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# WHAT TO EXPECT DURING YOUR **ENERGY AUDIT**

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## The Energy Audit: Why You Should Care

You spend a lot of money on energy. You use it to stay warm, keep cool, make dinner, light up the living room, take a hot shower and do a host of other things that help create a safe, comfortable home environment. Unfortunately, a large portion of the energy you pay for gets wasted through inefficiencies hidden all over your home. An energy audit is the best way to pinpoint these inefficiencies so you can improve your home and save money on energy.

So what happens during an energy audit? Energy auditors search your entire home for escaping energy. They search inside and out for inefficiencies and safety concerns using advanced equipment and techniques. After the tests, they provide a customized, detailed account of your home's energy efficiency that shows where the most energy escapes and what repairs can be made to maximize savings. Once you discuss the results with your auditor, they help you make plans to complete the work and show you ways to improve efficiency on your own.

In the end, you'll know exactly where energy is escaping and what you can do to fix it. It will save you money, improve comfort and safety, and increase the overall value of your home, all while reducing your energy footprint.

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### STEPS OF AN ENERGY AUDIT

1. Prepare Your Home for the Evaluation
2. Review Your Energy History and Habits
3. Exterior Inspection
4. Interior Inspection
5. Mechanical Systems Inspection
6. The Results



### Tools Your Auditor Will Use

Unseen air leakages through chimneys, attics, wall vents, and poorly sealed windows and doors can cause heat losses that may account for up to 50% of your total energy consumption. That's why energy auditors are trained to know what to look for and use the most advanced tools and techniques available to locate every problem.

#### ▶ Blower Door Evaluation

A blower door is a powerful fan mounted in the frame of your main doorway that is used to check for air leaks. It works by blowing the air out of the house, which temporarily lowers the air pressure inside. The outdoor air pressure then causes a flow into the house through all unsealed openings, revealing undetected leaks.

#### ▶ Infrared Scan

An infrared, or thermal imaging, camera detects energy waste, moisture, and even electrical problems. It shows exactly where the problems are. It also measures air loss.

#### ▶ Duct Blower

A duct blower is a fan that attaches to your duct system to measure the amount of air it leaks.

#### ▶ Manometer

A manometer is a small instrument that measures the pressure differences between two parts of your home.

#### ▶ Flow Hood

A flow hood is a device that measures the amount of air flowing through a register to determine total airflow, correct airflow, and duct air leakage.

# Focus Areas: Energy Audit Inspection

Your house has a whole range of pathways that energy may escape through. Here are the key areas your auditor will focus on.

**Legend**

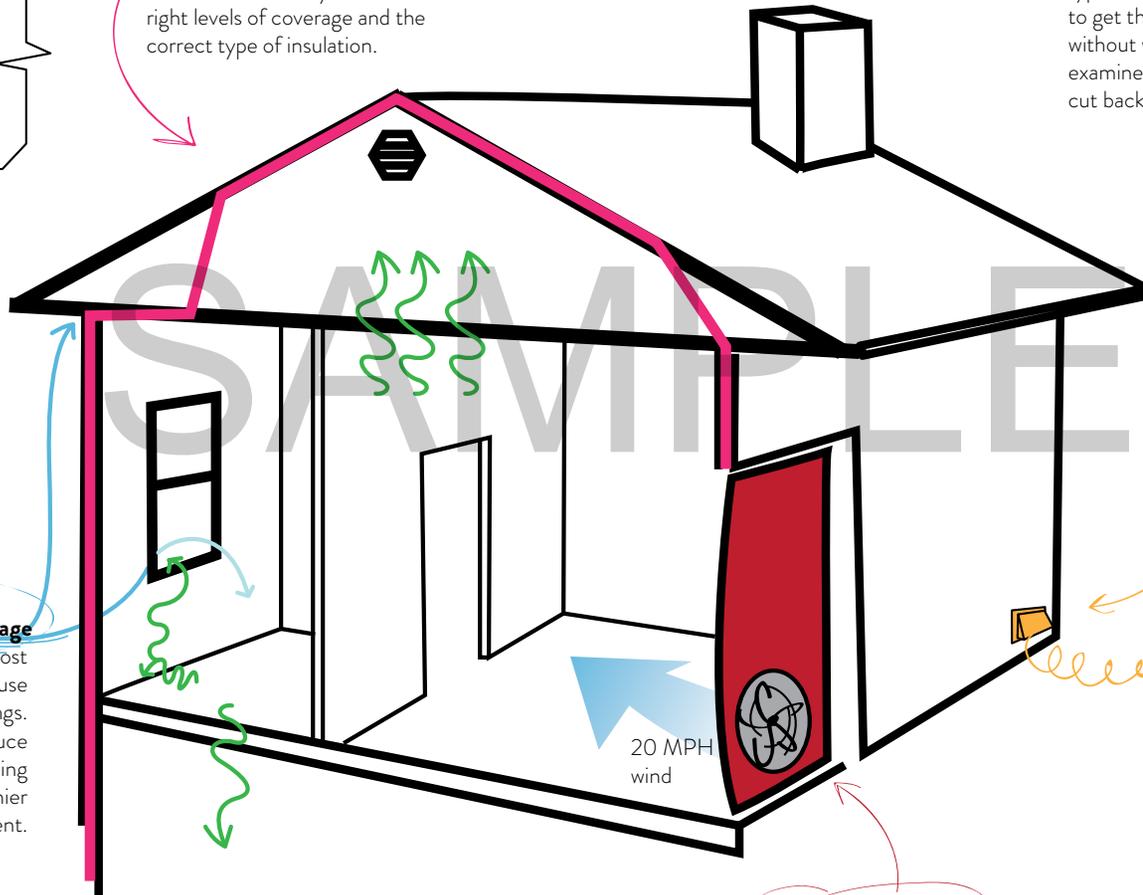
- Insulation
- eee Ventilation System
- ~ Escaping Air & Energy

