Chapter Objectives

- Demonstrate an understanding of why energy efficiency is important to the individual and to society.
- Identify specific tips for saving energy.
- Explain the process of an energy audit and its benefits.
- Summarize the benefits of the ENERGY STAR program and explain why they are important.
- List incentives and rebates offered by government agencies to encourage the practice of energy efficiency and conservation.
OVERVIEW OF ENERGY EFFICIENCY

Being energy efficient is the most effective way to save on energy and to protect the environment. To become energy efficient people must be informed and create new habits. It does not cost to do that. In fact, it saves money.

Let us review the importance of energy efficiency in the world today. Wasting energy by using fossil fuels in factories, plants, and cars contributes to air pollution. Specifically, it creates smog. Smog usually forms a brown, dirty haze on the horizon that makes people realize that there is too much pollution in the world.

Smog

The industrial-strength smog visible today is called photochemical smog. That means that when the emissions from industrial plants and automobiles, including nitrous oxides and various other volatile organic compounds, chemically react with sunlight and heat, it results in airborne particles that are left behind. This creates ground-level ozone. Photochemical smog affects breathing and makes conditions such as bronchitis, chronic obstructive pulmonary disorder (COPD), asthma, pneumonia, and other respiratory ailments worse. Many times the membranes in one's breathing passages are inflamed, lung capacity is diminished, and one experiences pain during deep breaths. Industrialized cities surrounded by hills or mountains are especially susceptible to severe levels of smog because the hills form a basin that traps the poisonous air. When people employ practices of energy efficiency they are combating unwise and extravagant energy expenditures that contribute to air pollution.

Smog is a visible reminder to us to find cleaner forms of energy.

Acid Rain

Another serious atmospheric impairment is acid rain. Burning fossil fuels wastes energy and contributes to the accumulation of acid rain in the troposphere. Acid rain is deposits in the air that contain higher than normal concentrations of sulfur dioxide and nitrogen oxides. These compounds come into contact with plants, the ground, buildings, and human beings even when it is not actually raining. When it does rain, the precipitation carries the compounds down to earth and across state or national boundaries. The compounds contained in acid rain have been shown to be carcinogenic in humans. The compounds also alter pH levels in surface water; affect the health of fish and other aquatic animals; and damage freshwater ecosystems,
forests, and soil. Energy conservation helps offset energy expenditures that contribute to acid rain.

**Greenhouse Gases and Global Warming**

Burning fossil fuels and wasting energy contribute to global warming and climate change. *Greenhouse gases* are gases that trap heat in the atmosphere. These include carbon dioxide, methane, nitrous oxide, and fluorinated gases such as hydrofluorocarbons. Scientists believe that, over the past century, the production of greenhouse gases has set a warming trend. They also believe that these gases will remain in the atmosphere for at least several decades and cause *global warming*. Scientists anticipate that the level of greenhouse gases will continue to increase and that the increasing level of greenhouse gases will cause average global temperatures and sea levels to rise. In addition, scientists expect the world populace to experience climate change in the areas of precipitation, wind, and storms.

The damage global warming causes to aspects of human life such as agriculture and forestry can be profound. Scientists warn of crop damage, soil erosion, soil saturation, and increased difficulty in cultivating the land as a result of frequent and heavy precipitation. Scientists are also concerned about the effect heavy precipitation has on the water supply. They state that global warming may cause the quality of surface and groundwater to decrease and that this may result in contamination of the water supply. As a result, the human toll could be significant. Heat related deaths, food and water shortages, wild fires, water and airborne diseases, injuries, allergies, and health conditions may increase.

![Crop damage due to heavy precipitation](image)

Other effects of global warming are likely to affect ecosystems, biodiversity, public lands, recreation, water resources, and future policy. The climate changes brought about by global warming have far-reaching effects. All energy-conservation measures people take help to mitigate industrial society’s waste and help slow the onset of global warming and its effects.

**Oil and Oil Spills**

Oil spills are ecological disasters that result from the need for oil. More than 4,000 commercial oil tankers carry two billion metric tons of oil over the oceans of the world every year. The sheer amount of oil transported makes it likely that oil
spills will occur. In 1989, the Exxon Valdez spilled over 10 million gallons of crude oil into the Prince William Sound. Crude oil contains polycyclic aromatic hydrocarbons (PAHs) that are difficult to neutralize and that last for years in the sediment of the ocean. In the Exxon Valdez incident, the devastation to wildlife and the environment was significant. Approximately 1,000 otters, over 400,000 seabirds, and an untold number of fish were killed.

![Visible damage from an oil spill](image)

In addition to spills caused by large tankers, oil is spilled into the oceans by smaller ships and barges and is leaked from oil pipelines. The United States alone has almost 200,000 miles of oil pipeline that ranges in size from two to 24 inches in diameter. As a result, accidents happen and wildlife and the environment suffer devastating losses. When people are efficient energy consumers they are doing their part to lessen the demand for oil and, as a result, the amount of oil that is transported across land and oceans each year.

