

THE CITY OF BRISBANE OPEN SPACE AND ECOLOGY COMMITTEE



HOME ENERGY AND WATER SAVINGS UPGRADES AND IMPROVEMENTS GUIDE

This guide was put together as a supplement to accompany the Home Energy and Water Savings Toolkits. The San Mateo County Office of Sustainability in conjunction with the City and County Association of Governments and the Peninsula Library System has made two of these kits available to the public at the Brisbane Public Library.

Contents

Why should you make energy upgrades around your home?	2
Energy Conserving Tools.....	2
Choices.....	3
What is a Net Zero home?.....	4
PACE Financing	5
Energy Audit.....	5
What Resources does the average American Use?	6
Light Pollution	7
Rain Water Collection.....	9
Clotheslines.....	10
Storm Windows & Warm Windows	11
Hot water and energy efficiency	11
Solar Hot Water	15
Testing a toilet for leaks.....	19
Water Savings at the Faucet.....	21
How to Replace a Showerhead	22
How to Replace a Faucet aerator/flow restrictor	23
How to clean your Refrigerator's Coils	24
Online Resources	26
Glossary	27
Attachment A.....	28

Why should you make energy upgrades around your home?

The US Department of Energy estimates that the typical annual home energy bill could be reduced by 10-20% with basic energy upgrades.

Here are some simple energy upgrades most everyone should check into:

- Older water heaters should have an insulation wrap of 2" or greater if warm to the touch.
- Hot & cold water pipes should be insulated for at least 2 feet from the water heater, or better yet for the entire length. Insulate all hot water pipes in pumped, recirculating heating systems to R-3 value
- Install weather stripping on all exterior doors (includes door sweeps or door shoes)
- Furnace ducting should be sealed at all joints and insulated. Air flow regulators are highly beneficial.
- Fireplace chimneys should have dampers, closures and doors installed.
- Ceiling insulation should be increased to R-30 value
- All utility lighting should be converted to LED lamps.

Water conservation basics

For new installations, current energy codes require the following maximum flow rates:

- Residential bathroom faucets: 1.2 gallons per minute,
- Residential kitchen faucets: normally 1.8 gallons per minute with a higher 2.2 setting for filling pots.
- Toilets: 1.28 gallons per flush
- Shower heads: 2 gallons per minute
- All hoses must have a shut off nozzle on the end

There are many things even renters can do. Please check with your landlord before making any alterations to your rental property.

Energy Conserving Tools

Below is a list of tools (available in the [Check it Out! Home Energy and Water Savings Toolkits](#) at the Brisbane Library.)

- A Kill-A-Watt meter is a tool that meters the electrical demand of any device you plug into it. This information can help you identify which appliances draw energy even when they are turned off or which appliances to upgrade. Knowing how the power is used in your home is a powerful decision making tool.
- A thermal imaging gun can help you identify locations where heat leaks out in the winter or where excess heat is entering in the summer. This information will allow you to target your sealing and insulation efforts.
- A refrigerator/freezer thermometer will check that your freezer and refrigerator are operating at their optimal temperatures.
- Pipe thread seal tape can be used to stop leaky fixtures.
- Water flow rate bag is useful for determining if an unlabeled shower head or faucet aerator is using a high flow rate (gallons per minute) and should be replaced to conserve water.
- The Women's Home Energy Tool Kit is a useful book, while an older publication. It contains good information and useful instructions.
- Rebates offered by local utilities can help lower the cost of some home upgrades.
- Electrical outlet gaskets will eliminate drafts that enter through switches and outlets, particularly in uninsulated and interior walls.
- A bottle of food coloring can be used to check for leaks in a toilet tank.

- Low flow faucet aerators can usually be added to existing faucets to conserve water.
- Low flow shower heads can reduce your average water consumption.
- LED light bulbs are an easy way to save energy if you are replacing incandescent bulbs.
- Weather stripping - useful in preventing air leaking around openings such as doors and windows.
- Cans of spray foam are useful for permanently sealing gaps.
- A clothes line and clothes pins can eliminate the need for using your dryer throughout much of the year.
- Pipe insulation reduces the demands placed on your water heater.
- Window insulation kits are helpful in eliminating drafts around your home.
- Outlet strips can be shut off to eliminate energy trickle to your electronic devices.
- Water heater insulation kit (2" thickness or greater).
- Motion activated outdoor lighting and/or a programmable timer switch will eliminate hours of unneeded lighting.
- A stick of incense can be used for tracking down drafts by watching how the smoke drifts.

Choices

In a world where solutions are being marketed to us at every turn, the most powerful solution is often passed by because no one profits from it, personal choice. Choosing to lower your thermostat by several degrees costs you nothing. It keeps your money in your pocket. *It requires you to do **less** to lower your ecological footprint.*

Here are some choices you can make about what to do and what not to do.

- Lower your thermostat in the cold season, especially at night.
- Wash only full loads of clothes and dishes.
- Make a game of turning off the lights when you leave the room.
- Turn off electronics when not in use. Use a power strip to make this easier.
- Put your WiFi router and computers on a programmable timer so they turn off during the night.
- If simple, take the handle off the hot water at the sink so people do not grab it out of habit.
- Remember to air out the house at night on hot days.
- Remember to close the curtains at night and open them in the morning.
- Remove window screens in the winter time.
- Remember to bring your reusable bags when shopping
- Buy bulk items when possible
- Buy second hand
- Donate things you don't use
- Set a goal for biking or walking places
- Bring containers to restaurants to package leftovers
- Buy things with less packaging
- Buy whole foods that are natural and unprocessed
- Shop at your local farmers market
- Plant an edible garden
- Maintain your air conditioner or replace it with a swamp cooler or geothermal system
- Vacuum the coils of your refrigerator to remove dust build up and improve efficiency
- Try not to run major appliances in the afternoon or early evening during peak load.
- Change the filter in your furnace on the recommended schedule
- If your refrigerator is chronically empty, place some jugs of water in the back to retain the cold temperature or replace it with a smaller refrigerator.
- De-ice your freezer

Reuse instead of buying new every time. Buy second hand goods.

Repurpose turns old junk into new, functional objects.

Recycle what can't be Reused or Repurposed.

Rot compost everything organic.

Repair instead of replacing.

Return Only buy from companies with take-back programs.

Refill using bulk supplies and foods instead of buying prepackaged food and goods.

Refuse to buy overpackaged, disposable, single-use junk and refuse to take freebies you will never use such as plastic silverware with take out.

ReThink your lifestyle choices

What is a Net Zero home?

A Net Zero Home in general is not energy independent, producing all of the electrons and natural gas it needs, but rather that over the course of a year, the inputs balance with the outputs. For instance, a Net Zero Home might produce a surplus of electricity during the middle of the day, but use electricity from the grid at night. Some Net Zero Homes also use carbon credits to offset part of their load, particularly for natural gas demands. The precise definition of Net Zero Homes depends somewhat on where you are. Different countries and regions have differing standards. For example, some places do not allow carbon offsets or do allow the purchase of additional renewable energy produced off site. Some builders are building and selling Net Zero Ready homes to which the buyer need only add the correct number of photovoltaic (PV) panels to match their actual consumption.

Advantages

- isolation for building owners from future energy price increases
- reduced total cost of ownership due to improved energy efficiency
- reduced total net monthly cost of living
- reduced risk of loss from grid blackouts
- improved reliability . photovoltaic systems have 25-year warranties and seldom fail during weather problems . the 1982 photovoltaic systems on the Walt Disney World EPCOT Energy Pavilion are still working fine today, after going through three recent hurricanes
- extra cost is minimized for new construction compared to an afterthought retrofit
- higher resale value as potential owners demand more ZEBs than available supply
- the value of a ZEB building relative to similar conventional building should increase every time energy costs increase
- future legislative restrictions, and carbon emission taxes/penalties may force expensive retrofits to inefficient buildings

Disadvantages

- initial costs can be higher . effort required to understand, apply, and qualify for ZEB subsidies, if they exist.
- very few designers or builders have the necessary skills or experience to build ZEBs^[22]
- new photovoltaic solar cells equipment technology price has been falling at roughly 17% per year. Current subsidies will be phased out as photovoltaic mass production lowers future price
- challenge to recover higher initial costs on resale of building, but new energy rating systems are being introduced gradually.^[34]
- while the individual house may use an average of net zero energy over a year, it may demand energy at the time when peak demand for the grid occurs. In such a case, the capacity of the grid must still provide electricity to all loads. Therefore, a ZEB may not reduce the required power plant capacity.
- Starting in 2020, all new residential construction will be required to be Net Zero by California law.

Advantages and Disadvantages taken from https://en.wikipedia.org/wiki/Zero-energy_building

PACE Financing

On December 17, City Council adopted a resolution to include the Property Assessed Clean Energy (PACE) program called Home Energy Renovation Opportunity (HERO). HERO allows home owners and business owners to finance energy saving, water saving and electric vehicle infrastructure projects. HERO is the second PACE program to be adopted by City Council, California FIRST was adopted in 2010.

California FIRST offers financing for similar projects and seismic strengthening projects. Benefits of upgrading your home or business are: saving money on your electric or water bill, increase in property value, increase local jobs, and decrease your contribution to global warming. Take advantage of one of these PACE programs to start saving energy used by your home or business!

