design visit:

ENERGY STAR's ProjectKalc
New Buildings Institute Lighting Guide **(EXIT>)**
DesignLights Consortium **(EXIT>)**
International Association of Lighting Designers **(EXIT>)**
Northwest Energy Efficiency Alliance's Lighting Design Lab **(EXIT>)**
Lithonia Lighting Visual Web page **(EXIT>)**

Project Suggestion

For new construction and major retrofits consider having computer models of your lighting system developed by a qualified professional to ensure that the design meets the criteria for your facility.

Additional Lighting Links and Information

ENERGY STAR Qualified Products' Change A Light, Change The World
ENERGY STAR Buildings Upgrade Manual's Lighting Chapter **(PDF)**
Illuminating Engineering Society of North America **(EXIT>)**
National Council on Qualifications for the Lighting Professionals **(EXIT>)**
New Buildings Institute's Lighting Web page **(EXIT>)**
International Association for Energy-Efficient Lighting **(EXIT>)**
American Lighting Association **(EXIT>)**
Rensselear Polytechnic Institute's Lighting Research Center **(EXIT>)**
DOE's EERE's Consumer's Guide Lighting and Daylighting **(EXIT>)**
Energy Design Resources' Energy Efficient Technologies: Lighting Design **(EXIT>)**

Larger Opportunities: Commercial Food Service Equipment

When you think of commercial food service equipment (CFSE), you probably think of restaurants, however CFSE is present in a variety of other facilities as well.

Facilities where CFSE may be found include:

- Restaurants
- Grocery stores
- Convenience stores
- Community centers
- Public assembly, sports and entertainment facilities
- Schools
- Congregations

If you operate a facility that serves food, there may be opportunities for saving energy and money from efficient CFSE equipment. CFSE is often the source of considerable energy and water consumption in a facility. ENERGY STAR has developed qualifications that identify some of the most efficient commercial food service equipment. ENERGY STAR qualified CFSE includes gas and electric deep fryers, hot food holding cabinets, gas and electric steam cookers, and commercial solid door refrigerators and freezers.

ENERGY STAR has developed a Commercial Food Service Equipment Incentive Finder. This tool provides information about rebates for ENERGY STAR qualified CFSE that are available from utilities and other energy-efficiency program sponsors.

To learn about CFSE and other product energy-efficiency opportunities visit ENERGY STAR Small Business's Restaurants Web page.

For detailed information on specific commercial food service equipment visit the following:

ENERGY STAR Qualified Products' Commercial Fryers

ENERGY STAR Qualified Products' Commercial Steam Cookers

ENERGY STAR Qualified Products' Commercial Hot Food Holding Cabinets

ENERGY STAR Qualified Products' Commercial Solid Door Refrigerators & Freezers

Consortium For Energy Efficiency's Commercial Programs: Commercial Refrigerators and Freezers **(EXIT>)**

Consortium For Energy Efficiency's Commercial Programs: Commercial Ice-makers **(EXIT>)**

Food Service Technology Center's Commercial Kitchen Appliance Technology Assessment Web page **(EXIT>)**

Food Service Technology Center's Design Guides **(EXIT>)**

Larger Opportunities: Heating, Cooling & Ventilating

Proper heating, ventilating, and air-conditioning (known in the trade as HVAC) are key to maintaining a comfortable, healthy and productive work environment. Collectively, these systems account for approximately 40 % of the electricity used in commercial buildings. Improved heating and cooling performance along with substantial energy savings can be achieved by implementing energy-efficiency measures.

Whether you wish to improve the efficiency of your existing heating and cooling systems or are considering upgrading to a new system, the information on this page will help you to make informed decisions!

- Cooling and Heating Load Reduction
- Heating and Cooling Systems
- Control Systems
- Maintenance

Cooling and Heating Load Reduction

One of the first steps you should consider in your facility before upgrading your heating and cooling system is to reduce your load (i.e. how much heating and cooling you actually use). Reducing your facility's load allows existing systems to operate less frequently and newer systems to be designed smaller, thereby lowering operating costs. Common load reduction strategies include:

- "Tightening" your building shell and adding additional insulation **(EXIT>)**) to reduce leakage.
- Installing energy-efficient windows **(EXIT>)** such as ENERGY STAR qualified windows.
- Upgrading lighting systems, energy-efficient lighting systems emit less heat into conditioned space than older inefficient technology.
- Reducing solar gain (e.g., cool roofing and window tints) in cooling dominated climates, and in cold climates taking steps to increase solar gain.
- Selecting efficient office equipment and consumer electronics to reduce heat output.
- Controlling ventilation to improve occupant comfort and save energy.

Once you have addressed these areas, you can then make the most of your heating and cooling equipment dollars.

Heating and Cooling Systems

Heating and cooling systems are critical to most businesses, but also represent a large component of many facilities' utility expenses. Cooling systems, in particular, are typically very energy intensive and are almost always fueled by electricity. Their operation typically coincides with periods that are subject to peak and time of use charges.

Heating and cooling systems have advanced significantly in design and efficiency. For example, today's air conditioners use 30% to 50% less energy to produce the same amount of cooling as air conditioners made in the mid 1970s. Even if your air conditioner is only 10 years old, you may save 20% on your cooling energy costs by replacing it with a newer, more efficient model.