Another effect of the need for oil is that the United States is partially dependent on foreign oil. When this situation occurs, the nation is at constant risk of international conflict over energy supplies. As a nation, the U.S. should not remain vulnerable in this situation. The United States needs oil because it runs our economy. However, the citizens of this nation are increasingly aware of the danger of dependence on foreign oil and are becoming more aware of viable alternatives to that dependence. Scientists continue to perform research to improve the technology that will bring renewable, efficient sources of energy. When people are energy-conscious, practicing conservation, and being good stewards of the environment, there is less demand for a source of energy that comes from foreign countries. This is a significant way to increase energy efficiency.

**Water Pollution**

Water is the most important natural resource on the planet. The simple combination of two atoms of hydrogen and one atom of oxygen sustains life on earth. Water pollution is another problem that people must contend with today. The Environmental Protection Agency (EPA) recognizes two different categories of water pollution—point and non-point. *Point pollution* is caused by sources such as sewage treatment plants and factories that drain their pollution into natural bodies of water. *Non-point* sources are more varied and random, such as pollution from paved roads or mining activities.
Managing water pollution involves protecting many different types of water and environments such as groundwater, aquatic ecosystems, wastewater, storm water, drinking water, and surface water. Water pollution affects the economy, health, and the environment. When people are energy efficient they lessen the demand for the transportation and production of non-renewable fuels. This has a positive effect on the water supply. People also create an awareness of the need to preserve a healthy and productive water system that contributes to human needs, as well as wildlife and all ecosystems.

**Power Plants**

When demand is great for new energy sources, new power plants are constructed. Power plants often burn fossil fuels that contribute to the pollution of the environment. In addition, building power plants often causes damage to the environment, stirs up carbon deposits that were sequestered in the environment, and sometimes uses up wilderness area and decreases animal habitat. When a hydro-electric plant is built, some of this damage is done to the environment, but it is usually mitigated when the power plant is established and is producing a good volume of clean electrical power. Thankfully, the environment rebounds and flourishes under the new design. When a dam is built and turbines are installed in a waterway, steps are sometimes constructed to help migrating fish reach their destinations. A power plant that burns fossil fuels does not have the same compensating benefits. Therefore, every step people take to conserve energy reduces the demand for energy and helps preserve a wilderness area.

![The burning of fossil fuels to power industry causes pollution of the environment.](image)

A large percentage of energy used in the United States today is spent on housing and transportation. An effective way to lessen the demand for non-renewable sources of energy and to make a lighter imprint on the environment is to focus on these two areas. This is the area in which individuals can most easily make an impact. If millions of individuals join together in this common cause, the impact can be significant. In addition, the government needs to exercise oversight over the industries that pollute the environment—manufacturing plants, energy-producing plants, transportation companies, and others. This supervision will improve utilization of renewable energy sources. If everyone works together, our nation can make this transition to energy conservation dynamic and effective.
TIPS FOR SAVING ENERGY

Government agencies, private commercial endeavors, and private individuals all offer tips the citizens of the United States can use to save energy. These tips are intended to be useful and practical so that individuals can actively participate in the transition to energy efficiency. Hopefully, the following tips will be used to make a positive impact on our environment.

In the Home

- **Adjust the thermostat**
  Thermostats should be set reasonably high in the summer and reasonably low in the winter. In other words, do not set the thermostat at 68 degrees inside when it is 95 degrees outside and do not set the thermostat for 75 degrees inside when it is 30 degrees outside. It costs an enormous amount of money to change the inside temperature of the home. Wear a sweater in the winter and dress cooler in the summer.

- **Utilize passive solar design**
  When building a new home, incorporate design features that keep the home more comfortable year-round without the aid of mechanical devices. Design the home so that radiant heat can enter the home through south-facing windows in the winter. Sunlight warms floor surfaces, walls, and personal items in the house like furniture and appliances. Sunlight can also be collected, stored, and its warmth redistributed throughout the house with the aid of fans. Another way to collect and store heat in the winter is to incorporate *thermal mass* into the design of the house. Thermal mass is any material that absorbs and stores radiant heat from the sun. Dark colored masonry material that faces the sun is the most common thermal mass used in house design. The heat is naturally released in the evening, which makes the interior temperature more comfortable. In the summer, the thermal mass cools down during the night and maintains that coolness the next day, which makes the house cooler during the sweltering heat of the day. *Passive solar design* also includes overhangs that shade the house during the hot summer but that allow the sunlight to penetrate the interior of the house during the winter.

Part of passive solar design is the effective use of insulation in the exterior walls, ceiling, floors, and around ducting. Solar homes use insulation with a higher R-value so that the insulation prevents temperature exchange more effectively. An R-value is the measure of thermal resistance and heat flow. The higher the R-value, the more resistant the insulation is to heat flow. Insulation belongs in ceilings, floors, walls, and even around water heaters.

In addition to effective insulation, the house should be made as airtight as possible; providing a *home envelope*. Otherwise warm air will escape from the house through cracks, crevices, and all other openings during the winter. In the summer, cool air will escape from the house through those same openings. The result is an expensive battle to keep the house close to the same temperature. Rather than constantly correcting the temperature, the house should be airtight. If the house is airtight, it will keep warm air in and cold air out during the winter, and cold air in and warm air out during the summer. Therefore, seal, caulk, and weather-strip the house so that air does
not enter or escape. Areas that commonly leak are around doors and windows and under sill plates.