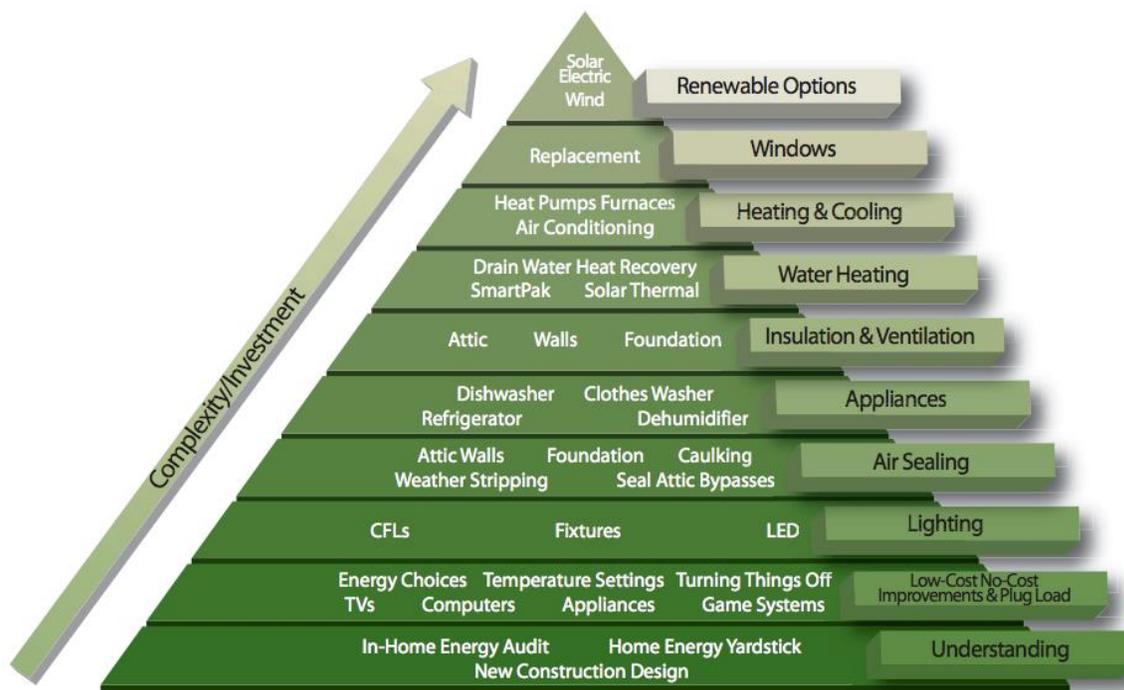
California FIRST: <https://californiafirst.org>

HERO: <https://www.heroprogram.com>

PACE Nation: <http://pacenation.us/>

Energy Audit

Home Energy Upgrade Pyramid



At the base of the home energy improvement guide is something called an energy audit.

Before beginning any energy retrofit work, a homeowner needs information · information best obtained through a home energy audit.

A good home energy audit always includes a blower-door test; most audits also include a thermographic inspection. To be sure your auditor is well trained; choose one certified by RESNET, BPI, or CBPCA.

A home energy audit can cost as much as \$600. Thanks to subsidies from utilities and local governments, however, the cost of a home energy audit is often much less. Yet even if you pay the full cost of an energy audit, the money maybe well spent.

Why spend hundreds of dollars on an energy audit? I can think of several reasons:

When considering energy retrofit work, most homeowners prioritize the wrong steps. An energy audit provides valuable information to counterbalance misleading advertising pitches for worthless products. Your audit is likely to reveal unseen defects in your home - for example, thermal bypasses (air leaks) through convoluted, hidden chases, or insulation gaps revealed by an infrared camera.

At the end of your audit, you'll receive a customized list of the most important energy retrofit steps for your house - a list that may differ from your assumptions (or even from the recommendations of the energy conservation pyramid).

By identifying the most important retrofit tasks for your specific house, a good audit can save you hundreds of dollars that might have been wasted on inappropriate work.

Lastly, be skeptical. Many auditors will also offer to do the work. Be sure to get several bids for any work you are considering.

Read more: <http://www.greenbuildingadvisor.com/blogs/dept/musings/energy-efficiency-pyramid#ixzz4HGJXdgrE>

Consider getting your home Rated.

This can be a useful tool for those who like having their accomplishments validated or who are thinking about selling their home and want to add value to prospective buyers.

The most widely recognized system for residential homes is the Green Point System. They will send you a checklist tailored to your specific home and circumstances. To be certified you will need to hire a rater.

<https://www.builditgreen.org/greenpoint-rated>

The US department of Energy offers Better Buildings, Home Energy Score.

<https://betterbuildingssolutioncenter.energy.gov/home-energy-score>

Attachment A, at the end of the document, is an example Green Home check list from

<http://www.moveincertified.com/>

What Resources does the average American Use?

The Average American consumes 5.5 planets worth of resources so in the broadest terms, an 82% reduction is needed if population levels remain the same.

- **Gasoline**
 - Average American usage is 500 gallons PER PERSON, PER YEAR.
- **Electricity**
 - Average US usage is 11,000 kWh PER HOUSEHOLD, PER YEAR, or about 900 kWh PER HOUSEHOLD PER MONTH.
- **Heating and Cooking Energy**
 - US Average Natural Gas usage is 1000 therms PER HOUSEHOLD, PER YEAR.
- **Heating Oil**
 - Average US usage is 750 Gallons PER HOUSEHOLD, PER YEAR. Biodiesel is calculated as equivalent.
 - (this is used by only about 8% of all US households, mostly in the Northeast).
- **Garbage**
 - The average American generates about 4.5 lbs of garbage PER PERSON, PER DAY.
- **Water**
 - The Average American uses 100 Gallons of water PER PERSON, PER DAY.

- **Consumer Goods**

- The average American spends \$10,000 PER HOUSEHOLD, PER YEAR on consumer goods, not including things like mortgage, health care, debt service, car payments, etc. Obviously, you should minimize those things to the extent you can, but what we're mostly talking about is things like gifts, toys, music, books, tools, household goods, cosmetics, toiletries, paper goods, etc.

Some example targets for reduction in ecological footprint

	80% reduction, 1 person household	80% reduction, 3 person household	90% reduction, 1 person household	90% reduction, 3 person household
Gasoline	100 Gallons per person per year	300 gallons per household, per year	50 gallons per person per year	150 gallons per household per year
Electricity	60 kwh per month	180 kwh per month	30 kwh per month	90 kwh per month
Solar	120 kwh per month	360 kwh per month	60 kwh per month	180 kwh per month
Natural gas	67 therms per year	200 therms per year	33 therms per year	100 therms per year
Garbage	6 gallons per week	19 gallons per week	3 gallons per week	9 gallons per week
Water	1.6 units of water per billing cycle	4.8 units of water per billing cycle	0.8 units of water per billing cycle	2.4 units of water per billing cycle
Consumer goods	\$60 per month including sales tax	\$180 per month including sales tax	\$30 per month including sales tax	\$91 per month, including sales tax.

From Riot for Austerity

Light Pollution

Reducing light pollution is a way to lower your environmental footprint and improve the natural world in your immediate area while saving some electricity. The simplest solutions are to close curtains at night and to minimize the use of outdoor lighting. Some lighting is needed for safety, some is not. When outdoor lighting is needed, put it on a motion detector or timer to minimize the amount it is used and choose fixtures that direct the light where it is needed and away from the sky.

What is Light Pollution?

From <https://www.globeatnight.org/>

Light pollution is excessive, misdirected, or obtrusive artificial (usually outdoor) light. Too much light pollution has consequences: it washes out starlight in the night sky, interferes with astronomical research, disrupts ecosystems, has adverse health effects and wastes energy.

A little more than 100 years ago, you could walk outside at night even in a city and see the Milky Way galaxy arch across the night sky. Being able to see thousands of stars was part of everyday life, inspiring artists like Van Gogh or musical composers like Holst or writers like Shakespeare. By allowing artificial lights to wash out our starry night skies, we are losing touch with our cultural heritage (e.g., what has made us who we are). We are also losing touch with what could inspire future generations.

With more than half of the world's population now living in cities, 3 out of every 4 people in cities have never experienced the wonderment of pristinely dark skies. How do you explain the importance of what they've lost to light pollution? How can you make them aware that light pollution is a concern on many fronts: safety, energy conservation, cost, health and effects on wildlife, as well as our ability to view the stars? Finally, how do you convince them that it's worthwhile to take even small steps, to help fix this problem?