## Proper Insulation

Since much of your home's wasted energy escapes through the floors, walls, and ceiling, proper insulation is crucial. The auditor will check these areas to make sure you have the right levels of coverage and the correct type of insulation.

## Lighting, Appliances & Electronics

The right lighting, appliances, and electronics affect productivity, health, safety, morale, and comfort. They also account for 29% of a typical home's energy use. So it's important to get the most out of every plug and bulb without wasting a watt. Your auditor will examine what you currently use and help you cut back and save money.



## Air Leakage

Home energy efficiency suffers the most when outside air enters a house unintentionally through cracks and openings. Sealing these areas can significantly reduce heating and cooling costs, improve building durability, and create a healthier indoor environment.

## Moisture Control

Properly controlling moisture in your home will improve the effectiveness of your air-sealing and insulation efforts. This is especially true in humid climates. The auditor will make sure your home is properly venting and controlling moisture. They'll also look for any leaking or buildup that may cause potential safety and health issues.

## Blower Door Evaluation

A blower door is a powerful fan mounted in the frame of your main doorway that checks for air leaks by creating a wind current in the house.

## Condition of Heating & Air Conditioning Units

Boilers, furnaces, water heaters, and other heating/cooling appliances are at the heart of a comfortable, energy-efficient home. Old, outdated, or inefficient equipment will not only cost you money but can pose health and safety issues. Your auditor will perform all the standard tests to make sure your equipment is safe, up-to-date, and functioning properly.

## Preparing Your Home for the Evaluation

An effective energy audit begins before the auditor arrives. Preparing your home beforehand ensures that your auditor will be able to give you the best report possible without anything getting in the way.

### ▶ Make a List of Questions

This is your chance to get an expert opinion. Draw up a list of questions and concerns to raise during the audit. Take stock of your home's drafty rooms, condensation, old equipment, or wall and window cracks.

### ▶ Collect Past Utility Bills

Have copies of your past utility bills that go back at least one year. Your utility company can provide these if you don't have them on hand. These records will help your auditor understand your overall energy consumption. They'll also perform a Utility Bill Analysis that will be included in your final inspection packet.

### ▶ Plan to Be Home

It is highly recommended that you be home during the audit. If you're gone, you'll miss out on a lot of useful information.

### ▶ Make Sure the Auditor has Access to Every Area of the House

The auditor needs to examine every nook and cranny of your home. Make sure everything is unlocked and uncluttered.

### ▶ Restrain or Remove Pets

Tests are safe for pets, but animals may obstruct the auditor's work.