**Close the flue to the fireplace when it is not in use**
The reason the flue is open is to allow smoke to escape from the house. The flue is a very effective conduit to the great outdoors and can quickly let warm air escape. Therefore, close the flue when the fireplace is not in use. Some experts recommend sealing the fireplace permanently if it is never used, but think before using that option because you never know when the fireplace may need to be used.

**Transition from incandescent light bulbs to fluorescent light bulbs**
Ninety percent of the energy consumption of an incandescent light bulb is from the production of heat. Only 10 percent produces actual light. Compact fluorescent light bulbs (CFLs) are available in warm or soft white lights for reading and in-home use, but are also available in a cooler color for task performance. There are CFLs that fit all sorts of fixtures. Installing CFLs, which use about 75% less energy and last about ten times longer than incandescent bulbs, is a great way to conserve energy.

**Energy efficient appliances**
A passive solar design house needs energy efficient appliances. Refrigerators that have earned the ENERGY STAR rating use high-efficiency compressors, have more effective insulation, and utilize precision thermostats and defrost mechanisms. ENERGY STAR refrigerators use 40 percent less energy than the conventional models sold in 2001 and require about half as much energy as refrigerators manufactured in 1993.

Clothes washers have changed significantly over the last few years. They have been designed to reduce energy and water consumption by over 40 percent. It is estimated that an individual can save in excess of $550 in operating costs over the lifetime of the appliance if he or she uses an ENERGY STAR qualified clothes washer in either a front-loading or redesigned top-load model instead of a conventional model.

Using ENERGY STAR washers saves energy during the drying process. ENERGY STAR washers are designed with efficient motors to spin clothes two or three times faster during the spin cycle, which extracts more water. This equates to less moisture in the clothes and requires less time and energy in the dryer. Therefore, energy efficient washers and dryers save energy, time, and money.

Another energy-saving appliance is the demand, or tankless, water heater. This device heats water only when required and delivers an endless supply of heated water on demand. The old-fashioned water heaters heat up 50 to 100 gallons of water and store it 24-hours a day. The same water is heated over and over until it is actually needed. A person who converts his or her water heater to a demand water heater can save between one quarter and one half of the money he or she previously spent using a conventional hot water storage system.

If upgrading to a demand water heater is impossible, insulate the water storage tank to avoid continual heat loss and increased heating costs.
**Heat pumps**
In moderate climates, heat pumps are an effective way to heat a home and save energy. These devices work by moving heat from one location to another. For example, heat is moved from outside in the ground, air, or water to the inside for use or for storage. A heat pump can also cool a house by collecting the heat inside and pumping it outside. It is estimated that heat pumps will consume only 60 to 70 percent of the electricity normally required to heat a house.

**Fans**
Using fans to distribute cool air throughout the house helps to cool and does not waste energy. It is not necessary to hike up the air conditioner to accomplish this. If the air conditioning system is properly sized for the house or room in which it is installed it will work in the most efficiently manner possible. By running the air at an appropriate cooling temperature and using a fan to pull cool air through the house, cooling occurs efficiently and energy is conserved.

**Windows**
Single-pane windows allow heat to transfer from outside to inside and vice-versa. In the last several years, there have been major advances in glass and window technology. Engineers have developed gas-filled double-pane windows with low emission glass coatings to reduce heat loss and heat gain. If installing double-pane windows is impossible, there are steps to take to make them more efficient. When the weather is cold, keep curtains open during the day to encourage the entry of warm air from the sun and close curtains and shades at night to capture that warmth. Make sure the windows that let in the most sunlight are clean so the warmth of the sun can penetrate the room. Install storm windows or weatherize the existing ones. Homeowners in the Sun Belt can install white window coverings on windows to further deflect heat. Keep curtains closed on south-facing windows during the day to diminish heat penetration. Awnings will also help deflect heat from windows that get the most direct sunlight.

**Landscaping**
Homeowners should not ignore the benefits of appropriate landscaping. It is estimated that landscaping befitting the home and the climate can save up to 25 percent of heating and cooling costs.

A homeowner should not expose his or her house to cold without proper insulation in the form of windbreaks. In cold-winter climates, such as the northern central part of the United States and Maine and Alaska, trees should be planted in order to create a thick windbreak to protect the house from stiff winter winds or wind chill. Wind chill can lower the temperature considerably. The Department of Energy reports that if the outside temperature is 10 degrees F and wind velocity is 20 mph, the wind chill is -24 degrees F. A windbreak will reduce wind speed for a distance of as much as 30 times the height of the windbreak. The Department of Energy indicates that “The best windbreaks block wind close to the ground by using trees and shrubs that have low crowns. Dense evergreen trees and shrubs planted to the north and northwest of the home are the most common type of windbreak. Trees, bushes, and shrubs are often planted together to block or impede wind from ground level to the treetops. Evergreen trees combined with a wall, fence, or
earth berm can deflect or lift the wind over the home.” For more information, visit www.eere.energy.gov.

It is also be important to allow the winter sun to penetrate into south-facing windows to maximize the benefits of the sun’s heat. Do not plant dense evergreens too close to the south side of the house because they will minimize the amount of heat that and penetrate into the house.