Effects of Light Pollution

In disrupting ecosystems, light pollution poses a serious threat in particular to nocturnal wildlife, having negative impacts on plant and animal physiology. It can confuse the migratory patterns of animals; alter

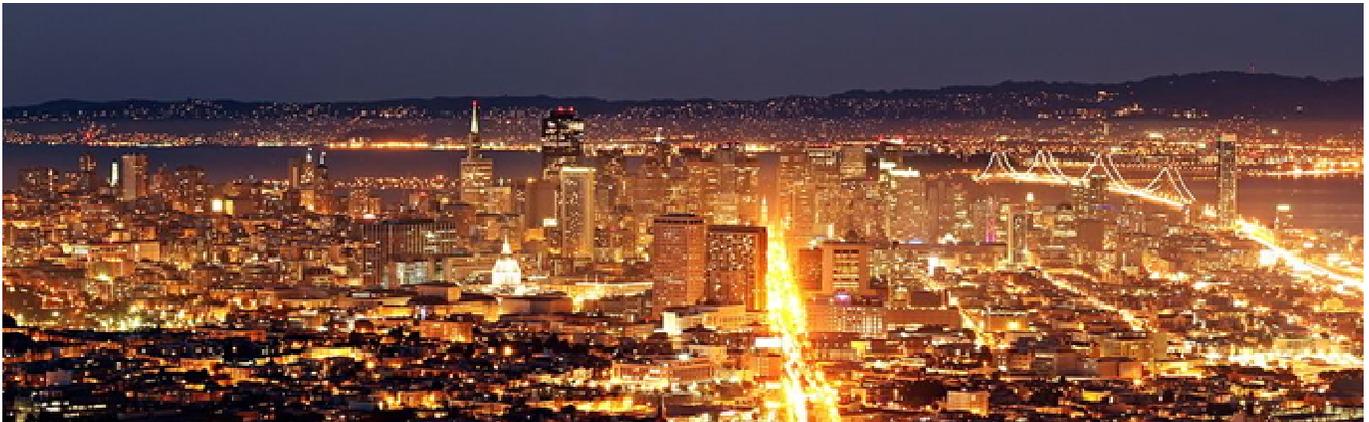
competitive interactions of animals, change predator-prey relations, and cause physiological harm. The rhythm of life is orchestrated by the natural diurnal patterns of light and dark; so disruption to these patterns impacts the ecological dynamics.

With respect to adverse health effects, many species, especially humans, are dependent on natural body cycles called circadian rhythms and the production of melatonin, which are regulated by light and dark (e.g., day and night). If humans are exposed to light while sleeping, melatonin production can be suppressed. This can lead to sleep disorders and other health problems such as increased headaches, worker fatigue, medically defined stress, some forms of obesity due to lack of sleep and increased anxiety. And ties are being found to a couple of types of cancer. There are also effects of glare on aging eyes. Health effects are not only due to over-illumination or excessive exposure of light over time, but also improper spectral composition of light (e.g., certain colors of light).

With respect to energy wastage, lighting is responsible for at least one-fourth of all electricity consumption worldwide. Over illumination can constitute energy wastage, especially upward directed lighting at night. Energy wastage is also a waste in cost and carbon footprint.

The good news is that light pollution can be reduced fairly easily by shielding lights properly, by only using light when and where it is needed, by only using the amount that is needed, by using energy efficient bulbs, and by using bulbs with appropriate spectral power distributions for the task at hand. Going further— Three Main Types of Light Pollution

Clinically speaking, *three main types of light pollution include glare, light trespass and skyglow (in addition to over-illumination and clutter). Glare from unshielded lighting is a public-health hazard—especially the older you become. Glare light scattering in the eye causes loss of contrast, sometimes blinds you temporarily and leads to unsafe driving conditions. Light trespass occurs when unwanted light enters one's property, for example, by shining unwanted light into a bedroom window of a person trying to sleep. Skyglow refers to the glow effect that can be seen over populated areas. Skyglow is the combination of all the reflected light and upward-directed (unshielded) light escaping up into the sky (and for the most part, unused). Shielding lights significantly reduces all three of these types of light pollution.



By participating in the citizen-science campaign, Globe at Night, and taking as many measurements as you can from different locations, you will be promoting awareness and helping to monitor light pollution levels locally. <http://www.globeatnight.org/webapp/> This worldwide database is used to compare trends over years and with other data sets (like on animals) to see what effects light pollution has on them.

Thank-you for your interest and participation in Globe at Night.

Rain Water Collection

From <http://www.flowstobay.org/>

1,000 square feet of roof surface can capture 625 gallons of water for every 1 inch of rainfall, that's over 11,000 gallons from one home per year! BAWSCA is offering a \$100 rebate per 50 gallons rain barrel.

How much water can you expect to capture?

Most roofs have more than one slope served by multiple downspouts. Try looking at your roof using <https://maps.yahoo.com/places>. Goggle maps uses a 45 degree view and is less useful for planning than Yahoo's top down view. Look for the largest surface and attached downspout. You can do some estimating about how many square feet based on the overall size of your home and the portion of the roof serve the selected downspout. For example: If your home is 1,200 sqft and has two equal roof planes, each plane will get about 50%. Assuming that you put one big cistern under one downspout:

Average annual rainfall in the Bay Area is approximately 23"

$1,200 \text{ sqft} \times 50\% = 600 \text{ sqft}$

$600 \times 144 \text{ square inches in a square foot} = 86,400 \text{ cubic inches}$

Times 23" per year = 1,987,200 cubic inches

231 cubic inches in a gallon

$1,987,200 / 231 = 8602 \text{ gallons}$

Putting cisterns under both downspouts would yield about 17,205 gallons.

How much water do you need?

The average home owner uses 50% of their water for irrigation. The average Brisbane user consumes around 45 gallons per day so the average 3 person home uses about 23,861 gallons per year for irrigation. The Bay Area average is about twice that. You can also call the City of Brisbane and ask to compare your summer use (including irrigation) to your winter use (no irrigation) to estimate what you use on an annual basis or try looking at your bills yourself if you have them.

It is recommended that you place your rain barrel on the highest corner of your home to insure good gravity flow.

Rain Barrel Rebate Program Requirements

Effective July 1, 2016

Prepare for the rainy season by installing a rain barrel! Rebates of up to \$100 are now available from the Bay Area Water Supply and Conservation Agency (BAWSCA).

In partnership with the San Mateo Countywide Water Pollution Prevention Program (a program of the City/County Association of Governments of San Mateo County), BAWSCA and participating member agencies are offering rebates of up to \$100 per rain barrel for the purchase and installation of qualifying rain barrels. For details about the program visit this link. <http://bawasca.org/consERVE/rebates/barrels>

Clotheslines

According to Project Laundry List (laundrylist.org) commercial, industrial and residential clothes dryers combined use a whopping 15-20% of domestic energy in the U.S. In 2007, clothes dryers in U.S. homes emitted 54.72 million metric tons of the greenhouse gas CO₂.

On January 1st, 2016, the right to use a clothes line was granted in the state of California. Governor Jerry Brown signed into law Assembly Bill No. 1448, which declares condo associations and community boards cannot ban clotheslines from private areas, such as backyards and balconies.



Why Hang Dry?

Don't be so quick to dismiss the ancient apparatus. By using a clothesline as opposed to a dryer machine, you can save money, reduce CO₂ emissions, and increase the longevity of your clothing. The sun is also a powerful bleaching agent and is more effective than bleach on some types of stains. It takes very little bleach to contaminate water, roughly 0.5ppm (parts per million) is high enough to kill fish.

Benefits for the Environment:

Dryers use an average of nearly 1,000 kilowatt hours of electricity annually. That's remarkable when you consider that a typical household in the United States consumes a total of about 11,000 kilowatt hours of electricity per year; your clothes dryer could be accounting for ten percent of your total electricity use. The majority of the electricity in the United States is generated by burning fossil fuels. The burning of fossil fuels is associated with many harmful effects, such as global warming, air pollution, and water and land pollution, and mountain top removal. http://en.wikipedia.org/wiki/Mountaintop_removal_mining

Benefits for Your Wallet:

Each year, it costs about \$130 just to run your clothes dryer if you use electricity, the cost of gas is similar. When you include the price of the dryer and the cost of repairs, it can add up to a lot of money. In contrast, most clotheslines are cheap to buy or make. Also, all of the energy from the sun is free!

Benefits for Your Clothes:

The dryer can wear down the material of your clothes, especially clothing with elastic, sweaters, and other delicates. You can see this wearing for yourself every time you remove lint from your dryer. Fortunately, line-drying your clothes helps you avoid all of these problems, making your clothes last longer.

Not so soft and fluffy and other considerations:

Clotheslines can leave clothing stiff and crisp especially on hot windless days. If the texture bothers you, place the clothes in a dryer to tumble for a few minutes.

The ideal location for a clothesline is a location that receives sun half of the day. For example a place with shade in the morning is good for drying blacks and colors while the afternoon sun can be used for bleaching whites. Most important is to place the clothesline where it convenient to use.

<http://www.greeniacs.com/GreeniacsGuides/Home/Dry-Your-Clothes-on-a-Clothesline.html>

Storm Windows & Warm Windows

A typical insulated wall has an R-value of between R-13 and R-19. A good double pane window has an R-value of around R-4 or R-5, making even a good window a thermal weak point in a building envelope.

Warm Windows

If you are looking at window replacement or involved in new construction consider triple pane windows. They are substantially more expensive than double pane windows and most contractors and home owners will shy away from the extra expense, but consider that six square feet of triple pane window costs less than six square feet of new construction. If it is not in your future, don't despair, there are low cost/highly efficient ways to improve the R-value of a double pane window. Replacing windows rarely is cost effective and is normally only done when necessary for some other reason.