### ▶ Close Windows, Exterior Doors, Fireplace Dampers, and Other Air Intakes

Make sure all openings to the outside are shut, and shut tight. This will allow your auditor to perform a proper interior analysis and make sure everything is sealing completely.

### ▶ Cover or Remove Ashes from Fireplace or Wood Stove

In general, if you can think of anything that might scatter or cause a mess if blown, it would be a good idea to cover it or weigh it down.

## Review Your Energy History and Habits

If a doctor tried to diagnose you without knowing your health history or asking questions, you probably wouldn't trust the diagnosis. It's no different with an energy audit. Your auditor needs to know the basic makeup and history of your home before the evaluation begins. The auditor will sit down with you for a one-on-one interview to discuss your energy-usage habits.

### Questions Your Auditor May Ask

#### How old is your home?

Housing regulations and building practices have evolved over the years, so knowing the year the home was finished may point the auditor toward common problems and outdated materials known to be used during that era.

#### How long have you lived in the home?

People who have lived in a home for a long time may be very familiar with leaks, drafty rooms, upgrades, and the general wear and tear of the home. This information will be very helpful to your auditor.

#### Which rooms get the most use? The least?

Knowing which rooms are used the most not only helps your auditor prioritize each area, but also indicates which places see the most wear and tear.

#### What is the average thermostat setting in summer and winter?

This will simply help the auditor understand your energy usage habits better.

#### Is anyone home during working hours?

When no one is home, you don't need to use as much energy to keep the place comfortable.

#### Are there any infants or elderly adults in the home?

A family with a newborn or an elderly adult may need to keep the home warmer in the winter and cooler in the summer. Your auditor will give extra attention to their rooms and suggest efficient ways to make sure they're as comfortable as possible.

#### Have there been any additions made to the home?

Extended bedrooms, covered porches, and connected garages are all great additions to a home's value. But they can present certain weatherization problems too. For example, there are typically cracks and leaks where the home and addition join. It's important to talk about additions so your auditor can pay special attention to these areas.

## The Exterior Inspection

The outer shell of your home is just like the skin of your body. The more you take care of it, the better it can take care of you. During the exterior inspection, your auditor will check to make sure the outside of your home is in proper working condition. They'll take measurements to determine your home's floorplan. The different components of the house are also important: porches, decks, attached garages, basements or crawl spaces, drainage systems, and the number of stories.

### Common Problem Areas

#### The Roof

The job of the roof is to keep the sun, rain, and snow out and to keep the heat or cool air in. The most common problems are small leaks between the tiles or shingles and gaps where the siding meets the roof. Air or bathroom vents that exit through the roof can often be damaged, blocked or painted over, causing air and moisture problems throughout the entire home.

#### Windows, Doors, and Siding

Think your windows are a problem? Think again. It's actually the area around the windows you have to look closely at. Although a double or triple-pane window is more efficient than a regular single-pane, most of your energy escapes through cracks, crevasses, and openings where the window meets the wall. The same is true for doors and siding. They all have small openings that develop around their edges, such as where the siding meets the foundation and the roof, or where two walls come together. Previous weather stripping that has deteriorated may also need to be replaced.

#### Crawl Space or Basement

If you have an outdoor entrance to your crawl space or basement, the auditor will check to make sure that it seals when closed. Some crawl spaces tend to have ventilation issues. The auditor will also make sure no air ducts from inside the home end in the crawl space. If they do, the air ducts will end up putting all the air you're trying to remove back into your home through the floor.

#### Chimney

The area between the base of the chimney and the roof can often have cracks and air leaks, letting warm air escape. Cold air can also get into a damaged or ill-maintained chimney.

If your chimney hasn't been cleaned for a while, that's another safety issue. A substance called creosote develops inside and on top of the chimney from the smoke, and if enough of it builds up, it could ignite.

#### Exterior Drainage System

The wetter the climate, the more you need a properly functioning gutter and drainage system. Water is more corrosive than you'd think: given time, it can create more cracks in your home and even compromise the foundation. If the ground surrounding the foundation gets soaked with water, then at least some of that moisture will find its way into the basement, crawl space, or concrete floor. The air in the home will absorb this moisture, which will make your air conditioner work harder in the summer and cause condensation to form on the walls during winter. Left unchecked, excessive moisture causes fungal wood rot, mildew and mold, or even a damaged foundation.