Heating and Cooling System Tips:

- Consider implementing efforts to reduce heating and cooling load before selecting equipment.
- NEVER OVERSIZE! Avoid over sizing equipment at all costs. Over sizing equipment increases the capital cost at the time of the installation and the costs of operation of the equipment. Request that your HVAC professional conduct an

Project Suggestion

For commercial facilities, request an ACCA Manual N, and for home businesses request a Manual J, evaluation of your facility's heating and cooling loads before purchasing any major heating or cooling system. By following these guidelines you will receive a system that is sized appropriately for your facility.

Air Conditioning Contractors of America's (ACCA) **(EXIT>)** Manual N Commercial Load Calculation to ensure proper sizing.

- When selecting a new cooling system, have your HVAC professional provide you a quote and specifications for a standard-efficiency and high-efficiency unit including lifecycle costs. If the lifecycle cost is less on the high-efficiency unit, purchase it.
- When purchasing Room Air Conditioners, or Light Commercial heating and cooling units select those units that are ENERGY STAR qualified.
- Consider energy recovery ventilation systems **(EXIT>)** to reclaim waste energy from the exhaust air stream and use it to condition the incoming fresh air.
- In humid climates, consult your HVAC professional about supplemental dehumidification. By controlling humidity at your facility, you can increase occupant comfort and allow for further downsizing of equipment.
- Consider specifying economizers. Often available at a low incremental cost, these units draw in fresh air from the outside when the temperature outside is lower than the temperature inside.
- Install programmable thermostats and use automated settings to achieve savings.
- At a minimum, specify National Electrical Manufacturers Association (NEMA **(EXIT>)**) premium motors on HVAC equipment, and consider specifying variable speed drives (VSD) on condenser and evaporator fans.
- In dry climates, consider evaporative coolers. These coolers use the evaporation of water to cool spaces, eliminating the need for energy intensive compressors.
- For facilities that have heat-generating processes such as cooking, or onsite distributed generation equipment, consider heat recovery as a way to capture free waste heat and use it to offset facility heating and cooling costs.
- For areas such as warehouses and garages, consider installing radiant heating **(EXIT>)**. Radiant heating warms objects instead of the air, and requires less fuel. Radiant heat is also useful for warming exterior areas that require heating, such as patios and waiting areas.
- Many buildings are impacted by what goes on inside the building just as much as (and sometimes even more than) the weather conditions outside. That is why it is important to properly size equipment and consider the use of a demand controlled ventilation system **(EXIT>)** coupled with economizers to meet the internal loads of the building, e.g., commercial kitchens, computer data centers, etc.

Heating and Cooling System Energy-Efficiency Resources

ENERGY STAR Qualified Products' Heating & Cooling Efficiently Web page

EPA's Indoor Air Quality (IAQ) Resources

DOE EERE's Consumer's Guide Space Heating and Cooling Web page **(EXIT>)**

American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) **(EXIT>)**

Air Conditioning Contractors of America Resources **(EXIT>)**

FEMP's Energy-Efficient Products: How to Buy an Energy-Efficient Commercial Unitary Air Conditioner **(EXIT>)**

Consortium for Energy Efficiency's High-Efficiency Commercial Air Conditioning & Heat Pumps **(EXIT>)**

Flex Your Power's Heating, Ventilation and Air Conditioning (HVAC) Systems **(EXIT>)**

Control Systems

A great way to improve the efficiency of heating and cooling systems is to incorporate control strategies that ensure systems are used only when necessary. Common control strategies include ENERGY STAR qualified programmable thermostats, multiple zones, and CO_2 demand sensors. These strategies can be specified on new heating and cooling systems and retrofitted to older systems as well.

- **ENERGY STAR Qualified Programmable Thermostats**: These simple, easy to install thermostats allow convenient night/weekend setback to save you money. Models range from $50 to $200 depending on the desired features and usually include manual overrides to ensure comfort for late night workers.

- **Multiple Zones**: By dividing your facility up into multiple heating and cooling zones, your system can deliver more efficient heating and cooling by eliminating inaccuracies from a central sensor point. In addition, building occupants in different areas can adjust the temperature to meet their actual needs. If your facility has many rooms or floors, multiple zones are recommended.
- **Demand or CO_2 Sensors:** Most heating and cooling systems draw in ventilation air by assumed occupancy, however modern technology has sidestepped this by designing systems that actually can regulate the air quality of your facility by measuring the amount of CO_2 present. The result is more energy-efficient operation and better air-quality.

Maintenance

Just like your automobile, your facility's heating and cooling systems need maintenance to operate efficiently. To improve efficiency and help ensure reliability and long life, consider the following tips.