Heavy curtains will help decrease light pollution and cut down on drafts but if you are interested in new curtains, insulated self sealing curtains are an order of magnitude more effective. While it is not the design of this guide to promote any product, Warm Windows provide a good example of what a good insulated curtain can be. Warm Windows can reduce heat loss by 80% and significantly raise the R-value of a window as well as preventing unwanted heat gain in the summer. Warm Windows are an insulated Roman shade that seals to the wall with either magnets or Velcro, providing insulation and a vapor barrier. They are then covered in a decorative fabric of choice.

Storm Windows

Storm windows conjure up images of deep winters in the Midwest but this is a somewhat misplaced notion. Even in milder climates such as ours, adding a storm window in winter turns a double pane window into a triple pane window when it is most needed and is much more economical than replacing a window. Traditional storm windows are added to the exterior of the building. In our climate it makes more sense to take advantage of the window casement and add a removable pane to the inside. This can save 12-33% on your heating bill according to Energy.gov. Interior storm window can be home made or purchased. The important design criteria is that the new plastic pane be within 1" but not touching the architectural window. Leaving more than a 1" gap allows convection currents to develop. Convection currents cause the air to circulate between the architectural window and the storm window greatly decreasing the insulation value.

Try removing your window screen in the winter. A screen blocks about 20% of the sunlight hitting the window reducing the available solar heat gain by an equal amount. Your screens will also last longer being out of the sun for one third of the year. Try leaving a few screens in place so you can open a window on milder days or leave those which are not accessible safely.

Brisbane Hardware and Rainbow Glass both make and repair screens locally.

Hot water and energy efficiency

Hot water is often the second largest energy use in a home after heating and cooling.

Is a heat pump water heater right for you?

Electric water heaters have traditionally been more expensive to operate, however if you have solar panels or are considering solar panels, the marginal cost of the electricity needed to power a heat pump water heater can be negligible.

Do you have an unconditioned air space such as a garage, basement or large crawl space?

It is recommended that you install them in a space 1,000 cubic feet (8' by 11' by 11') or larger that stays above 50 degrees most of the time. They can significantly lower the air temperature around them so do not place them within the living space. Heat pumps are less effective in very cold spaces.

Is it time to replace your water heater?

Heat pump water heaters are less common and are often special order items. Being prepared is important. Conversely replacing items before the end of their useful life is less sustainable.

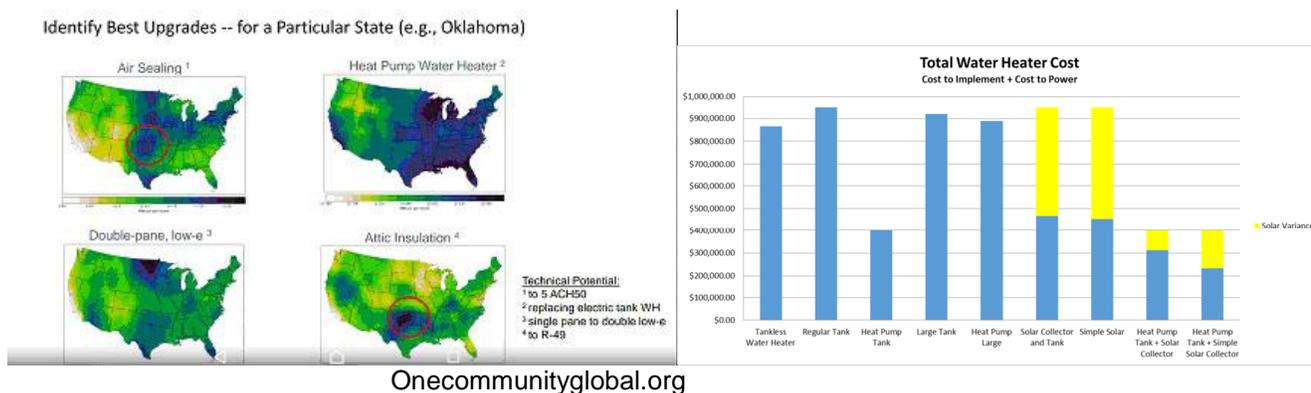
Do you currently have an electric water heater?

If you do not currently have an electric water heater expanding your electrical system to supply one may or may not be expensive. Consult a good contractor.

What is a heat pump water heater?

A heat pump is a device that provides heat energy from a source of heat to a destination called a "heat sink". Heat pumps are designed to move thermal energy opposite to the direction of spontaneous heat flow by absorbing heat from a cold space and releasing it to a warmer one. A heat pump uses some amount of external power to accomplish the work of transferring energy from the heat source to the heat sink. This is the same technology used by refrigerators only working in reverse to gather heat into the unit rather than expel it out.

A NREL study identified replacing an electric water heater with a heat pump water heater as an excellent upgrade for most Californians so the government is working to lower adoption barriers by providing financial aid. As of the publication of this paper, rebates available for new heat pump water heaters are a \$300 federal tax credit plus a \$500 rebate from PG&E. Before you buy, check that the credits are still in effect and your selection qualifies.



Heat pump water heaters also typically have the lowest life cycle costs when both the initial cost of the unit and long term energy use are factored in. The Heat Pump Tank+category includes residential water heaters; Heat Pump Large+refers to commercial systems.

Whatever type of water heater you have, there are simple things that can be done to raise the energy efficiency of the appliance.

Lower Water Heating Temperature

You can reduce your water heating costs by simply lowering the thermostat setting on your water heater. For each 10°F reduction in water temperature, you can save between 3%. 5% in energy costs.

Although, some manufacturers set water heater thermostats at 140°F, most households usually only require them set at 120°F or even 115°F. Water heated at 140°F also poses a safety hazard- scalding. However, if you have a dishwasher without a booster heater, it may require a water temperature within a range of 130°F to 140°F for optimum cleaning. Reducing your water temperature to 120°F also slows

mineral buildup and corrosion in your water heater and pipes. This helps your water heater last longer and operate at its maximum efficiency.

Consult your water heater owner's manual for instructions on how to operate the thermostat. You can find a thermostat dial for a gas storage water heater near the bottom of the tank on the gas valve. Electric water heaters, on the other hand, may have thermostats positioned behind screw-on plates or panels. As a safety precaution, shut off the electricity to the water heater before removing/opening the panels. Keep in mind that an electric water heater may have two thermostats- one each for the upper and lower heating elements. Mark the beginning temperature and the adjusted temperature on the thermostat dial for future reference. After turning it down, check the water temperature with a thermometer at the tap farthest from the water heater. Thermostat dials are often inaccurate. Several adjustments may be necessary before you get the right temperature.

If you plan to be away from home for at least 3 days, turn the thermostat down to the lowest setting or completely turn off the water heater. To turn off an electric water heater, switch off the circuit breaker to it. For a gas water heater, make sure you know how to safely relight the pilot light before turning it off.

Insulate Your Water Heater Tank

Unless your water heater's storage tank already has a high R-value of insulation (at least R-24), adding insulation to it can reduce standby heat losses by 25%. 45%. This will save you around 4%. 9% in water heating costs. If you don't know your water heater tank's R-value, touch it. A tank that's warm to the touch needs additional insulation.

Insulating your storage water heater tank is fairly simple and inexpensive, and it will pay for itself in about a year. You can find pre-cut jackets or blankets available from around \$10. \$20. Choose one with an insulating value of at least R-8. Some utilities sell them at low prices, offer rebates, and even install them at a low or no cost.

Insulating an Electric Water Heater Tank

You can probably install an insulating pre-cut jacket or blanket on your electric water heater tank yourself.

Read and follow the directions carefully. Leave the thermostat access panel(s) uncovered. Don't set the thermostat above 130°F on electric water heater with an insulating jacket or blanket- the wiring may overheat.

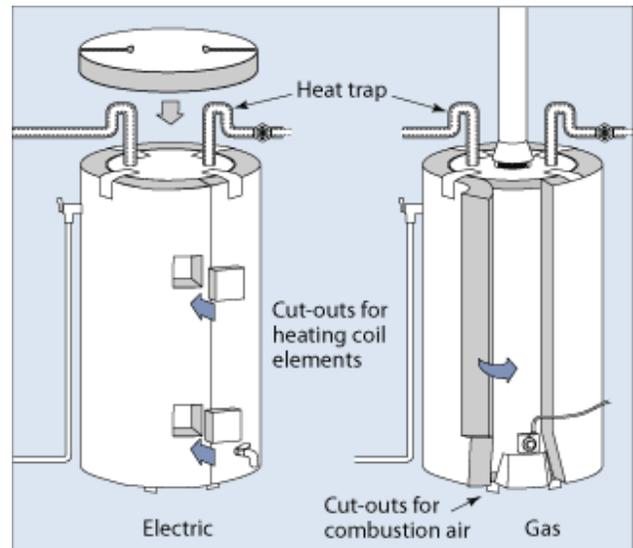
You also might consider placing a piece of rigid insulation- a bottom board- under the tank of your electric water heater. This will help prevent heat loss into the floor, saving another 4%. 9% of water heating energy. It's best done when installing a new water heater.

Insulating a Gas Water Heater Tank

The installation of insulating blankets or jackets on gas and oil-fired water heater tanks is more difficult than those for electric water heater tanks. It's best to have a qualified plumbing and heating contractor add the insulation. If you want to install it yourself, read and follow the directions very carefully. Keep the jacket or blanket away from the drain at the bottom and the flue at the top. Make sure the airflow to the burner isn't obstructed. Leave the thermostat uncovered, and don't insulate the top of a gas water heater tank- the insulation is combustible and can interfere with the draft diverter.