In climates such as the midsection and southern states of the United States, temperatures vary from hot to cold depending on the season. A homeowner should have large welcoming south-facing windows in the winter to take advantage of any heat supplied by the sun. Strategically placed trees deflect stiff winter winds away from the house and provide cooling shade during the summer. Deciduous trees are ideal for this purpose because in the summer they are full of leaves and offer very effective shade, but in the winter they shed their leaves and allow the sun to shine through and warm the house. Grasses, bushes, and other groundcover can shade pavement and the grounds around the home. This helps reduce heat radiation before it reaches the house and windows and adds to the aesthetic value of the home.

In the hot arid climates of Southern California, Nevada, Arizona, New Mexico, and parts of Texas, ample shade trees are necessary to cool exterior parts of the home and to deflect hot summer winds. In the hot humidity of the southern states, homeowners need shade trees that are effective in the summer but that allow the winter sun to penetrate windows. Again, deciduous trees are ideal. Groundcover that offers shade is also appropriate.

It is also necessary to channel summer breezes toward the home. A homeowner should assess the climate around his or her home. It is possible to be in one of the major climate zones in the U.S. and still experience predominant conditions that do not match the overall zone.

The science of water conservation is essential to appropriate landscaping. It is called xeriscaping. Xeriscaping is installing a planned landscape design that utilizes native plants that thrive in the local climate in order to reduce the need for water, fertilizer, and herbicides.

One xeriscaping strategy is to reduce the area of bluegrass turf in the yard. Bluegrass is lush, thick lawn that consumes a lot of water and is not considered appropriate in certain climates, such as the desert. Due to today’s automatically set sprinklers, bluegrass lawn is often over-watered. Bluegrass roots are capable of reaching deep into the ground in search of water. Over-watering a blue grass lawn causes the roots to atrophy. Under those conditions, if watering is missed for even one day, the grass begins to yellow and experience stress. It is better to water a bluegrass lawn twice a week to allow the root system to strengthen and find much of its own water.

A scientific concept used today to help homeowners understand how much water is necessary to support their landscaping is evaportranspiration. This is the amount of water that is evaporated from the soil and transpired through the plant’s leaves that needs to be replaced through watering. Based on local climate conditions, the local water district may be able to provide information on rate of the locale’s evaportranspiration.
Additional strategies involving landscaping include improving the soil to better absorb water, stimulating the plants to help them develop deeper roots, and irrigating in the most efficient manner. Mulch helps keep plant roots cool, minimizes evaporation, and prevents the surface of the soil from capping or becoming impenetrable. Mulch also inhibits the growth of weeds. These strategies should be incorporated into every home’s landscaping plan in order to conserve energy and reduce waste and pollution.

**Water Conservation**

Water conservation is vitally important. In some areas, water is in short supply especially after long periods of drought. The Metropolitan Water District (MWD), which manages the water supply for Southern California, offers the following ten tips on conserving water:

![Water drop](image)

**Every drop counts!**

**Water the lawn only when it needs it**
Step on the grass. If it springs back once your foot is lifted, it does not need water. Set automatic sprinklers to allow for more days in between watering. This saves 750 to 1,500 gallons per month. Water the lawn with a hose in times of drought. Convert the lawn to native plants.

**Fix leaky faucets and plumbing joints**
Repairing leaky fixtures saves 20 gallons of water per day for every leak stopped.

**Do not run the hose while washing the car**
Use a bucket of water for most of the washing and use only a quick hose rinse at the end of the wash. This process saves 150 gallons. A family with two cars can save up to 1,200 gallons a month.

**Install water-saving shower heads or flow restrictors**
Installing this equipment can save 500 to 800 gallons of water per month.

**Run only full loads in the washing machine and dishwasher**
This saves 300 to 800 gallons of water per month.
**Shorten shower time**
Reducing a shower by one or two minutes can save up to 700 gallons of water per month.

**Sweep the driveway and sidewalk**
Use a broom instead of the hose to clean driveways and sidewalks. This saves 150 gallons or more of water each time. If the driveway is cleaned once a week, that is a savings of more than 600 gallons of water per month.

**Use an ashtray or wastebasket**
Using the proper waste receptacle instead of the toilet will save 400 to 600 gallons of water per month.

**Capture unused water**
Catch the flow of tap or shower water while the water heats up and use it to water house or garden plants. This saves 200 to 300 gallons of water per month.

**Be water wise**
It is not necessary to water the sidewalks, driveways, or gutters. Adjust sprinklers so that they only water the lawn and garden. This saves 500 gallons of water per month.

Here are some additional water conservation tips:

- **Put a plastic bottle or a plastic bag weighted with pebbles and filled with water in the toilet tank.** Displacing water in this manner uses less water with each flush and saves five to 10 gallons of water per day. This can add up to 300 gallons per month or even more for large families. For greater savings, replace old water-guzzling, five-to-seven-gallon a flush toilets with a one and a half gallon, ultra-low flush model.

- **Place dye tablets or food coloring into the tank.** If color appears in the bowl when the toilet has not been flushed, there is a leak in the toilet that should be repaired. This saves 400 gallons of water per month.

- **Remember to turn off the water during teeth brushing.** This saves three gallons of water each day or about 100 gallons a month per family member. Fill the bottom of the sink with a few inches of water for rinsing the razor, and then turn the water off while shaving. This saves three gallons of water each day.