- Engage a qualified HVAC firm in a maintenance contract with seasonal tune-ups. During these tune-ups, a technician should check combustion efficiency, refrigerant charge, and belt tension as applicable.
- Replace air filters regularly. Accumulated dirt and dust make your fans work harder and reduce airflow. Clean or replace filters as recommended by your system's manufacturer.
- Clean the evaporator and condenser coils on your heat pump, air-conditioner, or chiller. Dirty coils inhibit heat transfer; by keeping them clean, you save energy.
- Inspect ducts and piping for leakage or damaged insulation. Leaky ductwork is one of the biggest contributors to cooling loss in buildings. Apply duct sealer, tape, and insulation as needed.
- Repair old valves and steam traps. These can waste hundreds of dollars and are low cost parts.

To learn more about maintaining your heating and cooling system visit ENERGY STAR's Heating & Cooling "Maintenance Checklist" and "Duct Sealing" information and the Air Conditioning Contractors of America's Preventive Maintenance = $avings **(EXIT>)** Web page.

Larger Opportunities: Office Equipment & Appliances

When facility operators think of energy consumption, they naturally focus on building operations (such as lighting and air-conditioning) and its shell components, but not necessarily on the energy consuming office equipment and appliances contained within.

Did You Know?
Liquid Crystal Display (LCD) monitors use less than 1/3 of the energy of conventional Cathode Ray Tube (CRT) monitors.

Office Equipment

As the nation transitions to a more service focused economy, a large portion of which are small businesses, the amount of energy consuming office equipment will also increase. Inefficient office equipment not only draws power, but also emits heat that can contribute to higher cooling bills. Fortunately, to address this issue there are a variety of ENERGY STAR qualified products that can help you save money and energy. If you are replacing or purchasing equipment such as computers, monitors, and copiers always consider ENERGY STAR qualified products.

Other office equipment savings opportunities include:

- Turning office equipment off at night.
- Checking to see if your computer already has power management software installed. If so, activate it.
- Printing double sided per page; much more energy is used in the manufacturing and distributing of paper than the actual printing at your office.

Find out more information about ENERGY STAR qualified office equipment.

To download FREE Power Management Software for your non-ENERGY STAR qualified computer visit ENERGY STAR's Power Management Software.

To learn more about office equipment energy efficiency visit:

Pacific Energy Center's "Energy-Efficient Office Equipment" Fact Sheet **(PDF)**

Advanced Buildings Technologies & Practices' Energy Efficient Office Equipment **(EXIT>)**

Appliances

Many small businesses, for example offices, have a variety of appliances such as refrigerators and dishwashers. These appliances, just like the ones in your home, can be purchased in models that are more energy efficient. ENERGY STAR qualified appliances incorporate advanced technologies that use 10% to 50% less energy and water than standard models.

In addition, there are many energy-efficiency opportunities to help you reduce the energy consumption of these appliances.

- For refrigerators, water coolers, and freezers maintain an air-gap of at least 3 inches between the back of the appliance and the wall. Also, try cleaning condenser coils (or the back of the appliance) regularly.
- Check door seals for signs of cracking or hardening, if you can easily pull a dollar bill out from between the seal and frame on a closed door replace the seal.
- Use dishwashers only when full to conserve energy, water, and detergent.
- Use timers to ensure that coffee maker heating elements are not operating in off hours.

To learn more about appliance energy efficiency visit:

ENERGY STAR Qualified Appliances

Consortium for Energy Efficiency **(EXIT>)**

Federal Trade Commission's How to Buy an Energy-Efficient Home Appliance Fact Sheet **(EXIT>)**

California Energy Commission's Database of Energy Efficient Appliances **(EXIT>)**

Larger Opportunities: Refrigeration

Refrigeration equipment for businesses such as grocery stores, convenience stores, and restaurants typically account for 25% to 60% of electricity consumption. Fortunately, there have been many advances in commercial refrigeration technology – many of which are extremely cost effective with improved product quality.

Your facility's size and type, and the needs of your business may determine the type of refrigeration system used.

Central refrigeration systems consist of refrigerated spaces connected to a remote condenser. These systems have the advantage of emitting waste heat outside of the conditioned space through the condenser.

Stand-alone refrigeration systems, often called merchandisers, usually have the case, evaporator and condenser packaged in a single unit, similar to your home refrigerator. These stand-alone units are commonly used in smaller facilities where a central refrigeration system is not justified.

Did You Know?

Technology options can save considerably on electricity used for refrigeration.

Save:

- 10% with energy-efficient case lighting
- 3% to 10% with floating head pressure controls
- 5% to 13% with energy-efficient fan motors
- 1% to 6% with defrost controls
- 3% to 9% with evaporative condensers

Source: "Focus on Energy" **(EXIT>)**

There are many other efficiency opportunities in refrigeration. When working with a contractor or service provider, ask them to review and specify additional efficiency measures, such as:

- ENERGY STAR qualified commercial solid door refrigerators and freezers.
- Premium insulation packages where available for walk-in coolers.

- National Electrical Manufacturers Association (NEMA) **(EXIT>)** premium motors and/or variable speed drives on evaporator and condenser fans.
- Oversized condensers to supercool refrigerant.
- Humidistat controlled anti-sweat heaters, instead of timers, for large display systems.
- Evaporative condensers.
- Defrost controls, instead of timers, that measure frost accumulation and humidity.
- Floating head pressure systems and/or liquid pressure amplifier pumps.
- Efficient T8, T5, or compact fluorescent lighting with electronic ballasts.
- Glass door cases (instead of open door cases).
- Heat recovery from compressors and condensers to provide hot water.
- Automatic door closers (with appropriate interior safety releases).