Insulate Hot Water Pipes for Energy Savings

Insulating your hot water pipes reduces heat loss and can raise water temperature 2°F. 4°F hotter than uninsulated pipes can deliver, allowing for a lower water temperature setting. You also won't have to wait



as long for hot water when you turn on a faucet or showerhead, which helps conserve water and reduce standby losses.

Insulate all accessible hot water pipes. It's also a good idea to insulate the cold water inlet pipes for the first 3 feet and the pipe coming from the pressure relief valve. Use quality pipe insulation wrap, or neatly tape strips of fiberglass insulation around the pipes. Pipe sleeves made with polyethylene or neoprene foam are the most commonly used insulation. Match the pipe sleeve's inside diameter to the pipes outside diameter for a snug fit. Place the pipe sleeve so the seam will be face down on the pipe. Tape, wire, or clamp (with a cable tie) it every foot or two to secure it to the pipe. If you use tape, some recommend using acrylic tape instead of duct tape.

On gas water heaters, keep insulation at least 6 inches from the flue. If pipes are within 8 inches of the flue, your safest choice is to use fiberglass pipe-wrap (at least 1-inch thick) without a facing. You can use either wire or aluminum foil tape to secure it to the pipe.

How to install Pipe Insulation

Pipe insulation has an opening that is used to place it around the pipe. If your pipes are hard to reach, as in they pass into a wall or behind something, you can place just the very end around the pipe, removed the protective plastic strip from the sealing adhesive and push the insulation along the pipe into the wall. Continue doing this in stages until the insulation will not move further along the pipe. Do not be afraid to cut into the insulation to make it bend around curved pipes. Use a good tape to seal your cuts.



Install Heat Traps on a Water Heater Tank for Energy Savings

If your storage water heater doesn't have heat traps, you can save energy by adding them to your water heating system. They can save you around \$15. \$30 on your water heating bill by preventing convective heat losses through the inlet and outlet pipes.

Heat traps valves allow water to flow into the water heater tank but prevent unwanted hot-water flow out of the tank. The valves have balls inside that either float or sink into a seat, which stops convection. These specially designed valves come in pairs. The valves are designed differently for use in either the hot or cold water line.

A pair of heat traps costs only around \$30. However, unless you can properly solder a pipe joint, heat traps require professional installation by a qualified plumbing and heating contractor. Therefore, heat traps are most cost effective if they're installed at the same time as the water heater. Today, many new storage water heaters have factory-installed heat traps or have them available as an option. Inexpensive or improperly installed heat traps can interfere with water pressure. A downward loop of 6" in the water lines is often a better solution.

Install a Timer and Use Off-Peak Power for Electric Water Heaters

If you have an electric water heater, you can save an additional 5%. 12% of energy by installing a timer that turns it off at night when you don't use hot water and/or during your utility's peak demand times. You can install a timer yourself. They can cost \$60 or more, but they can pay for themselves in about 1 year. Timers are most cost effective if you don't want to install a heat trap and insulate your water heater tank and pipes. Timers aren't as cost effective or useful on gas water heaters because of their pilot lights.

Contact your utility to see if it offers a demand management program. Some utilities offer "time of use" electricity rates that vary according to the demand on their system. They charge higher rates during "on-peak" times and lower rates during "off-peak" times. Some even offer incentives to customers who allow them to install control devices that shut off electric water heaters during peak demand periods.

These control devices may use radio signals that allow a utility to shut off a water heater remotely anytime demand is high. Shut-off periods are generally brief so customers experience no reduction in service.

Drain-Water Heat Recovery

<https://energy.gov/energysaver/drain-water-heat-recovery>

Any hot water that goes down the drain carries away energy with it. That's typically 80. 90% of the energy used to heat water in a home. Drain-water (or grey water) heat recovery systems capture this energy to preheat cold water entering the water heater or going to other water fixtures.

How It Works

Drain-water heat recovery technology works well with all types of water heaters, especially with demand and solar water heaters. Also, drain-water heat exchangers can recover heat from the hot water used in showers, bathtubs, sinks, dishwashers, and clothes washers. They generally have the ability to store recovered heat for later use. You'll need a unit with storage capacity for use with a dishwasher or clothes washer. Without storage capacity, you'll only have useful energy during the simultaneous flow of cold water and heated drain water, like while showering.

Some storage-type systems have tanks containing a reservoir of clean water. Drain water flows through a spiral tube at the bottom of the heat storage tank. This warms the tank water, which rises to the top. Water heater intake water is preheated by circulation through a coil at the top of the tank. Non-storage systems usually have a copper heat exchanger that replaces a vertical section of a main waste drain. As warm water flows down the waste drain, incoming cold water flows through a spiral copper tube wrapped tightly around the copper section of the waste drain. This preheats the incoming cold water that goes to the water heater or a fixture, such as a shower. By preheating cold water, drain-water heat recovery systems help increase water heating capacity. This increased capacity really helps if you have an undersized water heater. You can also lower your water heating temperature without affecting the capacity.

Cost and Installation

Prices for drain-water heat recovery systems range from \$300 to \$500. You'll need a qualified plumbing and heating contractor to install the system. Installation will usually be less expensive in new home construction. Paybacks range from 2.5 to 7 years, depending on how often the system is used.

Original page from U.S. Department of Energy - Energy Efficiency and Renewable Energy

Solar Hot Water

<https://energy.gov/energysaver/solar-water-heaters>

Solar water heaters, also called solar domestic hot water systems, can be a cost-effective way to generate hot water for your home. They can be used in any climate, and the fuel they use, sunshine, is free. At the time of printing, solar hot water system tax credits are around 30% and apply only to indirect circulation systems.

Solar water heating systems include storage tanks and solar collectors. There are two types of solar water heating systems: active, which have circulating pumps and controls, and passive, which don't.

Active Solar Water Heating Systems

There are two types of active solar water heating systems:

Direct circulation systems

Pumps circulate household water through the collectors and into the home. They work well in climates where it rarely freezes.

Indirect circulation systems

Pumps circulate a non-freezing, heat-transfer fluid through the collectors and a heat exchanger. This heats the water that then flows into the home. They are popular in climates prone to freezing temperatures.

A large, flat panel called a flat plate collector is connected to a tank called a solar storage/backup water heater by two pipes. One of these pipes runs through a cylindrical pump into the bottom of the tank, where it becomes a coil called a double-wall heat exchanger. This coil runs up through the tank and out again to the flat plate collector. Antifreeze fluid runs only through this collector loop. Two pipes run out the top of the water heater tank; one is a cold water supply into the tank, and the other sends hot water to the house.

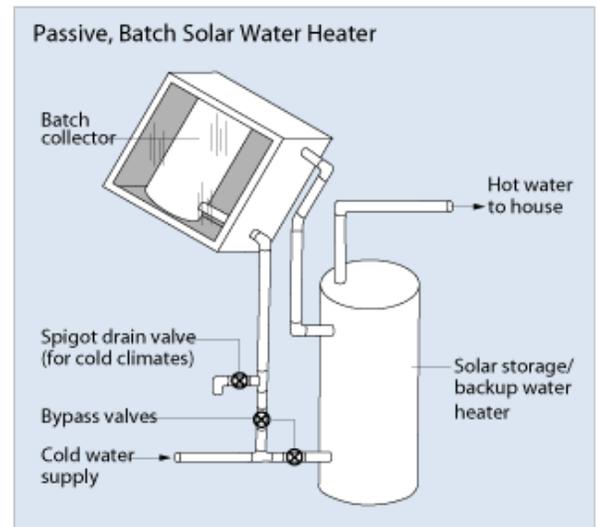
Passive Solar Water Heating Systems

Passive solar water heating systems are typically less expensive than active systems, but they're usually not as efficient. However, passive systems can be more reliable and may last longer. There are two basic types of passive systems:

Integral collector-storage passive systems: These work best in areas where temperatures rarely fall below freezing. They also work well in households with significant daytime and evening hot-water needs.

Thermosyphon systems

Water flows through the system when warm water rises as cooler water sinks. The collector must be installed below the storage tank so that warm water will rise into the tank. These systems are reliable, but contractors must pay careful attention to the roof design because of the heavy storage tank. They are usually more expensive than integral collector-storage passive systems.



Cold water enters a pipe and can either enter a solar storage/backup water heater tank or the batch collector, depending on which bypass valve is opened. If the valve to the batch collector is open, a vertical pipe (which also has a spigot drain valve for cold climates) carries the water up into the batch collector. The batch collector is a large box holding a tank and covered with a glaze that faces the sun. Water is heated in this tank, and another pipe takes the heated water from the batch collector into the solar storage/backup water heater, where it is then carried to the house.

STORAGE TANKS AND SOLAR COLLECTORS

Most solar water heaters require a well-insulated storage tank. Solar storage tanks have an additional outlet and inlet connected to and from the collector. In two-tank systems, the solar water heater preheats water before it enters the conventional water heater. In one-tank systems, the back-up heater is combined with the solar storage in one tank.

