



# Energy Efficiency

## Energy Consumption

The United States uses a lot of energy—over 2.1 million dollars worth each minute, 24 hours a day, every day of the year. With less than five percent of the world's population, we consume about 17.4 percent of its energy. People in Europe and Japan also use a large amount of energy. The average American consumes 4.0 times more energy than the world average.

## Efficiency and Conservation

Energy is more than numbers on a utility bill; it is the foundation of everything we do. All of us use energy every day—for transportation, cooking, heating and cooling rooms, manufacturing, lighting, and entertainment. We rely on energy to make our lives comfortable, productive, and enjoyable. To maintain our quality of life, we must use our energy resources wisely.

The choices we make about how we use energy—turning machines off when we're not using them or choosing to buy energy efficient appliances—impact our environment and our lives. There are many things we can do to use less energy and use it more wisely. These things involve energy conservation and energy efficiency. Many people think these terms mean the same thing, but they are different.

**Energy conservation** is any behavior that results in the use of less energy. **Energy efficiency** is the use of technology that requires less energy to perform the same function. An LED light bulb that uses less energy than an incandescent light bulb to produce the same amount of light is an example of energy efficiency. The decision to replace an incandescent light bulb with an LED light bulb is an example of energy conservation.

As consumers, our energy choices and actions can result in reductions in the amount of energy used in each sector of the economy—residential, commercial, industrial, and transportation.

## Residential/Commercial

Households use just over one-fifth of the total energy consumed in the United States each year. The typical U.S. family spends about \$1,850 a year on utility bills.

Much of this energy is not put to use. Heat pours out of homes through drafty doors and windows, as well as through ceilings and walls that aren't insulated. Some appliances use energy 24 hours a day, even when they are turned off. Energy efficient improvements can make a home more comfortable and save money. Many utility companies provide energy audits to identify areas where homes are wasting energy. These audits may be free or low cost.

## Selected Countries and Energy Consumption, 2018

Country	Population (millions)	Total 2017 Primary Energy Consumption (Qbtu)	2017 Energy per capita (MBtu/person)
World	7,594.3	582.46	77.74
China	1,384.69	139.44	100.7
India	1,296.83	30.48	23.5
United States	327.17	97.8	296.73
Indonesia	262.79	7.16	27.24
Brazil	208.85	12.59	60.3
Pakistan	207.86	3.18	15.32
Nigeria	203.45	1.54	7.57
Russia	142.12	32.83	231.01
Japan	126.17	19.6	155.38
Mexico	125.96	7.91	62.8
Germany	80.46	14.01	174.15
Iran	83.02	11.6	139.7
Thailand	68.62	5.52	80.44
France	67.36	10.32	153.23
United Kingdom	65.11	8.23	126.38
South Africa	55.38	5.68	102.48
South Korea	51.42	12.36	240.36
Canada	35.88	15.05	419.55
Saudi Arabia	33.09	11	332.32
Australia	23.47	6.08	259.21
Netherlands	17.15	0.2	11.39
Chile	17.93	1.51	84.32
Honduras	9.18	0.17	18.63
Haiti	10.79	0.05	4.5
Libya	6.75	0.57	84.68
Iraq	40.19	1.87	46.42
Dominican Republic	10.30	0.34	33.1
Kuwait	2.92	1.59	545.6
Angola	30.36	0.36	11.95
Zimbabwe	14.03	0.16	11.35
Mauritius	1.36	0.08	66.66

\*2018 Global Data not yet available for all nations.

Data: Energy Information Administration, The World Bank

## ■ Heating and Cooling

Heating and cooling systems use more energy than any other systems in our homes. Typically, about half of the energy of an average family's utility bills is used to keep homes at a comfortable temperature. You can save energy and money by installing **insulation**, maintaining and upgrading the equipment, and practicing energy efficient behaviors. A seven to 10 degree adjustment to your thermostat setting (lower in winter, higher in summer) for just eight hours per day can lower heating and cooling bills by 10 percent. Programmable **thermostats** can automatically control temperature for time of day and season.