To learn more about refrigeration energy efficiency visit:

ENERGY STAR Qualified Products Commercial Solid Door Refrigerators and Freezers

Focus on Energy Business Programs' Energy Efficient Refrigeration for Grocery Stores, Convenience Stores and Restaurants Fact Sheet **(PDF) (EXIT>)**

PG&E's A Guide to Help You Minimize Your Refrigeration System Energy Use Fact Sheet **(PDF) (EXIT>)**

FEMP's Technology Installation Review: Energy Savings in Refrigerated Walk-in Boxes Fact Sheet **(PDF) (EXIT>)**

Maintenance Tips

- Engage a qualified heating, cooling, and ventilation (HVAC) contractor in a maintenance contract with seasonal tune-ups. During these tune-ups, a technician should check combustion efficiency, refrigerant level, and belt tension as applicable.
- Properly load the unit. Overloaded refrigeration units result in disrupted airflow while under loaded units are using more energy than needed.
- Clean cooling coils regularly to ensure proper airflow and heat transfer.
- Whenever considering any modification to an existing refrigeration system that involves changing refrigerants, consult your refrigeration professional.

To learn more about refrigerants visit EPA's Stationary Air Conditioning Web page.

For information on stand alone commercial solid and glass door refrigerators and freezers please visit the "Commercial Food Service Equipment" section of the Small Business Guide.

In addition, the "Office Equipment & Appliances" section of the Guide has information on residential stand-alone refrigerators and freezers.

LEADING SMALL BUSINESS FACILITY TYPES

The kind of energy-efficiency upgrades that are available and/or are applicable vary by type of small business. Find information on energy-efficiency opportunities, technologies and practices specifically designed for your facility type using the links below.

- Auto Dealers
- Educational Facilities
- Food Service/Restaurant
- Grocery/Convenience Store
- Lodging
- Office
- Retail

LEADING SMALL BUSINESS FACILITY TYPES: AUTO DEALERS

For information on energy-efficiency opportunities in automobile dealer facilities visit:

ENERGY STAR for Auto Dealers

A Dealer Guide to ENERGY STAR® Putting Energy into Profits **(PDF)**

National Automobile Dealers Association (NADA), Energy Stewardship Initiative **(EXIT>)**

Learn more about the following technologies and practices that are applicable in automobile dealer store facilities.

Building Shell

Heating, Cooling & Ventilating

Lighting

Office Equipment & Appliances

Leading Small Business Facility Types: Educational Facilities

For information on energy-efficiency opportunities in education facilities visit:

ENERGY STAR for K-12 School Districts

ENERGY STAR for Higher Education

DOE's Energy Solutions for Your Building – School Buildings **(EXIT>)**

DOE's Energy Solutions for Your Building – University Buildings **(EXIT>)**

DOE's Rebuild America's EnergySmart Schools **(EXIT>)**

DOE's Rebuild America's Collages and Universities **(EXIT>)**

Pacific Gas and Electric Company's Energy Reduction Action Plan For Schools **(EXIT>)**

Energy Design Resources' Building Types: Schools **(EXIT>)**

Council of Educational Facility Planners International's (CEFPI) U.S. Environmental Protection Agency Web Page **(EXIT>)**

Learn more about the following technologies and practices that are applicable in education facilities.

Building Shell

Commercial Food Service Equipment

Heating, Cooling & Ventilating

Lighting

Office Equipment & Appliances

Refrigeration

Resources for students and teachers:

EPA's Environmental Kids Club

EPA Clean School Bus USA

DOE's "For Students and Kids" **(EXIT>)**

DOE's Office of Science: Office of Workforce Development for Teachers and Scientists **(EXIT>)**

Leading Small Business Facility Types: Food Service/Restaurant

For information on energy-efficiency opportunities in food service/ restaurant facilities visit:

ENERGY STAR Small Business' Restaurants Web page

Green Restaurant Association **(EXIT>)**

National Restaurant Association **(EXIT>)**

Pacific Gas and Electric Company's Energy Reduction Action Plan for Restaurants **(EXIT>)**

San Diego Gas & Electric's Energy-Saving Solutions for Restaurants Guide **(PDF) (EXIT>)**

North American Association of Food Equipment Manufacturers **(EXIT>)**

Fisher Nickel's Food Service Technology Center **(EXIT>)**

Learn more about the following technologies and practices that are applicable in food service/restaurant facilities.

Building Shell

Commercial Food Service Equipment

Heating, Cooling & Ventilating

Lighting

Office Equipment & Appliances

Refrigeration

Leading Small Business Facility Types: Grocery/Convenience Store

For information on energy-efficiency opportunities in grocery/convenience store facilities visit:

ENERGY STAR Small Business Grocery & Convenience Stores Web page

EnergySmart Grocer **(EXIT>)**

Focus On Energy's Grocery and Convenience Stores Web page **(EXIT>)**

National Grid's Managing Energy Costs in Grocery Stores Fact Sheet **(PDF) (EXIT>)**

Learn more about the following technologies and practices that are applicable in grocery/convenience store facilities.