- **Do not leave the water running if washing dishes by hand.** If there are two sinks available, fill one with rinse water. If only one sink is available, use a spray device or short blasts instead of letting the water run. This saves 200 to 500 gallons of water per month. In addition, use the least amount of detergent possible. This minimizes rinse water needed and saves between 50 and 150 gallons of water per month.

- **Keep a bottle of drinking water in the refrigerator.** This eliminates the wasteful habit of running tap water in an effort to cool it for drinking and saves 200 to 300 gallons of water per month.
Avoid defrosting frozen foods with running water. Planning ahead and placing frozen items in the refrigerator overnight or defrosting them in the microwave saves 50 to 150 gallons of water per month.

When cleaning vegetables, rinse them in a filled sink or pan instead of allowing the faucet to run. This saves 150 to 250 gallons of water per month.

Use the garbage disposal less and the garbage more. An even better alternative is to make compost. This saves 50 to 150 gallons of water per month.

The Mono Lake Committee suggests the following tips for conserving water outside the house:

Place a layer of mulch around trees or plants. Mulch made up of chunks of bark, peat moss, or gravel slows down evaporation and saves 750 to 1,500 gallons of water per month.

Use a pool cover to cut down on evaporation from a pool. This conserves water and keeps the pool cleaner. This reduces the need to add chemicals and saves 1,000 gallons of water per month.

When watering the yard, water during the cool parts of the day. Watering in the early morning is better than at dusk since it prevents the growth of fungus. This saves 300 gallons of water per month.

Do not water on windy days. Watering when the wind is blowing causes too much evaporation and wastes up to 300 gallons of water in one watering.

Reduce watering on cool and overcast days and do not water in the rain. Adjusting or deactivating automatic sprinklers can save up to 300 gallons per watering.

Set lawn mower blades one notch higher. Longer grass means less evaporation and saves 500 to 1,500 gallons of water each month.

If using an evaporative air conditioner, direct the water drain line to a flower bed, tree base, or lawn.

Drive cars onto the lawn to wash them. Rinse water can help water the grass.

Discourage children from playing with the garden hose. This saves 10 gallons per minute.

When children are allowed to play in the sprinklers, make sure it is only when the yard is being watered.

Consider xeriscaping, which is the science of replacing the lawn and other plants with those native to the area. It is important to do this only in wet years as even these plants take extra water to get them going. Xeriscaping saves 750 to 1,500 gallons of water per month.
Go to car washes that recycle the wash water.

Dispose of hazardous materials properly. One quart of oil can contaminate 250,000 gallons of water. This effectively eliminates that much water from the water supply. Contact city or county authorities for information on proper waste disposal.

Do not flush prescription medications down the toilet.

This list is provided courtesy of the Mono Lake Committee. For more information, visit www.monolake.org/waterconservation.

There are many simple steps homeowners can take to conserve energy and water. It is gratifying to know that individuals can make a difference. It is even more exciting to realize the difference that can be made when many individuals band together and embrace the environmental movement. There is power in numbers.

**Transportation**

Industries that provide transportation need to comply with sound environmental principles of energy efficiency and conservation. Trucking companies, bus companies, airplanes, and trains all must comply with environmental regulations and strategies. Such compliance usually requires government mandate.

Motor vehicles are responsible for more than half of all hydrocarbon emissions that contribute to the formation of smog. It is estimated that old gas-guzzlers that are improperly maintained produce more than 20 times more air pollution than newer, energy efficient vehicles. It is important to report polluters to local authorities. There are great differences between old and new motor vehicles. Here are some energy conservation and driving tips for efficient automobile usage.

**Lighten the load**

When a person drives a car with extra items in the trunk, in the back seat, or on the roof, fuel efficiency is reduced. It has been estimated that 2 percent of fuel efficiency is lost for every extra 100 pounds of weight.

**Reduce resistance**

Place additional items inside the car or trunk rather than on the roof. Carrying items on the roof disrupts the aerodynamics of the car as it interacts with the wind. Automobiles have been designed so that the air flows around the contours of the vehicle with as little resistance as possible. Placing an object of any shape on the roof of the car removes the benefits of aerodynamic engineering.

**Slow down and be cool**

Driving with a heavy foot, accelerating rapidly, and slamming on the breaks at every red light are not energy efficient techniques and they use too much fuel. As traffic signals are usually timed for the speed limit, calmer drivers conserve more energy and save dollars at the pump. Driving this way makes mileage only two thirds of what it can be and wears out brakes and tires more quickly. Driving 65 mph instead of 75 may save up to 15% on fuel expenses.
Don’t idle the engine for long periods of time
Newer cars with fuel injection systems are designed to get up and go within thirty seconds of starting. Idling for more than 30 seconds wastes gas and contributes additional hydro-carbon emissions to the atmosphere.

Pay attention to the car’s tires
A car’s tires represent the entire point of contact for the vehicle with the road. Tires are important and, in order for them to function properly, they must be inflated to the right level. If they are over-inflated, they will not grip the road properly. If they are under-inflated, which is more often the case, there is too much resistance against the road. The proper amount of air pressure will produce less friction, less resistance, better gas mileage, and greater safety.

Use air conditioning only when necessary
Using the air conditioner places a heavy load on the engine and reduces gas mileage.