## The Interior Inspection

The interior is likely the most crucial step in the energy audit. The inside is where you spend most of your time. A home is meant to be safe and comfortable, and if it isn't, your auditor will find out how to change that for you.

This is the point of the inspection where your auditor will check for interior air leaks using the blower door evaluation and the infrared scan. As discussed earlier, these tests usually uncover the most vital energy-escape routes. Then the auditor will check insulation levels in the attic, walls, and basement or crawl space. Once completed, they'll check the interior venting and drainage systems for signs of problems and moisture damage.

An interior investigation can also uncover a number of safety issues. The auditor will check for signs of mold, asbestos, or vermiculite insulation, and make sure temperature levels are appropriate for any sensitive individuals. If your auditor finds any of these problems, the issues will need to be taken care of by a professional immediately.

## Common Problems

### Air Leaks: Cracks, Crevasses, and Bypasses

Air leaks are the most common cause of energy inefficiency. They are usually found near and around doors, windows, corners, joints, connections to home additions, electric outlets, vents, recessed lighting, and other areas. Your auditor will help you find all these significant leaks and include a detailed list on the final report. The goal is to get your home as airtight as possible while still allowing controlled and gradual air exchange with the outside.

### Insulation

Ineffective or insufficient insulation is another very common problem. The auditor will check the insulation of the attic, walls, floor, basement, and crawl space.

The attic is likely the most important focus area for homes in cold areas. Since heat rises, this is where most energy escapes during the winter. In order for the attic to be sufficiently insulated, there needs to be a thick and even layer of insulation in every spot. If insulation is too thin, damaged, or missing in some areas, a lot of heat will escape.

To check levels, the auditor will need to take a peek inside your wall cavities. There may already be a few inconspicuous holes in your home that have allowed builders and contractors to check insulation levels, but if that's not the case, the auditor may need to make a few. They'll typically make them in a concealed space, like the back of a closet, and seal them up when finished.

If your home is built on concrete without a basement or crawl space, then you likely won't need floor insulation. But a home with a crawl space or basement does need insulation on any above-ground exterior walls or on the interior ceiling. Without it, cold air will infiltrate your home from the ground up.

### Venting System

All homes have venting systems that remove moisture and maintain a healthy cycle of air. This controlled air exchange is crucial not only to your comfort but also to your safety. Blocked or damaged venting systems can lead to moisture problems, mold, and even the buildup of dangerous toxins.

The opposite is also a problem. A vent that allows too much air to leak in can cause energy waste and moisture problems. During the inspection, the auditor will check your home to make sure neither is happening.

They'll also check that all the vents are properly routed to the outside. Vents that end within the home are problems (such as the exhaust vent of your dryer).

## Safety Concerns

### Moisture Damage

Moisture damage will not only hurt your home, but can also compromise your safety. It's typically caused by a leaky roof; damaged or blocked venting systems; vents that empty in the attic, basement, or crawl space; a poor or absent gutter system; and leaky pipes. Excessive moisture can lead to wood rot, mildew, and mold. Mold in particular can cause serious health problems, so if your auditor finds evidence of it, they'll not only recommend you immediately fix the problem, but you may even need to leave the house until it has been cleared.

### Asbestos

From the mid-1800s to about the 1970s, asbestos was commonly used in homes for insulation. We now know that asbestos is a toxic substance that has caused illness and even death for those who have been overexposed to it. Newer homes will likely be safe, since builders now only use cellulose or fiberglass insulation. But if you have an older home, your auditor will need to check your walls to make sure you're asbestos free.

### Caring for Sensitive Occupants (Newborns, Sick, Elderly)

Homes with newborns, elderly adults, or people with chronic illnesses may need to be warmer during the winter and cooler during the summer. For these households, energy efficiency won't just save money. It could save lives. The auditor will likely recommend you keep the indoor environment more temperate, and will take extra care to properly seal the rooms of sensitive occupants.



## The Mechanical Systems Inspection

Making sure your home is well-insulated and free of leaks is important. But fixing the shell of a house won't mean much if your home's combustion and cooling equipment isn't up to par. These systems are the heart of any home's climate control, so the auditor will inspect them to make sure they're working both efficiently and safely.