Building Shell

Commercial Food Service Equipment

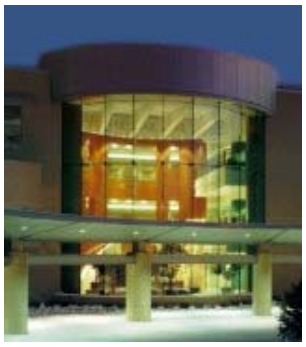
Heating, Cooling & Ventilating

Lighting

Office Equipment & Appliances

Refrigeration

Leading Small Business Facility Types: Health Care



For information on energy-efficiency opportunities in health care facilities visit:

ENERGY STAR for Healthcare

DOE's Energy Solutions for Your Building – Health Care Buildings **(EXIT>)**

DOE's Rebuild America's Commercial Buildings **(EXIT>)**

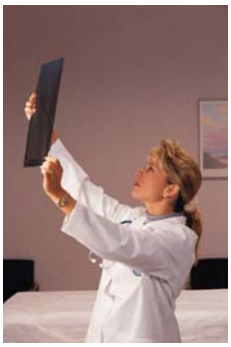
Hospitals for a Healthy Environment **(EXIT>)**

EPA & DOE's Labs For The 21st Century **(EXIT>)**

NYSERDA's Hospital/Institutions Web page **(EXIT>)**

Whole Building Design Guide's Health Care Facilities **(EXIT>)**

Energy Design Resources' Building Types: Hospitals & Labs **(EXIT>)**



Learn more about the following technologies and practices that are applicable in health care facilities.

Building Shell

Commercial Food Service Equipment

Heating, Cooling & Ventilating

Lighting

Office Equipment & Appliances

Refrigeration

Leading Small Business Facility Types: Lodging

For information on energy-efficiency opportunities in lodging facilities visit:

ENERGY STAR Small Business' Lodging Web page

ENERGY STAR for Hospitality

DOE's Energy Solutions for Your Building – Lodgings **(EXIT>)**

DOE's Rebuild America's Commercial Buildings **(EXIT>)**

Global Steward's Environmental Tips For Green Hotels **(EXIT>)**

Green Hotels Association **(EXIT>)**

Learn more about the following technologies and practices that are applicable in lodging facilities.

Building Shell

Commercial Food Service Equipment

Heating, Cooling & Ventilating

Lighting

Office Equipment & Appliances

Refrigeration

Leading Small Business Facility Types: Office

For information on energy-efficiency opportunities in office facilities visit:

ENERGY STAR Small Business' Office Web page

ENERGY STAR for Commercial Real Estate

DOE's Energy Solutions for Your Building – Office Buildings **(EXIT>)**

DOE's Rebuild America's Commercial Buildings **(EXIT>)**

Pacific Gas and Electric Company's Energy Reduction Action Plan For Office Buildings **(EXIT>)**

Energy Design Resources' Building Types: Offices **(EXIT>)**

Flex Your Power's Small Retailers and Offices **(EXIT>)**

Learn more about the following technologies and practices that are applicable in office facilities.

Building Shell

Heating, Cooling & Ventilating

Lighting

Office Equipment & Appliances

Leading Small Business Facility Types: Retail

For information on energy-efficiency opportunities in retail facilities visit:

ENERGY STAR Small Business' Retail Web page

DOE's Energy Solutions for Your Building – Retail Buildings

DOE's Rebuild America's Commercial Buildings **(EXIT>)**

Energy Design Resources' Building Types: Retail Stores **(EXIT>)**

Flex Your Power's Small Retailers and Offices **(EXIT>)**

Learn more about the following technologies and practices that are applicable in retail facilities.

Building Shell

Heating, Cooling & Ventilating

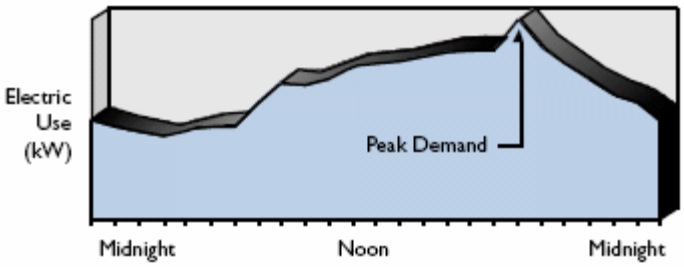
Lighting

Office Equipment & Appliances

CALCULATE YOUR SAVINGS

Assess Your Savings Potential!

You can't see energy, so it can be difficult to visualize the potential savings lying undiscovered in your facility. However, you can see and easily understand those utility bills you receive each month. Visualize your energy bill being lower by 25 to 30 percent, or even more. Visualize your potential energy savings as an appreciable pile of cash that could go to your bottom line instead of to your local utility.