Three types of solar collectors are used for residential applications:

Flat-plate collector

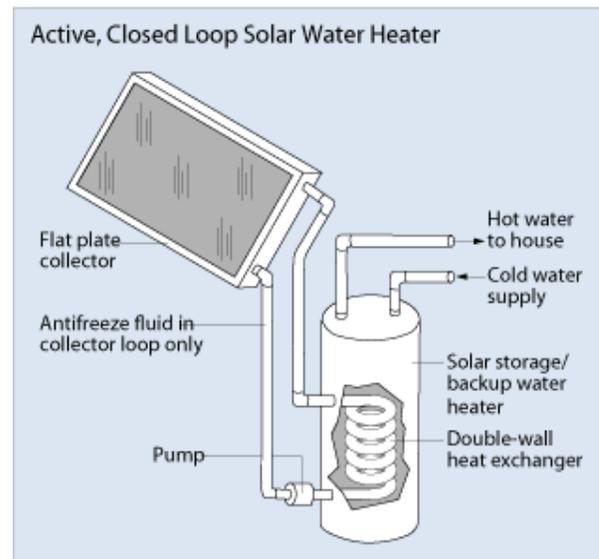
Glazed flat-plate collectors are insulated, weatherproofed boxes that contain a dark absorber plate under one or more glass or plastic (polymer) covers. Unglazed flat-plate collectors -- typically used for solar pool heating -- have a dark absorber plate, made of metal or polymer, without a cover or enclosure.

Integral collector-storage systems

Also known as ICS or batch systems, they feature one or more black tanks or tubes in an insulated, glazed box. Cold water first passes through the solar collector, which preheats the water. The water then continues on to the conventional backup water heater, providing a reliable source of hot water. They should be installed only in mild-freeze climates because the outdoor pipes could freeze in severe, cold weather.

Evacuated-tube solar collectors

They feature parallel rows of transparent glass tubes. Each tube contains a glass outer tube and metal absorber tube attached to a fin. The fin's coating absorbs solar energy but inhibits radiative heat loss. These collectors are used more frequently for U.S. commercial applications.



Solar water heating systems almost always require a backup system for cloudy days and times of increased demand. Conventional storage water heaters usually provide backup and may already be part of the solar system package. A backup system may also be part of the solar collector, such as rooftop tanks with thermosyphon systems. Since an integral-collector storage system already stores hot water in addition to collecting solar heat, it may be packaged with a tankless or demand-type water heater for backup.

SELECTING A SOLAR WATER HEATER

Before you purchase and install a solar water heating system, you want to do the following:

- Estimate the cost and energy efficiency of a solar water heating system
- Evaluate your site's solar resource
- Determine the correct system size
- Investigate local codes, covenants, and regulations.

Also understand the various components needed for solar water heating systems, including the following:

- Heat exchangers for solar water heating systems
- Heat-transfer fluids for solar water heating systems

INSTALLING AND MAINTAINING THE SYSTEM

The proper installation of solar water heaters depends on many factors. These factors include solar resource, climate, local building code requirements, and safety issues; therefore, it's best to have a qualified solar thermal systems contractor install your system.

After installation, properly maintaining your system will keep it running smoothly. Passive systems don't require much maintenance. For active systems, discuss the maintenance requirements with your system provider, and consult the system's owner's manual. Plumbing and other conventional water heating components require the same maintenance as conventional systems. Glazing may need to be cleaned in dry climates where rainwater doesn't provide a natural rinse.

Regular maintenance on simple systems can be as infrequent as every 3. 5 years, preferably by a solar contractor. Systems with electrical components usually require a replacement part or two after 10 years. Learn more about solar water heating system maintenance and repair.

When screening potential contractors for installation and/or maintenance, ask the following questions:

Does your company have experience installing and maintaining solar water heating systems?

Choose a company that has experience installing the type of system you want and servicing the applications you select.

How many years of experience does your company have with solar heating installation and maintenance?

The more experience the better. Request a list of past customers who can provide references. Is your company licensed or certified?

Having a valid plumber's and/or solar contractor's license is required in some states. Contact your city and county for more information. Confirm licensing with your state's contractor licensing board. The licensing board can also tell you about any complaints against state-licensed contractors.



IMPROVING ENERGY EFFICIENCY

After your water heater is properly installed and maintained, try some additional energy-saving strategies to help lower your water heating bills, especially if you require a back-up system. Some energy-saving devices and systems are more cost-effective to install with the water heater.

The picture above shows a water heater with no insulation on the pipes or the tank.

The picture to the left shows a water heater with insulation added to both the hot water pipe and the tank.



Testing a toilet for leaks

Wikihow.com

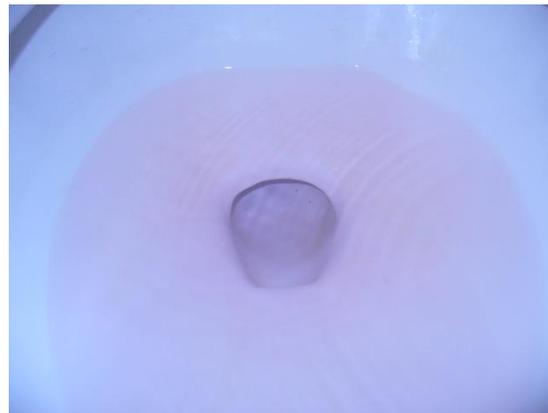
1. Remove the tank lid of the toilet.

2. Flush your toilet as usual. Wait for the water to rise again to the designated water line of the tank and the toilet to fully complete a flush.

3. Drop about 4 to 5 food coloring drops in the toilet tank. You may want to use a dark color such as blue or red instead of yellow. **Replace the toilet lid and wait 20 to 30 minutes.**

4. Survey the toilet bowl. If the water is clear, there is no leak. If the water has changed color, there is a leak.

5. Repeat the process with all toilets in the house, if applicable. This is necessary to see if the issue is coming from one specific toilet or happening in multiple ones.



Saving Water with an older Toilet

It is estimated that there are still 6 million older high water use toilets in California. Is yours one? BAWSCA offers a \$100 rebate for replacing an older high water using toilet. If that is not an option, there are still some things you can do.

Do not place a brick in the toilet. Bricks are porous and if they have been in contact with the ground can harbor micro biotic life and introduce algae and other things into your toilet tank. A better method is to use a plastic bottle, or heavy duty plastic bag (sometimes called a Toilet Tummy) to hold some of the water back when the toilet is flushed. This will decrease the amount of water that is used to refill the tank. Be sure nothing interferes with the flapper or flush mechanism. Toilets also send water directly to the bowl when refilling.

To decrease the water used in the bowl, there are number of useful gadgets that will allow you to partially clamp off the hose that fills the bowl. Many toilets fill the bowl faster than the tank is filled resulting in water from the bowl going down the drain as the tank continues to fill. A fill cycle diverter allows you to divert some of the water from the bowl into the tank by changing the ratio of water that goes to the tank vs the water that goes to the bowl.

Here are some examples:



Water Savings at the Faucet

Three ways to approach water reduction at the faucet

1. If you are currently in the middle of a remodel; consider installing a foot pedal to turn the water off at the kitchen sink. This leaves your hands free and prevents the dripping of dirty and soapy water all over the back of the sink and will not require you to readjust the temperature of the water. For most of us, this option may be too costly.
You can also add a shut off valve to the tip of your kitchen and bathroom faucet. This device will reduce the water flow momentarily and costs only a few dollars. Pictured from left to right are: a foot control pedal and two types of faucet aerators that include a shut off.



2. Replace the aerator and flow restrictor with one that has a lower flow rate. The aerator and flow restrictor are normally combined into a perforated plastic disk placed in the tip of the faucet. See included directions for replacing an aerator.
3. Use the valves under the sink to lower flow rate. A fully open valve without a flow restrictor provides around 4gpm (gallons per minute.) By closing the valve, and then opening it slowly and watching the water while it runs, you can reduce your water pressure without sacrificing very much. This method has the advantage of being adjustable and free, but may not comply with water saving codes and it is not easily verifiable.

If you are buying a new faucet, be aware that only about 33% of kitchen faucets, and 13% of lavatory faucets, on the market in California meet the new standards.

2016 California Standards

Residential bathroom faucets: 1.2 gallons per minute

Residential kitchen faucets: normally 1.8 gallons per minute with a higher 2.2 setting for filling pots

Toilets 1.28 gallons per flush

Shower heads 2 gallons per minute

All hoses must have a shut off valve on the end

How to Replace a Showerhead

Turn off the water supply

Make sure the shower knobs are completely turned off and are secured tightly. No water should be dripping from the shower head. If water continues to drip, you may have a bad valve and a plumber may be needed.

Lay down a blanket

Lay a blanket down in the tub or on the shower floor to prevent any showerhead bits from possibly falling down the shower drain, and to protect the tub or shower floor surface from falling tools or materials.

Remove the existing showerhead

Wrap a cloth around the base of the shower arm. Open up a pair of pliers, and grip them onto the cloth and shower arm, to hold the shower arm secure when you screw off the showerhead. If you want to keep the old shower head, then wrap a second cloth around the showerhead, and use an adjustable wrench to clamp down onto the base of the showerhead. Turn the showerhead counter clockwise to completely unscrew the showerhead from the shower arm. Pliers can easily damage the finish on plumbing fixtures. Some showerheads are screwed on rather loosely, and can be easily removed by turning it counter clockwise with your hands. You can try removing with showerhead with your hands initially, but if you can't loosen it, use the tools and cloths to remove the showerhead.