The auditor will check for leaks, rust, corrosion, and malfunctioning safety controls. They'll not only examine the equipment itself, but also the vents, flue pipes, fuel lines, duct work, and wiring. And most importantly, they'll check for safety issues, such as gas, carbon monoxide, or water leaks. Let the auditor know if you have old equipment and if you've ordered any repairs in the past.

## Heating Systems

### Efficiency Rating

How can you tell if you're getting the most out of your current system? Check the equipment's efficiency rating. A system's rating is measured by Annual Fuel Utilization Efficiency (AFUE), or how efficiently the equipment uses energy over the course of a year. For example, if a model's AFUE is 80%, that means 80% of the heat is used in the home and 20% escapes through the flue, chimney, or elsewhere. New systems are required to display the rating so consumers can compare

different models. If you don't know or can't find the AFUE of your heating system, your auditor should be able to make a close estimate and recommend any upgrades or replacements.

### Retrofitting Your Equipment

There are some common cases where retrofitting your equipment is recommended. For example, if your furnace or boiler is too big for your home, it may be possible to modify it to operate at a lower capacity. Other retrofitting options include installing programmable thermostats, upgrading duct work in forced-air systems, and adding zone control for hot-water systems.

### Replacing Your Boiler or Furnace

By far, most U.S. homes are heated with furnaces or boilers. Old systems typically have efficiencies at 56%–70%, while newer systems can achieve efficiencies as high as 97%. But keep in mind that the most efficient models are also the most expensive, so unless you live in a particularly cold climate, the most efficient model may not be the best choice. Your auditor will help you decide what efficiency level will offer you the most savings at the lowest cost. Also, don't buy a new system until after you've completed any weatherization repairs. Once these improvements are made, you'll likely need a smaller furnace than before, which will not only be less expensive to buy, but also less expensive to operate.

## Space Heaters

Small space heaters can be a cost-effective solution when the main heating system is inadequate or when you want to supplement the heat in only one room (e.g. the room of a newborn or elderly person) without wasting energy maintaining that temperature throughout the entire house. But if you use space heaters, you need to be careful.

The U.S. Consumer Product Safety Commission estimates that more than 25,000 residential fires every year are associated with space heaters, causing more than 300 deaths. An estimated 6,000 people receive hospital emergency room care for burn injuries associated with contacting hot surfaces of room heaters, mostly in non-fire situations. So make sure your space heater has all the current safety features, and use it with care.

**Electric resistance heating** is typically more expensive and less efficient than the more common combustible heating systems. Even though it converts nearly 100% of its electricity to heat, the electricity itself is produced from oil, gas, or coal generators that are only 30% efficient. This system may be acceptable in warm, dry climates where heating needs are low. But if heating needs are moderate to high and electricity is the only practical choice, then your auditor may recommend supplementing your system with heat pumps, which are more cost-effective and cut electricity use by 50%.

**Radiant heating** is a system that provides heat to panels in the floor, wall, or ceiling of a house, bringing heat directly from the hot surfaces to the people in the room, much like the heat you feel from a hot frying pan. This is typically a fairly efficient system, beating out baseboard and forced-air heating. And the lack of moving air can be good for people with severe allergies.

An **active solar heating system** is one that harnesses the power of sunlight to offset the use of gas and electricity. Though energy from the sun is free, installing a system can be expensive and will likely take at least 10 to 20 years to pay itself off in savings. Plus, most systems won't produce enough energy to run your whole home, so they are currently best used to offset costs of your current energy system, such as with solar water heaters.

**Wood and pellet heating** have become more popular as the cost and environmental impact of fossil fuels rise. It's a cheap way to supplement the heat in your home. But don't go out of your way to install a fireplace if you don't have one unless you're doing it for aesthetic reasons. The purchase and installation cost will be much too high to justify any savings.

## Cooling Systems

### Air Conditioners

Two-thirds of all homes in the U.S use air conditioners. If your central air-conditioning system is more than 10 years old, replacing it with an Energy Star model could reduce your energy consumption for cooling by 20%. Use your system properly and you can save even more. Make sure all windows and outside doors are closed while it's running. Install the window unit on the shady side of your home, and make sure the area around it is sealed.

### Venting

Venting with fans and natural breezes is the least expensive and most energy-efficient way to cool a building. In some cases, natural ventilation will be enough, although it usually needs to be supplemented with spot ventilation, like a ceiling fan and window fan.