Use the proper grade of motor oil for all vehicles
The manufacturer will state the best motor oil for the vehicle in the owner’s manual. Using the correct motor oil ensures that the car will get the optimal gas mileage.

Keep cars properly maintained
Get regular tune ups and maintenance checks. Make sure fluid levels are right. Have fuel, air, and oil filters checked to be sure they are clean and operating properly. This will maximize fuel efficiency.

Plan vehicle use
When going to work, consider car pooling. Carpooling minimizes the number of cars on the road, lessens the amount of fuel being burned, and lessens the amount of emissions being released into the atmosphere. When using one’s own vehicle for errands, plan to cover them all in one trip. One can use half as much fuel this way than if each errand is conducted from a cold start.

Decide whether a car is a necessity
Owning a car is a habit in many parts of the country. People think they cannot get along without one. In reality, mass transit in the form of trains and buses is available in most areas. Bicycles may be an alternative. A relatively new service that is becoming available in urban areas is called car-sharing. Those who participate in car-sharing may commute to work during the week using public transit and pay a monthly fee to use a car during the weekends when one is needed. Car-sharing saves on insurance and gas and takes cars off the road.

Consider the fuel source
Some consumers drive large pickup trucks and run them on biofuel. They obtain biofuel from restaurants after it has been used to deep-fry the fish and chips. Some systems require adding chemicals or running the biofuel through a processor. This requires extra effort but saves gasoline.
Rearrange work routines
More people are rearranging their work schedules today. Some employers are finding that a four-day work week is better for production and morale and saves in energy costs. It also reduces emissions and takes cars off the road. Instead of working five days a week for eight hours, the employees work four days a week for ten hour shifts. A variation of this is telecommuting or working from home. This does not work for all types of work and for all work environments, but it works well for some. If work can be done on a computer with a high-speed internet connection, why not try it? As long as productivity is not impaired, the employer, employee, and the environment should benefit from the arrangement.

Voice your concern
If you are concerned about the air quality and would like to do something about it, join the Clean Air Congress. These activists share ideas, information, strategies, and new technologies for fighting the causes of air pollution. For more information, go to www.CleanAirCongress.org. Together we can make a huge difference.

Business
Industry contributes almost one third of the greenhouse gas emissions in the United States today. These emissions are created through the use of electricity and as a result of transporting products on the public highways. Gas emissions travel through the air and over the waterways. Many companies have their own plants and factories that burn fossil fuels to produce steam and generate electricity. Others run fleets of thousands of vehicles fueled by internal combustion engines that burn gasoline.

It makes sense for businesses to be responsible for managing their energy needs. Businesses who take the lead in promoting energy-efficiency will save money and enhance their bottom lines, which all businesses should be interested in doing. A business that uses energy inefficiently is wasting money and putting itself at a disadvantage. Both large industries and small businesses can learn to be more energy efficient. Portfolio Manager, which is a tool provided by ENERGY STAR, helps businesses asses their current energy consumption and determine how they can take steps to improve.

Some businesses have taken steps to purchase renewable energy by installing solar panels on buildings and establishing wind farms to generate the electricity they need. In addition to these energy conserving steps, some companies are actively engaged in educating their employees, customers, and suppliers on the dangers of global warming and are trying to establish a consensus on solutions to the problem.

Agriculture
A concept scientists have recently become aware of is carbon sequestration. This is when carbon is removed from the atmosphere and stored in carbon reservoirs through a biological or physical process. There are two great reservoirs that store carbon for an indefinite period of time. One is the ocean and the other is plants, which use the process of photosynthesis. In photosynthesis, six molecules of water plus six molecules of carbon dioxide produce one molecule of sugar and six molecules of oxygen. Therefore, nations that plant or preserve forests provide a resource that naturally extracts carbon dioxide from the atmosphere. This process is
supported by environmentalists and government agencies on the state and federal levels.

![Forest Preservations](image)

**The preservation of forests is key to maintaining carbon sequestration**

**Recycling**

Recycling and waste prevention help reduce greenhouse gases and global warming. All people can participate in recycling, but often people do not realize how helpful these efforts are. The Environmental Protection Agency (EPA) states that “The disposal of solid waste produces greenhouse gases emissions in a number of ways. First, the anaerobic decomposition of waste in landfills produces methane, a greenhouse gas 21 times more potent than carbon dioxide. Second, the incineration of waste produces carbon dioxide as a by-product. In addition, the transportation of waste to disposal sites produces greenhouse gas emissions from the combustion of the fuel used in the equipment. Finally, the disposal of materials indicates that they are being replaced by new products; this production often requires the use of fossil fuels to obtain raw materials to manufacture the items.”

Visit [www.epa.gov/climatechange](http://www.epa.gov/climatechange) for more information.

**Schools**

Schools have a wonderful opportunity to make an impact on global warming, energy waste, and pollution. Schools are supposed to teach. They can and should teach the science of sound environmental practices. The EPA has a site on their website called the Climate Change Kids Site, which is a place where children can watch climate animations that teach lessons on climate change in an entertaining way. In this way children can come to know the science behind the issues and are not likely to forget. High school students can actually assess the activities of their high school regarding greenhouse gas emissions and climate change. The EPA provides a Climate Change Emission Calculator Kit called Climate CHECK, which students can use to estimate their school’s greenhouse gas emissions. Using this information, students can formulate a plan to reduce the school’s negative impact on the environment. This type of participation can prepare students for the business and professional world that will have to resolve these problems. The same type of hands-on application can be utilized at the college level and carried into dormitories, the cafeteria, and all energy-producing and distributing entities on the campus.
Schools today have a real opportunity to teach energy efficiency and conservation.