Clean the threads of the shower arm

Use a clean rag to wipe off the screw threads of the shower arm. You could also use an old toothbrush to get in between the threads, and clean out any built up grime and rust. Remove any old Teflon tape from the shower arm's threads.

Tape the threads of the shower arm

Apply about 2-3 turns of Teflon tape to the threads of the shower arm, wrapping the tape tightly in a clockwise direction. Wrap the tape in a clockwise direction so when you screw on the new showerhead, the sealing Teflon tape doesn't come undone.

Attach the new showerhead

Place the new showerhead onto the shower arm, and twist it clockwise by hand to secure it into place. Once the showerhead is secure, use the cloths, pliers, and adjustable wrench to tighten the showerhead. Wrap the base of the showerhead with a cloth, and wrap the base of the shower arm with cloth. Use the pliers to grip onto the cloth and hold the shower arm base in place. Use the adjustable wrench to clamp onto the cloth, and turn the showerhead clockwise as much as it will comfortably go.

Turn on the water slowly to check for leaks. If the joints leak, take it apart and repeat paying special attention to cleaning the threads.

*adapted from various online sources 2016

How to Replace a Faucet aerator/flow restrictor



Turn off the water supply

Make sure the faucet knobs are completely turned off and are secured tightly. No water should be dripping from the faucet. If water continues to drip, you may have a bad valve and a plumber maybe needed.

Lay down a blanket

Lay a blanket down in the sink and on the floor to prevent any bits or parts from possibly falling down the drain, and to protect the sink and floor from falling tools or materials.

Remove the existing tip

Most can be unscrewed by hand. If not, wrap a cloth around the tip of the faucet. Pliers can easily damage the finish on plumbing fixtures. Open up a pair of pliers, and grip them onto the cloth and faucet tip, hold the faucet spout secure when you screw off the tip. Turn the tip counter clockwise to completely unscrew the tip from the faucet spout. Please note that you are probably looking down on the faucet so the rotational direction will appear to be reversed. It should look as if you are turning it clockwise when looking down on it.

Clean the threads of the faucet spout

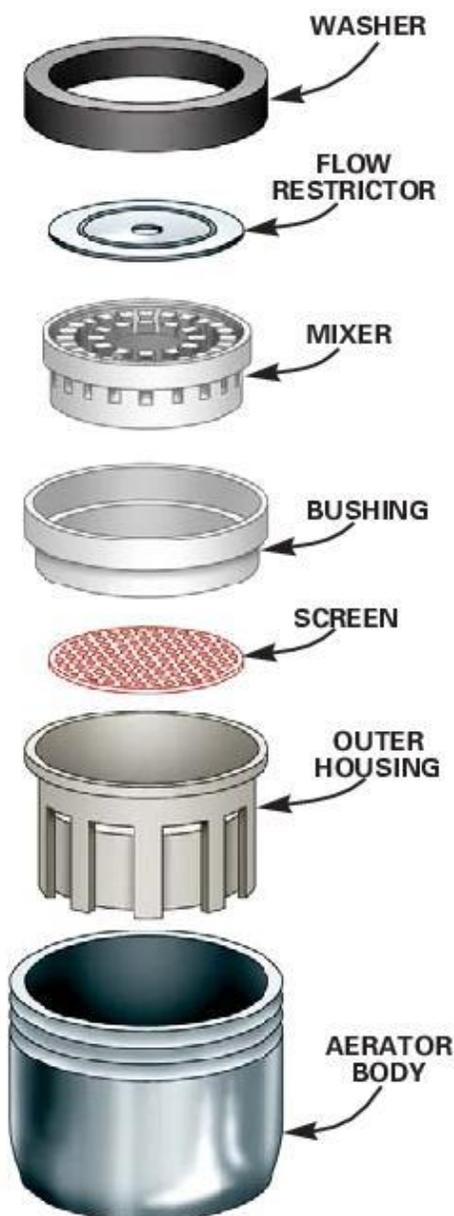
Use a clean rag to wipe off the screw threads of the spout. Some spouts have interior threads and some have exterior threads. You could also use an old toothbrush to get in between the threads and clean out any built up grime and rust.

Replace the aerator

Inside the faucet tip you will find a thick plastic disk with small holes. This is a combination aerator and flow restrictor. Place the new aerator into the faucet tip using the product instructions to determine the correct direction. Add a rubber gasket on top of the aerator if called for.

Reattach the faucet tip

Place the tip, new aerator and rubber gasket onto the faucet spout and twist it clockwise by hand to secure it into place. Again, remember that you are looking down and so the direction of rotation will appear reversed. It is normally unnecessary to use Teflon tape on a faucet spout. Turn the water on gently and then increase pressure. If it leaks, try redoing it. If it continues to leak around the tip, you may try a small amount of Teflon tape or plumber's putty.



If you are replacing your aerator, consider adding a combination aerator/water shut off valve. See [three ways to approach water reduction at a faucet.](#)

How to use Pipe Sealing Thread

Teflon pipe sealing tape is very useful. To use it, hold the end with your thumb just past the pipe threads. Pass the sealing tape around the thread clockwise several times (2-3 should work.) Cut the roll off and install your fixture. It is important that you go clockwise so that the tape is not pushed off when you screw on your fixture. Pipe sealing tape has the advantages of being easier to use and remove than plumber's putty and it won't dry out like plumber's putty. Plumber's putty is necessary for some types of repairs.



How to clean your Refrigerator's Coils

Adapted from [wikihow.com](http://www.wikihow.com)

Disconnect

Shut off the circuit breaker, remove the fuse or slide the refrigerator away from the wall as needed to remove the refrigerator's plug from the electrical outlet. Shut off water supply lines if equipped with icemaker or water dispenser.

Locate the condenser coil

There are two sets of coils for cooling appliances like refrigerators, the evaporator³ and condenser¹ coils. Overly simplified, the two coils are filled with gas and liquid respectively, and are parts of a complex "circuit" that has a compressor⁴ and expansion valve² that perform the work. The heated compressed gas and liquid is passed through the condenser coil that is located away from the cooled space. This condenser coil is where some of the heat in the liquid is released to the ambient air. The cooled liquid is then drawn through the *expansion valve* by the suction of the compressor, where the liquid immediately boils off to a gas. This causes the temperature of the gas to drop significantly (well below freezing) in the evaporator coil. The process repeats until the thermostat in the space is satisfied. Because the condenser coil is exposed to the ambient air on the refrigerator, it requires regular cleaning. There are a few locations that the condenser coil may be found.

Older refrigerators

Have the coil (a grid-like structure often painted black) mounted on the rear of the refrigerator.

Newer refrigerators

Often locate the condenser coil at the bottom. It is likely that a fan (that may or may not be readily visible) will be directed at the coil to assist with heat dissipation. Use a flashlight to assist locating the coil and fan if needed. The coil will be accessible from one of two places:



Toe space panel

Remove the panel at the bottom of the front of the refrigerator and carefully slide the condensate tray out (if present, the condensate tray may contain water). A visual inspection upward into this space may reveal a flat condenser coil when located here.

Rear access panel

If not found behind the toe space, the refrigerator will have to be slid away from the wall further to work from behind. Disconnect water supply lines if too short to allow

enough room to work. Remove the fasteners that hold an access panel in position. The condenser coil may be flat, but will likely be cylindrical in shape when located here.

Disconnect power

Seriously. Make sure the power to the refrigerator is disconnected.

Vacuum the coil

With a plastic crevice or brush attachment, carefully vacuum dirt and dust wherever it is seen. Use care not to damage the fins or coil. A breach created in the coil will allow the refrigerant to escape and will likely result in an expensive repair.



wikiHow to Clean Refrigerator Coils

Vacuum the fan

If the fan is visible and accessible, cleaning it will help it move air across the condenser coil as designed. Dirt and dust, if allowed to accumulate on the fan blades, decreases airflow, affects balance and can contribute to early failure of the compressor.

Brush away stubborn dirt and dust

Use a narrow paint brush to gently remove stubborn dirt and dust from the coil and fan if able to get sufficient access.



wikiHow to Clean Refrigerator Coils

Slide refrigerator back into position

Plug the refrigerator back into wall outlet. Arrange any water supply lines and power cords so that they will not be kinked or crushed by the refrigerator. *Whatever you do, do not forget to reconnect the supply lines and plug the refrigerator in again.*

Online Resources

<https://enervee.com/> - find energy efficient appliances and electronics

<https://renewfinancial.com/product/californiafirst> - PACE financing

<https://www.heroprogram.com/> - PACE financing

<http://www.epeat.net/> - find sustainable electronics

https://www.pge.com/en_US/residential/home.page . PG&E rebates

<http://www.smcenergywatch.com/> - Learn about what the county is doing and incentives offered.

<http://www.peninsulacleanenergy.com/> - learn about the county's default electrical provider and options to increase the portion of renewable energy you receive.