Clearly managing energy use makes good business sense, but remember, "you can't manage what you can't measure." Your facility's energy use for lighting, heating, cooling, office equipment and other systems can be easily identified, measured and analyzed. The result is a new and interesting look at your facility – where simple identification and measurement techniques provide the first steps toward eliminating waste and saving money. You can begin the process today by pulling out your utility bill file and looking at what you are paying each month and each year for energy with the knowledge that you can reduce energy waste and reclaim much of the money you are paying out for energy. Then use the following resources to:

Identify how your energy use compares to that of similar type facilities.

ENERGY STAR's Energy-Intensive Calculator

ENERGY STAR's Portfolio Manager

Lawrence Berkley National Laboratories' ARCH: A Building Energy Reference Tool **(EXIT>)**

DOE's Building Technologies Program's Building Energy Software Tools Directory **(EXIT>)**

Did You Know?

Your peak electricity use usually occurs during a time of day when rates are at their highest. If you are charged a "demand rate" on your electric bill, you pay a fee based on your peak amount of electricity consumption. Lowering your peak rate of usage can save big!

Assess your facility and discover energy-efficient upgrade opportunities.

DOE's Energy-Efficiency Products: Energy Cost Calculators **(EXIT>)**

Alliant Energy's Energy Efficiency Calculators **(EXIT>)**

ENERGYguide's Online Analysis Tools **(EXIT>)**

Calculate Your Savings: Financial Analysis

Turning Energy Into Cash

It always pays to do your homework before investing in energy-efficient equipment such as ENERGY STAR qualified products. What products and equipment really work? How much will it cost to install? Where do you find the money? How quickly will you recover your investment? There are many resources to help you get the answers that will work for your business.

Did You Know?

Bill comparison provides you with a technique to quantify your savings after implementation of energy-efficient measures.

Analysis - Tools and Resources

ENERGY STAR's Resources: Finance, Products & Services

EPA's Small Business Gateway

Small Business Administration's Financing Your Business **(EXIT>)**

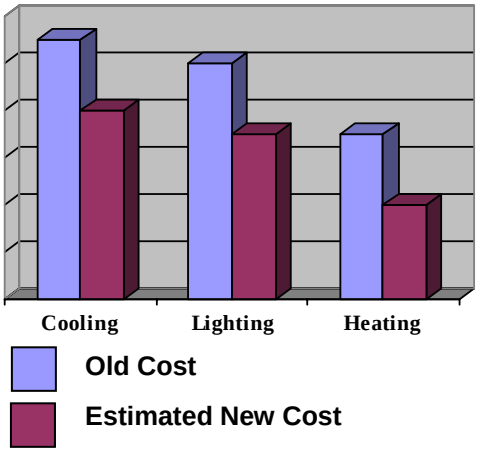
Incentives, Rebates and Other Resources

National Association of State Energy Officials' "State and Territory Energy Offices" Web page **(EXIT>)**

Alliance to Save Energy's Financing Energy Efficiency **(EXIT>)**

Local Government Commission's Funding Opportunities**(EXIT>)**

Another consideration in funding energy-efficiency upgrades is the price of the equipment. Why pay more than you must for efficient products and equipment? Perhaps your Chamber of Commerce, trade or professional business association would sponsor a group purchase in which you and other small businesses pool your buying power for volume discounts. Read more about this strategy to stretch your investment capital in ENERGY STAR Small Business's Group Purchasing Fact Sheet **(PDF) (EXIT>)**



The two most common financial evaluation tools are simple payback and internal rate of return (IRR).

- Simple Payback: The number of years it takes to recover the cost of the upgrade from the savings.
- Internal Rate of Return: Compares the financial results of an upgrade against other investments.

Learn more about financial indicators in ENERGY STAR's Buildings Upgrade Manual's Financing Section. **(PDF)**

Calculate Your Savings: Saving With ENERGY STAR

ENERGY STAR qualified products are equal to or better than standard products of the same type, but the good news is they use less energy! And since they use less energy, ENERGY STAR qualified products save you money on your utility bills while helping to protect the environment by causing fewer harmful greenhouse gas emissions. The following link provides access to calculators of various types of ENERGY STAR qualified products. These calculators estimate the annual dollar and energy savings you can expect by installing an ENERGY STAR qualified version.

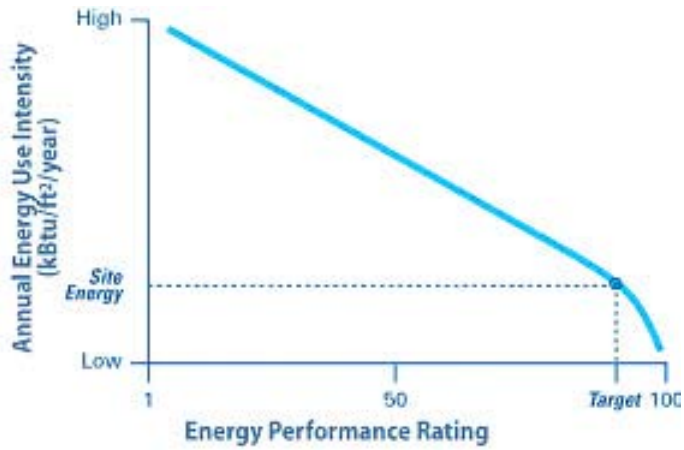
Energy Star Savings Calculators

Calculate Your Savings: Indirect Benefits

Saving More Than You Know

When you invest in energy efficiency, the benefits go far beyond saving energy and money, and protecting the environment by helping prevent pollution and greenhouse gas emissions.