## ■ Insulation and Weatherization

You can reduce heating and cooling needs by investing in insulation and weatherization products. Warm air leaking into your home in summer and out of your home in winter can waste a lot of energy.

Insulation wraps your house in a nice warm blanket, but air can still leak in or out through small cracks. Often the effect of small leaks is the same as keeping a door wide open. One of the easiest money-saving measures you can do is caulk, seal, and weather-strip all the cracks to the outside. You can save 10 percent or more on your energy bill by stopping the air leaks in your home.

## ■ Doors and Windows

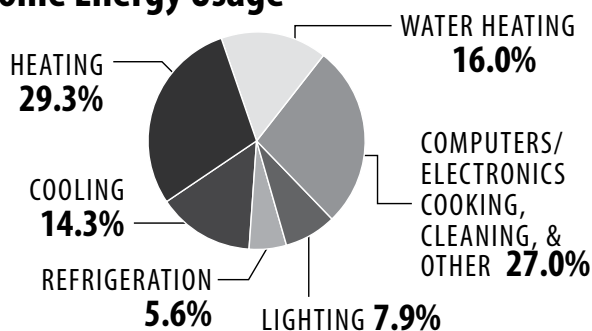
About one-quarter of a typical home's heat loss occurs through the doors and windows. Energy efficient doors are insulated and seal tightly to prevent air from leaking through or around them. If your doors are in good shape and you don't want to replace them, make sure they seal tightly and have door sweeps at the bottom to prevent air leaks. Installing insulated storm doors provides an additional barrier to leaking air. Most homes have many more windows than doors. Replacing older windows with new energy efficient ones can reduce air leaks and utility bills. The best windows are constructed of two or more pieces of glass separated by a gas that does not conduct heat well.

If you cannot replace older windows, there are several things you can do to make them more energy efficient. First, caulk any cracks around the windows and make sure they seal tightly. Add storm windows or sheets of clear plastic to the outside to create additional air barriers. You can also hang insulated drapes on the inside. In cold weather, open them on sunny days and close them at night. In hot weather, close them during the day to keep out the sun.

Windows, doors, and skylights are part of the government-backed **ENERGY STAR**® program that certifies energy efficient products. To meet ENERGY STAR® requirements, windows, doors, and skylights must meet standards tailored for the country's three broad climate regions.



## Home Energy Usage



Data: EIA 2015 RECS

## ■ Landscaping

Although it isn't possible to control the weather, landscaping can reduce its impact on home energy use. By placing trees, shrubs, and other landscaping to block the wind and provide shade, people can reduce the energy needed to keep their homes comfortable during heating and cooling seasons.

## ■ Electricity and Appliances

Appliances that contribute the most to a typical household's energy use are refrigerators, clothes washers, and dryers. When shopping for new appliances, you should think of two price tags. The first one is the purchase price. The second price tag is the cost of operating the appliance during its lifetime.

You'll be paying that second price tag on your utility bill every month for the next 10 to 20 years, depending on the appliance. Many energy efficient appliances cost more to buy, but save money in lower energy costs. Over the life of an appliance, an energy efficient model is always a better deal.

When you shop for new appliances, consider only those with the ENERGY STAR® label, which means they have been rated by the U.S. Environmental Protection Agency and Department of Energy as the most energy efficient appliances in their classes.

If every clothes washer purchased in the U.S. this year earned the ENERGY STAR® label, we would save 540 million kilowatt-hours of electricity, 20 billion gallons of water, and 1.4 trillion **Btus** of natural gas, resulting in energy bill savings of about \$250 million every year.

Another way to compare appliances is by using **EnergyGuide labels**. The government requires appliances to display yellow and black EnergyGuide labels. These labels do not tell you which appliances are the most efficient, but they will tell you the annual energy usage and average operating cost of each appliance so that you can compare them.