<http://www.energy.ca.gov/> - learn about financing and CEC programs

<http://www.stopwaste.org/> - A wide variety of resources for waste reduction at home, schools and for businesses.

<https://builditgreen.org/> Find Green home checklist and other information.

<http://www.recycleworks.org/> San Mateo County resource for everyone.

<https://www.bayren.org/> Find information and webinars about green building and updates to energy codes.

<http://bawsca.org/conserve> Water rebates and conservation programs.

<https://energy.gov/energysaver/do-it-yourself-home-energy-audits>

<http://www.homeenergysaver.lbl.gov/consumer/>

https://www.energystar.gov/index.cfm?fuseaction=home_energy_yardstick.showgetstarted

https://www.pge.com/en_US/residential/save-energy-money/analyze-your-usage/home-energy-checkup/home-energy-checkup.page?

Glossary

All Definitions taken from Wikipedia.org

- **Building envelope**: A building envelope is the physical separator between the conditioned and unconditioned environment of a building including the resistance to air, water, heat,[1] light, and noise[2] transfer.
- **Greenhouse gases**: gases that absorb solar radiation that can be responsible for the greenhouse effect, e.g carbon dioxide, methane, ozone, and fluorocarbons.
- **Kilowatt**: a unit of power equal to 100 watts. Your electrical bill will read in kilowatt hours used.
- **Lumens**: The **lumen** (symbol: **lm**) is a measure of the total quantity of visible light emitted by a source.
- **Phantom Load**: Standby power is electrical power used by appliances and equipment while switched off or not performing their primary function, often waiting to be activated by a remote controller (<http://bit.ly/2d0cRzI>). That power is consumed by internal or external power supplies, remote control receivers, text or light displays, circuits energized when the device is plugged in even when switched off, etc.^[1] Power can be saved by disconnecting such devices, causing at worst only inconvenience.
- **R value**: The **R-value** is a measure of thermal resistance^[1] used in the building and construction industry. Under uniform conditions it is the ratio of the temperature difference across an insulator and the heat flux (heat transfer per unit area per unit time,) through it.
- **Renewable energy**: a naturally occurring source of energy not derived from fossil or nuclear fuel, e.g. biomass, solar, wind, tidal wave, and hydroelectric power.
- **Sustainability**: the United Nations (<http://bit.ly/2cshra5>) on March 20, 1987: %ustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.+
- **Therm**: The **therm** (symbol **thm**) is a non-SI unit of heat energy equal to 100,000 British thermal units (BTU). It is approximately the energy equivalent of burning 100 cubic feet (often referred to as 1 CCF) of natural gas
- **U value**: The *U-factor* or *U-value*, is the overall heat transfer coefficient that describes how well a building element conducts heat or the rate of transfer of heat (in watts) through one square meter of a structure divided by the difference in temperature across the structure

Attachment A

This copy is for educational purposes only and is out of date.

PROPERTY OWNER

FIRST NAME	LAST NAME		
PHONE NUMBER	E-MAIL ADDRESS		
ADDRESS	CITY	STATE	ZIP/POSTAL



YES
NO
PROPERTY QUALIFIES
SEE PAGE 3 FOR VERIFICATION.

INSPECTION REPORT DATE INSPECTED:

OBSERVATION	POINTS
The house, if in a cold climate, is oriented so that the side with the most glass faces south (within 30°).	8
Deciduous trees are providing sun in the winter and shade in the summer.	4
There is an edible garden area.	3
The driveway is shared.	6
Drives and walkways are mostly of permeable material such as gravel.	5
Exterior lighting is controlled by motion sensors.	2
Some of the outdoor/walkway lighting is solar powered.	2
The downspouts and gutters are clean and in working order.	6
Splashblocks are present where needed.	3
The roof slope is at least 3/12 or steeper.	5
There is south facing roof area for future solar use.	5
The roofing material is at least 30-year grade, slate, clay, composition, metal or fiberglass.	7
The roofing material is a light color in warm climates or a dark color in colder climates.	8
A two-foot overhang exists between one and two feet above the south windows.	5

COLUMN TOTAL:

OBSERVATION	POINTS
The deck is made of composite recycled material.	1
There is no swimming pool or a pool with a cover.	1
The house was wrapped with an exterior air infiltration barrier such as Tyvek.	3
That areas of potential air infiltration have been sealed, foamed or caulked.	4
The exterior doors have intact weather-stripping.	1
The exterior doors close tightly.	1
The windows are mostly double glazed.	8
The windows are mostly low-e rated.	9
There are no metal-frame windows.	5
There is flashing above the windows.	4
There is flashing above the exterior doors.	2
Operable shutters are providing window shading.	2
Window treatments include solar screens, sun shades or thermal curtains.	1
Foundation is insulated (from inside or Insulated concrete forms were used for the foundation out).	5
Insulated concrete forms were used at the foundation.	3

INITIAL

COLUMN TOTAL:
PAGE TOTAL:

OBSERVATION	POINTS
Insulated panels were used at the foundation.	3
The crawlspace soil is covered by a vapor barrier.	4
The crawlspace is properly ventilated.	3
Little solid, large-dimension (2" x 10" or greater) lumber was used as joists and rafters.	2
Wall studs are on 24-inch centers.	2
Engineered joists were used more than dimensional solid lumber.	2
Engineered rafters or trusses were used more than dimensional solid lumber.	2
The furnace is centrally located.	1
The furnace is at least 90% energy efficient or 80% for boilers.	9
The furnace filter is clean.	3
A built-in electronic or HEPA air filter exists.	2
An air-to-air heat exchanger exists.	7
An in-floor heating system exists.	1
An active solar heating system exists.	10
A geothermal heating or cooling system exists.	10
More oriented strand board (OSB) was used than plywood.	2
The thermostat(s) has a "fan only" option.*	2+
The thermostat is programmable.	4+
The heating/cooling system has more than one thermostat controlled zone.	3+
The ductwork is sealed with low toxic mastic tape.	2
There are return air ducts in every bedroom.	4

COLUMN TOTAL:

* Multiply points by number of thermostats/zones

OBSERVATION	POINTS
No uninsulated ducts exist in outside walls.	5
No uninsulated ducts exist in the attic.	6
A whole house fan exists.	3
A ceiling fan exists.	2
Bathroom exhaust fans vent to the exterior.	1
The garage has an exhaust fan.	1
The water heater is high efficiency.	4
The house would be described as taller than it is wide.	3
The water heater is within 20 pipe feet of the dishwasher.	1
The water heater is within 20 pipe feet of the clothes washer.	1
All hot water lines are insulated.	4
A tankless water heater exists.	2
The boiler has a side-arm water heater.	3
No faucets drip.	1
Kitchen and bath faucets have aerators.	2
Most shower heads are low flow, water saving types.	5
No showers have more than 1 shower head.	3
All toilets are 1.6 gallons per flush or less.	5
A dual flush toilet(s) exist.	8
The dishwasher has an energy saving cycle.	1
There is no garbage disposal.	1
A sealed combustion, wood-burning fireplace or stove exists.	3
The attic is properly ventilated.	4

COLUMN TOTAL:
PAGE TOTAL:

INITIAL

OBSERVATION	POINTS
The sill plate has been sealed with a foam sill gasket.	1
The home including attic is well insulated (<i>points inspector's discretion</i>).	1-10
A passive radon mitigation system exists.	1
An active (with fan) radon mitigation system exists.	1
The kitchen range hood vents to the exterior.	2
The dryer vents to the exterior.	2
The gas cook top/oven has an electronic ignition.	1
The refrigerator is rated for an annual electric cost of \$66 or less.	5
There are gas appliance rough-ins available even if electric appliances are in use.	1
The kitchen has a built-in recycling center that includes two or more bins.	2
The kitchen has built-in, short-term compost storage bins.	2
Most of the walls and ceilings are painted with a light color.	4
COLUMN TOTAL:	

OBSERVATION	POINTS
Some light fixtures have dimmers (<i>points inspector's discretion</i>).	2-4
Most fixtures are using compact fluorescent bulbs.	7
Interior lighting controlled by motion sensors.	9
A sun tube(s) lighting system exists (<i>1 point for each</i>).	1+
Most of the trim is finger-jointed, not clear wood.	1
Most of the carpeting is light-colored.	2
Recycled-content carpet padding is in use.	1
Recycled-content or natural material (domestic cotton or wool) carpeting is in use.	2
Carpeting is mostly tacked not glued down.	1
There are no visible indications of lead paint.	5
There are no visible indications of asbestos.	5
There are no visible indications of mold.	5
INITIAL <input type="text"/>	COLUMN TOTAL:
	PAGE TOTAL:

ADDITIONAL COMMENTS

ADDITIONAL POINTS FOR UNLISTED FACTORS (UP TO 40 POINTS AT INSPECTOR'S DISCRETION):

FINAL RESULTS

PAGE 1 POINTS _____

PAGE 2 POINTS _____

PAGE 3 POINTS _____

ADD'L POINTS _____

TOTAL

130+ Required for CLASS I
210+ Required for CLASS II

CERTIFYING INTERNACHI INSPECTOR

FIRST NAME LAST NAME

INTERNACHI ID NUMBER PHONE NUMBER

WEB SITE E-MAIL ADDRESS

ADDRESS CITY STATE ZIP/POSTAL