Make a Good Building Even Better!



- **Potential to Improve Employee Productivity**: Enhanced comfort and improved lighting conditions may contribute to improvements in staff productivity.
- **Reduced Operations and Maintenance Costs**: Many energy-efficient technologies significantly decrease your operations and maintenance requirements, saving not only money but also staff time.
- **Increased Customer Comfort:** Building upgrades will improve your facility's appearance, present your products or services in a comfortable, well-lit environment, and help your customers enjoy their visit. This can increase sales and encourage repeat business.
- **Increased Asset Value:** Efficient business properties have higher market values than those with higher operating costs.
- **Enhanced Public Image:** Your contribution to environmental protection very positively differentiates your business from your competitors.

GREEN YOUR BUSINESS

GREEN YOUR BUSINESS: RENEWABLE ENERGY AND GREEN POWER

After addressing energy-efficiency opportunities available in your facility, you may also want to consider renewable energy and green power. Renewable energy refers to electricity supplied from energy sources, such as wind, solar, geothermal, hydro, and biomass. These energy sources are considered renewable sources because they are continuously replenished.

Electricity that is generated from renewable energy sources is often referred to as "green power." Green power products can include electricity generated exclusively from renewable resources or, more frequently, electricity produced from a combination of fossil and renewable resources.

If interested in installing renewable energy equipment in your facility, incentives may be available in your state to "buy down" the cost. To learn more about incentives visit the "Finding Funds" section of this guide.

Of course, not every small business can install renewable energy technology at their facility. Fortunately you can buy green power for your facility directly from many utilities at a slightly higher cost than regular electricity. If your utility does not offer green power options you can still participate by purchasing renewable energy certificates. Renewable energy certificates (or green tags) document the purchase of renewable energy.

Check out the following links for additional information on renewable energy and green power:

EPA's Clean Energy Web site

EPA's Green Power Partnership

DOE's Energy Efficiency and Renewable Energy (EERE) Office **(EXIT>)**

Renewable Energy Policy Project (REPP) **(EXIT>)**

National Renewable Energy Laboratory's (NREL) Renewable Energy for Small Business Owners **(EXIT>)**

Interstate Renewable Energy Council's Small Wind Energy **(EXIT>)**

DOE's EERE's The Green Power Network **(EXIT>)**

GREEN YOUR BUSINESS: AIR POLLUTION

Pollution Prevented Through Energy Savings

Employing energy-efficient technology such as ENERGY STAR qualified products can help reduce emissions (air pollution) from power plants that produce energy. Carbon dioxide emission is a primary cause of global climate change, sulfur dioxide is a key component of acid rain, and nitrogen oxide is responsible for smog.

Making your business more energy efficient means you will use less energy and save money, while helping the environment at the same time! Since utilities will not need to generate as much electricity, they won't burn as much fossil fuel, which means they are releasing less pollution into the atmosphere. To find out more about estimating how much money you can save by reducing your facility's energy use, please visit the "Calculate" section of this guide.

Did You Know?

For each kilowatt-hour (kWh) of electricity that you save through the application of energy-efficient technologies, you are reducing the emissions of carbon dioxide, sulfur dioxide, and nitrogen oxides.

Air Pollution links:

EPA's Air Pollution Web Page

AIRNow **(EXIT>)**

DOE's Clean Air, Soil, & Water Web Page **(EXIT>)**

Centers for Disease Control and Prevention's Air Pollution & Respiratory Health **(EXIT>)**

NEW BUILDING DESIGN

GREEN YOUR BUSINESS: NEW BUILDING DESIGN & CONSTRUCTION PROJECTS

The intent of energy-efficient design for new construction and/or remodeling is to utilize efficient equipment while optimizing the use of natural energy sources. The ultimate goal is to provide increased comfort with reductions in energy costs and greenhouse gas pollution.

Energy-efficient design and construction does not need to cost any more than standard design – so get started and realize significant energy and cost savings for your business. Let ENERGY STAR's Building Design Guidance help you manage the design and construction process right from the start!

Get energy code advice from DOE's Building Energy Codes Program. **(EXIT>)**

Energy-Efficiency Design and Construction Resources

Whole Building Design Guide's Building Types **(EXIT>)**

DOE's Design, Construct & Renovate **(EXIT>)**

ENVIRON Design Collaborative's Solar & Energy Efficient Design **(EXIT>)**

Sustainable and Green Building Guidance

EPA's Green Buildings

Building Green's Making the Case for Green Building **(EXIT>)**

California Integrated Waste Management Board's **(EXIT>)**

Green Building Design and Construction **(EXIT>)**

Sustainable Buildings Industry Council **(EXIT>)**

U.S. Green Building Council**(EXIT>)**

GREEN YOUR BUSINESS: PAPER

You may not think of your business' paper use as an area to save energy, but it is. Paper manufacturers in the U.S. consume a significant amount of energy each year in the production of paper – not to mention the energy spent harvesting and shipping trees, and shipping paper products to your business. There are some simple steps you can follow to optimize your use of this valuable resource that will save money, reduce waste, protect our nation's forests and reduce energy consumption!