## ■ Lighting

Starting in 2012, legislation under the Energy Independence and Security Act put restrictions on how much energy light bulbs use. Traditional, inefficient incandescent bulbs have been replaced with more efficient models.

**Halogen**, or energy-saving incandescent bulbs, are more expensive than incandescent bulbs, but use 25 percent less energy and last three times as long.

**Compact fluorescent light bulbs (CFLs)** provide the same amount of light as incandescent bulbs. CFLs save money because they use only one-quarter the energy of incandescent bulbs and last 10 times longer.

**Light emitting diodes (LEDs)** are even more efficient, are cheaper than CFL bulbs, and last longer, too. Savings are evident very early on after switching to LED bulbs from incandescents.

### ■ Water Heating

Water heating is one of the largest energy expenses in your home. It typically accounts for about 16 percent of your utility bill. Heated water is used for showers, baths, laundry, dishwashing, and general cleaning. There are four main ways to cut your water heating bills—use less hot water, turn down the thermostat on your water heater, insulate your water heater and pipes, and buy a new, more efficient water heater.

Other ways to conserve hot water include taking showers instead of baths, taking shorter showers, fixing leaks in faucets and pipes, and using the lowest temperature settings on clothes washers.

## Transportation

Americans make up less than five percent of the world's population, yet own about 15% of its automobiles. The transportation sector of the U.S. economy accounts for 28.1 percent of total energy consumption. America is a country on the move.

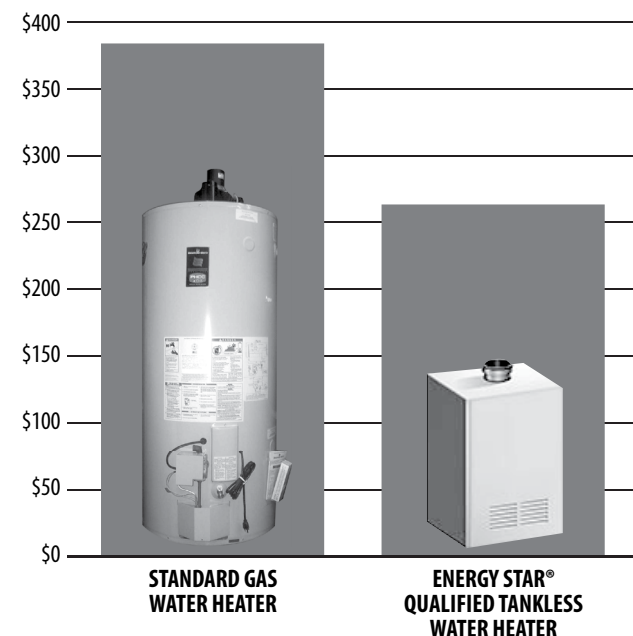
The average price of gasoline in 2018 was \$2.7 per gallon with the current average at the time of print about \$2.16. If the average vehicle is driven 11,300 miles each year, and gets an average of 29.2 **miles per gallon (mpg)**, the average driver spends over \$900 per year on gasoline. A person driving a smaller, more fuel-efficient car will have spent as little as \$800 per year, while a person driving a larger vehicle that is less efficient could spend \$4,000 or more each year on fuel.

The average fuel economy of new cars and light trucks increased significantly from the mid-1970s through the mid-1980s. Unfortunately, it declined from a high of about 26 miles per gallon (mpg) in 1987 to 24.5 mpg in the late 1990s due to larger vehicles, more horsepower, and increased sales of sport utility vehicles (SUVs) and trucks. In 2017, new car fuel economy rose to meet 40 mpg, due to demand for hybrid and fuel efficient vehicles.

When buying a vehicle, you can save a lot by choosing a fuel-efficient model. All new cars must display a mileage performance label, or Fuel Economy Label, that lists the estimated miles per gallon for both city and highway driving. Compare the fuel economy of the vehicles you are considering and make it a priority. Over the life of the vehicle, you can save thousands of dollars and reduce emissions significantly.