Educators have a wonderful opportunity to assemble curricula that address climate change in a complete way by ranging from the basic science to environmental impact, national security, economics, culture, and everyday life. There are many aspects of climate change and all of them must be approached.

Administrators are in a position to make a huge difference in the battle against global warming. The EPA states that the least efficient schools use three times more energy than the best energy performers. School administrators at all levels have the opportunity to assess the school’s current performance level, formulate a plan to mitigate inefficient practices, and apply it to make the school a leader in energy efficiency and conservation. The school can also lead the community in reducing, reusing, and recycling efforts, which make a significant impact on negative environmental practices and education. Think of all the volunteers the administrator has at his or her disposal.

**Government**

Local, state, and federal governments have released more information and initiated more programs to encourage energy-efficiency and conservation than the general public knows of or utilizes. This will continue as the United States works to meet a national goal of reducing greenhouse gas emissions by 18% by the year 2012. Visit the EPA at [www.epa.gov](http://www.epa.gov) or the Department of Energy at [www.energy.gov](http://www.energy.gov). Governments at all levels are taking a proactive role in improving the environment.

**Energy Audit**

An audit is a diagnosis. An accurate diagnosis is an appropriate place to start when considering remediation. A home energy audit will state the areas in which energy is being wasted and suggest methods the owner can use to conserve. A home energy audit can be performed by the homeowner himself, or he or she can hire a professional auditor.

When approaching the audit him or herself, the homeowner should address the issue of leaks that allow air flow into and out of the house. As the homeowner walks through the house, he or she should pay attention and take note of drafts. These commonly occur around window frames, baseboards, attic hatches, and fireplaces. Any place where there are joints or seams is a potential location for air to leak in or
out. Also, gaps around electrical outlets, switch plates, doors, mail slots, and pipes and wires can be gateways for unwanted air. If windows and doors are not snug in their frames, air can probably leak in or out. If the homeowner can see sunlight entering a house where there is no window, he or she should use caulking and weather stripping to seal these unwanted openings.

When the joints and seams are tight, the homeowner must consider the insulation. Insulation comes with different ratings called R-values. The higher the R-value, the more resistant the insulation is to heat flow. Insulation belongs in ceilings, floors, walls, and even around water heaters. Investigating insulation can be an intrusive process. The homeowner may have to cut out a portion of drywall or turn off the circuit breaker and check through an electrical outlet to see if there is any insulation in the wall. In addition, the homeowner may have to crawl up into the attic or under the house. Remember that the end result is worth all the hard work. Check with the Department of Building and Planning or the local building supply stores for information on recommended R-values for the area.

The homeowner should also examine the heating and cooling system. Change the filters regularly so the system can run efficiently. Check the age and condition of the system. If the system is over 15 years old, it may be time to consider replacing it with a more energy efficient design. Also, insulate around the ducting to conserve energy.

Next, look at the home’s indoor and outdoor lighting systems. Modern, energy efficient fixtures are now available. Changing the lighting system or the bulbs (from incandescent to compact fluorescent) is a simple, inexpensive change the homeowner can make that will lower energy costs and the negative impact on the environment.

Converting to compact fluorescent lights will help the environment

Make notes on all of the issues detected during the energy audit. Prioritize the discovered items in order of importance and begin to address those issues as soon as possible.

If the homeowner opts for a professional home energy audit, he or she should hire an inspector who has some kind of certification and performs inspections as his or her primary business. Find an inspector who is not trying to sell a product or continual service. The inspector should have no agenda other than helping the homeowner make his or her home more energy efficient. The homeowner should be ready when the inspector comes to the house by having all utility bills for the past year handy. In addition, he or she should make a list of any obvious concerns he or
she has about the house. The professional auditor will have equipment at his or her disposal that the homeowner will not have, such as thermographic scan devices that detect heat loss, or blower doors to measure how air tight a house is. The inspector should encourage the homeowner to accompany the inspector during the audit and to ask questions as the auditor works. The inspector will have some questions for the homeowner as well, such as how many people live in the house and whether every room is used. The inspector should know about the homeowner's habits regarding thermostat settings, water usage, and use of the house during working hours.

ENERGY STAR

ENERGY STAR was started in 1992 as a joint effort between the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Energy (DOE) for the purpose of identifying and promoting energy efficient products to reduce greenhouse gas emissions. The effort began in the office by labeling computers and monitors. The ENERGY STAR label quickly spread to other office equipment and residential heating and cooling. From there, the ENERGY STAR label began to appear on a host of office and household products including dishwashers, clothes washers, clothes dryers, refrigerators and freezers, dehumidifiers, battery chargers, room air conditioning units, room air cleaners, central air conditioning units, ceiling fans, furnaces, ventilating fans, insulation, geothermal heat pumps, boilers, cordless phones, televisions, computers, and many other products. Products in more than 50 categories qualified for the ENERGY STAR label. Those that do use less energy, save money, and help protect the environment. For a complete list, visit www.energystar.gov.