- Use double-sided printing and copying.
- Distribute documents electronically instead of in hard copy when feasible.
- Select paper products with a high recycled content.
- Recycle as much of the paper products you use as possible.

Check out the following links for additional information:

EPA's WasteWise

Paper Industry Association Council paperrecycles.org's Recycling: in the workplace **(EXIT>)**

GREEN YOUR BUSINESS: RECYCLING

It does not matter what type of business you have or what type of facility you run – there is some amount of material you use that can be recycled. From aluminum cans, and glass and plastic bottles, to used oil and printer toner cartridges, recycling reduces the amount of waste materials that are put in landfills or incinerated while decreasing greenhouse gas emissions and deforestation. That's good for everybody! Ask your building management or waste handler about recycling opportunities.

Check out the following links for additional information:

EPA's "Recycling" Web page

EPA's "Recycling/Pollution Prevention" Web page

EPA's "WasteWise" Web site

Technology Specific Recycling

During your upgrade projects, and normal maintenance, you will likely have to deal with lighting and electronic waste. The disposal of some of this waste may be regulated, since both electronic and lighting waste may contain potentially harmful substances, and these products may need to be separated from your other garbage. The best way to dispose of this waste is to recycle it.

To learn more about the recycling and disposal of lighting and electronic waste visit:

EPA's Toxic Substance Control Act (TSCA) Disposal Requirements for Fluorescent Light Ballasts Fact Sheet **(PDF)**

EPA's Electronics: A New Opportunity for Waste Prevention, Reuse, and Recycling Fact Sheet **(PDF)**

National Park Service's Envirofacts: Lighting Waste Management Fact Sheet **(PDF) (EXIT>)**

National Electrical Manufacturers Association's Lamp Recycle.org Web site **(EXIT>)**

GREEN YOUR BUSINESS: WATER

You may wonder what water use and saving energy have to do with each other? In most cases, electricity or gas are used to heat water, and this costs you money. In addition, your water company uses energy to purify and pump water to your business as well as in the treatment of your sewage. So part of your water and sewage bill is really an energy bill. The more water your business consumes, the more you will benefit from optimizing water use. Some ways to save related to the water you use are:

- Repair leaking pipes, fixtures and seals.
- Install water-efficient appliances where applicable.
- Install efficient showerheads **(EXIT>)** and faucets. **(EXIT>)**
- Install controls that turn faucets off automatically.
- Put in high-efficiency toilets and urinals. **(EXIT>)**
- Depending on your type of business, use horizontal axis washing machines.
- Practice green landscaping (greenscaping or xeriscaping) to preserve natural resources and prevent waste and pollution.
- Install an insulation blanket on water heaters seven years of age or older, and insulate the first 3 feet of the heated water "out" pipe from your water heater.
- Install an energy-efficient electric **(EXIT>)** or gas **(EXIT>)** water heater.
- In areas of infrequent water use, consider "tankless" water heaters to reduce "standby" storage costs and waste.

Did You Know?

Repairing a seal that is leaking water can save money and hundreds of gallons of water per year – and if it's a hot water leak, you can save even more money!

Check out the following links for additional information:

EPA's "WaterSense: Efficiency Made Easy" Web page

EPA's Water – Glossary

"Water Wiser – The Water Efficiency Clearinghouse" Web site **(EXIT>)**

"Water Efficiency Manual for Commercial, Industrial, and Institutional Facilities" **(PDF) (EXIT>)**

Colorado Springs Utilities' "Xeriscape" Web page **(EXIT>)**

GREEN YOUR BUSINESS: SMALL BUSINESS TRENDS

Small Business, Big impact!

One thing is for sure, as a small business owner you are not alone! There are millions of small businesses across the United States traveling the same road as you each and every day. Although your business operates in its own unique fashion, the cumulative impact of the small business sector is enormous.

Small business is BIG!

- The 23 million small businesses in America account for 54% of all U.S. sales.
- Small businesses provide 55% of all jobs and 66% of all net new jobs since the 1970's.
- The 600,000 plus franchised small businesses in the U.S. account for 40% of all retail sales and provide jobs for some 8 million people.
- The small business sector in America occupies 30-50% of all commercial space, an estimated 20-34 billion square feet.

Did You Know?

Small business drives the U.S. economy by providing jobs for over half of the private workforce.

Furthermore, the small business sector is growing rapidly. While corporate America has been "downsizing", the rate of small business "start-ups" has grown, and the rate for small business failures has declined.

- The number of small businesses in the United States has increased 49 % since 1982.
- Since 1990, as big business eliminated 4 million jobs, small businesses added 8 million new jobs.

For more interesting facts about the Small Businesses community visit:

U.S. Census Bureau's Statistics of U.S. Businesses **(EXIT>)**

U.S. Small Business Association **(EXIT>)**

SBA Office of Advocacy's Firm Size Data **(EXIT>)**

DOE's Energy Information Administration **(EXIT>)**

National Small Business Association **(EXIT>)**