## Water Heater Comparison

ANNUAL ENERGY COSTS PER YEAR



Data: ENERGY STAR®

## Fuel Economy Label

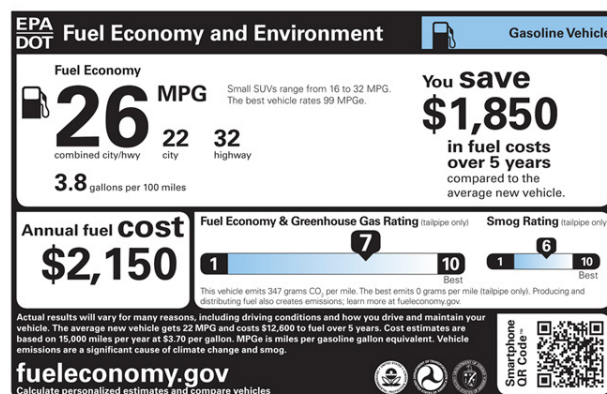


Image of label courtesy of [www.fueleconomy.gov](http://www.fueleconomy.gov)

## HYBRID PASSENGER VEHICLE



Image courtesy of NREL

## Manufacturing

Manufacturing the goods we use every day consumes an enormous amount of energy. The industrial sector of the U.S. economy consumes a little more than one-fifth of the total energy used in the U.S.

In the industrial sector, the economy controls energy efficiency and conservation measures. Manufacturers know that they must keep their costs low to compete in the global economy. Since energy is one of the biggest costs in many industries, manufacturers must use energy efficient technologies and conservation measures to be successful. Their demand for energy efficient equipment drives much of the research and development of new technologies.

Individual consumers can, however, have an effect on industrial energy use through the product choices we make and what we do with packaging and products we no longer use.

### ■ A Consumer Society

Every American produces over 1,600 pounds of trash a year. The most effective way for consumers to help reduce the amount of energy consumed by industry is to decrease the number of unnecessary products produced and to reuse or repair items whenever possible. Purchasing only those items that are necessary, while also reusing and **recycling** products can reduce energy use in the industrial sector.

The four “Rs” of an energy-wise consumer are easy to put into practice. Reducing, reusing, repairing, and recycling help protect the environment and save money, energy, and natural resources.

### REDUCE

Buy only what you need. Purchasing fewer goods means less to throw away. It also results in fewer goods being produced and less energy being used in the manufacturing process. Buying goods with less packaging also reduces the amount of waste generated and the amount of energy used.

### REUSE

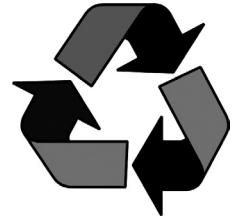
Buy products that can be used repeatedly. If you buy things that can be reused rather than disposable items that are used once and thrown away, you will save natural resources. You’ll also save the energy used to make them and reduce the amount of landfill space needed to contain the waste.

### REPAIR

Many people throw away products when they break and buy new ones. Many of these products could be easily and cheaply repaired. Always consider repairing a product before throwing it away. It saves energy, money, and natural resources.

### RECYCLE

Make it a priority to recycle all materials that you can. Using recycled material almost always consumes less energy than using new materials. Recycling reduces energy needs for mining, refining, and many other manufacturing processes.



Recycling a pound of steel can save 1.25 pounds of iron ore. Recycling aluminum cans saves 95 percent of the energy required to produce aluminum from bauxite. Recycling one ton of paper saves seven gallons of water.

## Energy Sustainability

Efficiency and conservation are key components of energy **sustainability**—the concept that every generation should meet its energy needs without compromising the energy needs of future generations. Energy sustainability focuses on long-term energy strategies and policies that ensure adequate energy to meet today’s needs, as well as tomorrow’s.

Sustainability also includes investing in research and development of advanced technologies for producing conventional energy sources, promoting the use of alternative energy sources, and encouraging sound environmental policies.



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