ENERGY STAR partners with more than 12,000 public and private sector organizations to deliver information on technology needed by consumers and organizations to make wise choices on energy-efficiency. It is estimated that the efforts of ENERGY STAR have saved business, organizations, and individual consumers more than $16 billion in energy costs in 2007 alone. To date, more than 40% of the American public recognizes and respects the ENERGY STAR label. Americans have purchased more than one billion ENERGY STAR labeled products. More than 15,000 non-residential buildings have been rated using the EPA's national energy performance rating system, and more than 100,000 families live in new homes that have earned ENERGY STAR approval.

ENERGY STAR makes concerted efforts in several specific areas. One area is in the improvement of existing homes. ENERGY STAR is concerned about residential energy efficiency because 17% of greenhouse gas emissions in the United States come from the use of residential energy. ENERGY STAR has solutions for many of the common energy problems in houses, including leaks, which can result in dry indoor air in winter, draftiness, or cold floors in the winter. High energy bills can often be traced to deficiencies in the home’s envelope, which is the barrier of protection that is supposed to keep temperatures stable and air where it belongs. ENERGY STAR recognizes hot or cold rooms as an indication of inadequate insulation, failing duct performance, or breaks in the home’s envelope. ENERGY STAR deals with the structure of the house and all of its operating systems and appliances. It is believed that if half of all U.S. households replaced a standard television with an ENERGY STAY model, the change would be like shutting down a fossil fuel burning power plant. ENERGY STAR seeks to educate service providers and homeowners so the best solutions can be reached for all household systems and functions.
ENERGY STAR is also interested in seeing that new homes are built according to sound environmental principles. To earn the ENERGY STAR label, a house must comply with energy efficiency guidelines set by the EPA. The EPA makes sure that insulation is properly installed in the walls, ceilings, and floors to ensure even temperatures and reduced energy use. It also verifies that heating and cooling equipment is sized and powered to accommodate the square footage and design of the house to reduce indoor humidity and improve the comfort level of the home. Also, the EPA confirms that energy efficient windows utilizing advanced technology such as spectral coatings and improved frames that do not allow the escape of air are installed. Lastly, the EPA ensures that the home’s envelope is tight and includes proper weather stripping and fitting so the heating and cooling systems do not have to work so hard, and that the appliances and lighting fixtures are energy efficient. The whole concept of a green house starts with energy efficiency and conservation.

ENERGY STAR has also made great progress in improving the design and energy efficiency of large commercial buildings and plants. It has been shown that at least 15% of greenhouse gas emissions in the U.S. come from commercial properties. ENERGY STAR has helped commercial properties trim energy consumption by 35%. ENERGY STAR offers property and business managers the tools to successfully manage the use of energy, which helps both the environment and the company’s bottom line. It helps the business make a commitment to energy management, assess the current status of energy efficiency, create a plan to change what needs to be changed, and set some goals. Then, as the company implements the plan, ENERGY STAR makes it possible to measure the results and rewards companies that make improvements. This recognizes the leadership in the community when significant changes have been brought about. Buildings and plants that have earned the ENERGY STAR label include schools, luxury hotels, corporate centers, city hall complexes, and office buildings all over the country.

Rebates and Incentives

The government wants consumers to convert to green in all areas of their lives. Because of this, incentives, rebates, and tax credits are offered to motivate and to help offset the high initial cost of some types of technology. Incentives are offered at all levels of government.

The federal government offers tax credits for energy efficiency in all sectors. Tax credits are offered to consumers for home improvements including windows, doors, insulation, roofs, solar, fuel cells and other items. Home builders are offered a $2,000 tax credit for new home construction that achieves a 50% greater energy savings in heating and cooling over the 2004 International Energy Conservation Code (IECC). There is also a $1,000 tax credit for the builder of a manufactured home that achieves a 30% energy savings in heating and cooling over the 2004 IECC standards. The owners and designers of commercial buildings have similar tax savings. Pacific Gas & Electric cites other residential energy-efficiency federal tax credits. For example, builders receive a $2,000 credit when a new home that uses less than half the energy of an average home is built. Homeowners receive amounts varying from $50 to $2,000 for various improvements, including insulation upgrades, high efficiency water heaters, solar water heating systems, solar photovoltaic systems, ground source heat pumps, high efficiency furnace and/or central air fans, and other energy efficient improvements. For other federal deductions, go to www.energystar.gov or research incentives, rebates, or tax credits for energy conservation.
Most, if not all, states also have rebate programs. For example, the state of California, in collaboration with the California Solar Energy Industries Association (CAL SEIA), offers the Expected Performance Base Incentive (EPBI) and the California Public Utilities Commission California Solar Initiative, which results in rebates to homeowners whose solar energy systems reach certain performance based objectives. Comparable rebates are offered to builders and developers. California law also provides a property tax exemption for qualified solar energy systems.

Many local cities offer loan programs, property tax exemption, rebates, and incentives for energy efficiency. In California, these cities include Costa Mesa, Marin County, San Bernardino County, San Diego County, Santa Monica, San Francisco, Palo Alto, Alameda, Burbank, Anaheim, and many others. Research the cities and counties in your area to find rebates, incentives, and tax credits for which you can qualify.