### Evaporation Systems

An evaporation system, or "swamp cooler," is a good way to cool a home in a dry climate. The unit works by adding moisture into the air, which brings the temperature down by 15°F to 40°F. The cool air is then directed into the home while warmer air gets pushed out through windows. Because of the moisture they add, they should not be used in humid climates.

## Safety Concerns

### Carbon Monoxide

Carbon monoxide leaks can come from a variety of sources, but usually come from leaking, worn, blocked, ill-fitting, or poorly maintained boilers, furnaces, flues, gas water heaters, and gas stoves.

High levels of carbon monoxide are extremely dangerous and pose a serious safety issue. Your auditor will use equipment similar to what the utility company uses to check for leaks. If there is a problem, you'll need to get it fixed immediately.

### Gas Leaks

Gas leaks typically come from the same sources as carbon monoxide leaks and are also extremely dangerous. The auditor will use special equipment to make sure there are no gas leaks in your home.

## The Results

### Diagnostic Summary

The Diagnostic Summary analyzes the results from all the various tests, including the utility bill analysis, blower door test, and infrared scan to give you an overall energy-efficiency rating. It will also show your air exchange rate, which is the rate at which outdoor air replaces indoor air in your home. A lower exchange rate is good, while a high one indicates a lot of leaks.

### Recommendations List

Each home has dozens of improvements that you can make to increase energy efficiency. So where should you start? Using the data gathered during the audit, you'll get a prioritized list of improvements, from the easiest and most cost effective to the least. To do this, the auditor will calculate a Savings-to-Investment Ratio (SIR) for each project, showing which will yield the greatest savings at the lowest cost. Projects that yield the greatest improvement and pay themselves off quickly go at the top of the list, while expensive projects with a lower return go at the bottom. If an improvement will take 10 to 20 years to pay for itself, they likely won't recommend it unless it will correct a safety issue.

### Plan of Action

With the recommendation list in front of you, your auditor will help you make a plan of action for making improvements. Choose which projects you want to begin, on both a do-it-yourself and professional level. The plan may even include discounts, a list of recommended contractors, and payment schedules.

## Steps For Moving Forward

### Step One - Decide which improvements you want to make

This decision should be based on money-saving potential and safety concerns. The priority list with the SIR ratings will help. But if you want to do an improvement low on the list for aesthetic reasons, such as plant a tree or install a fireplace, feel free. It's your home. Choose to do a lot, a little, or nothing at all. It's up to you.

### Step Two - Contact utilities or search for government grants

Your utilities company may cover the costs of some upgrades and repairs, so make sure you give them a call to find out what is offered in your area. The government also has money available in the form of grants and tax breaks for people who perform weatherization improvements on their homes. Do your research to find out if you qualify.

### Step Three - Choose a good contractor

If your auditor can't do the follow-up work for you, then you'll need to find a reputable company that can. Your auditor will have a list of recommended contractors and can help you pick one. This is an important decision, so use all your resources to find the right person for the job. It's best to hire a professional who understands all the aspects of the audit. Each part of your home functions interactively with the rest of your home; for example, the way that your home is air sealed can affect both how your furnace functions and how hard it must work to heat the home. If you do decide to hire several separate contractors to make individual improvements to your home, make sure to take note of the changes that are made as they occur, and keep each subsequent contractor informed of those changes.

### Step Four - Set the date

The average family saves \$350 or more a year on their utility bills after having their homes weatherized. So don't wait any longer. Call your contractor, set a date, and make the changes as soon as you can. You'll be glad you did. Save money, be more comfortable, increase the value of your home, and get peace of mind. An energy-efficient home is good for everyone. Especially you.

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# SOURCES

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**The U.S. Department of Energy**

[www.energy.gov](http://www.energy.gov)

**American Council for an Energy-Efficient Economy**

[www.aceee.org](http://www.aceee.org)

**The U.S. Department of Energy's Office of Energy  
Efficiency and Renewable Energy**

[www.eere.energy.gov](http://www.eere.energy.gov)

**SAMPLE**  
**Energy Star®**  
[www.energystar.gov](http://www.energystar.gov)

**U.S. Consumer Product Safety Commission**

[www.cpsc.gov](http://www.cpsc.gov)

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